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Exploring Factors Influencing Adoption of Electronic Prescription at Community Pharmacies in Germany: An Omnichannel Perspective

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“Great things are not done by impulse,

but by a series of small things brought together.”

- Vincent Van Gogh -

Abstract

This research project delved deeply into the specific factors influencing the adoption of electronic prescriptions at community pharmacies in Germany from an omnichannel perspective. Overall, the study encompassed both qualitative and quantitative analyses, offering two complementary approaches to the research topic.

Starting with a qualitative study, semi-structured interviews were conducted with ten participants. This process uncovered pivotal elements that either foster or hinder the acceptance of electronic prescriptions. It yielded a complex network of 31 factors within ten constructs, setting the stage for the subsequent phase of the research.

Transitioning to a quantitative approach, the latter part of the study strived to delve deeper into these influences. It also projected the potential customer acceptance for the online purchase of prescription medications via electronic prescriptions. This quantitative analysis was based on the results of an online survey with 500 participants, the results of which are presented here and further explored via multiple regression.

The study ascertained that perceived risk, relative advantage, compatibility, personalization, connectivity, consistency, and flexibility are significant predictors of adoption, with the first three aforementioned factors emerging as the most influential. These findings indicate that mitigating safety concerns and highlighting the benefits and suitability of electronic prescriptions in an omnichannel context are crucial for increasing adoption rates. Furthermore, the research also underscores the importance of personalization and flexibility, suggesting that pharmacies should individualize their services to meet customer preferences.

In conclusion, this study unifies diverse research methods to deliver significant insights, while also covering the way for future academic exploration. Moreover, it provides practitioners with practical advice to remain competitive in the evolving realm of electronic prescriptions.

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Furthermore, I would like to convey my sincere appreciation to my family, who have supported me throughout this demanding journey. Your intense encouragement, empathy, and faith in my abilities have been my guiding light, helping me navigate the ups and downs of this academic endeavor.

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Abbreviations

ABDA:	Federal Union of German Associations of Pharmacists
AMG:	Arzneimittelgesetz or German Medicine Act
EHR:	Electronic health record
GDPR:	General Data Protection Regulation
Gematik:	Gesellschaft für Telematikanwendungen der Gesundheitskarte mbH (Gematik),
OTC:	Over-the-counter
RX:	Prescribed medicine

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this commentary has been approved. Ethical approval was granted by the Northumbria University after completing an application for ethical approval (submission ref. 43084). Furthermore, a formal letter of approval was received from the Department of Ethics (e-mail 16.02.2022 19:58 CET).

I declare that the Word Count of this Thesis is 66,483 words

Name: Gregor Franz Anton Bernhart

Date: 10. August 2023

Chapter 1: Introduction

In an era characterized by rapid digital transformation, the healthcare sector finds itself amid significant shifts in its landscape. One notable development is the emergence of electronic prescriptions, a technological innovation that has captured the attention of researchers, practitioners, and – of course – pharmacists. This introductory chapter highlights the research purpose and theme, rationale and focus, motivation, general research questions, and aims. Additionally, it offers a brief summary of the study's contributions and presents a high-level overview of the thesis structure. By addressing these aspects, the stage is set for a comprehensive exploration of the adoption of electronic prescriptions in the German healthcare context.

Research purpose and theme

Despite Germany's standing as the fourth-largest healthcare market globally and its per capita healthcare expenditure ranking among the highest worldwide, the nation's healthcare sector shows a relatively low degree of digitalization compared to other European Union members (European Union, 2018). In response, the Federal Ministry of Health has not only established legal frameworks for advancing digitalization in recent years but also acquired majority ownership of Gesellschaft für Telematikanwendungen der Gesundheitskarte mbH (Gematik) in 2018 to facilitate and speed up the development of a digital healthcare ecosystem. The company was already founded by the Federal Ministry of Health and the National Association of Statutory Health Insurance Physicians (Kassenärztliche Bundesvereinigung) back in 2005. The government's stake in the company was increased from 51% to 100% in 2018, effectively making Gematik a state-owned enterprise. This move was part of a broader effort by the German government to increase its control over the country's digital infrastructure.

To date, Gematik supervises the implementation and management of electronic health records (EHRs), electronic prescriptions, and other important infrastructure elements. Furthermore, Gematik aims to establish standards, specifications and guidelines for healthcare providers and other stakeholders to ensure secure, efficient and seamless integration in the digital healthcare ecosystem (Gematik, n.d.). For example, in the context of community pharmacies, Gematik has developed specifications for the use of electronic prescriptions, outlining the technical requirements for pharmacies to receive and process electronic prescriptions. Moreover, the Federal Ministry of Health has also strongly promoted the adoption of electronic prescriptions and set up several regional pilot projects in recent years (Bundesministerium für Gesundheit, 2019). Among others, these initiatives demonstrate the overall importance and relevance of technological elements such as electronic prescriptions within the growing digital healthcare system in Germany. Researchers studying similar situations in other countries have also found that these digital developments hold strong potential to improve safety, quality and efficiency (e. g. Black et al., 2011; Ross et al., 2015).

Community pharmacies are also essential from a customer's perspective, as they serve as the primary point of access for medicine supply in Germany. In fact, the vast majority of medicines are still provided through community pharmacies (ABDA, 2022). This highlights the crucial role that community pharmacies play in ensuring that patients have access to the medications that they need, and underscores the importance of integrating pharmacies into the digital healthcare ecosystem. As of the end of 2022, there were 18,461 community pharmacies across the country (ABDA – Bundesvereinigung Deutscher Apothekerverbände, 2022). These pharmacies have a significant impact on the healthcare system, with 1 billion patient contacts per year and 3 million patients served daily. They also make 300,000 deliveries daily and provide a quality check of more than 6 million medications produced per year. Apart from providing medications, public pharmacies also offer a range of services such as health

screenings, immunizations, medication management and health education. These services contribute to the overall well-being of the communities that they serve and help to promote preventative healthcare practices. Furthermore, ABDA (2022) shows that 83% of patients who regularly take three or more medications also regularly visit a community pharmacy, while the study reveals that a significant 88% of the German population express confidence in their pharmacists. Moreover, according to ABDA (2022), 83% of adults describe the quality of health care provided by local pharmacies as good to excellent, and 93% of German citizens are either satisfied or very satisfied with local pharmacies. These statistics demonstrate the existing trust and importance of community pharmacies in ensuring the health and well-being of the population in Germany.

Given this critical role that public pharmacies play in ensuring medication supply and patient care in Germany, it is essential to explore any changes or advancements in the healthcare system that may affect their operations. The advent of electronic prescriptions is such a development that has the potential to significantly affect the pharmacy industry. Electronic prescriptions provide a digital alternative to traditional paper ones, potentially offering several benefits to patients, healthcare providers, and pharmacies. For instance, electronic prescriptions can improve patient safety by reducing the risk of errors that may occur with handwritten or printed prescriptions. However, the implementation of electronic prescriptions may also pose some challenges and changes to the existing workflow and business models of pharmacies.

Furthermore, as the healthcare industry continues to advance technologically, community pharmacies face new competition such as growing digital online pharmacies. According to the E-commerceDB database provided by Statista (2023) showing the revenue figures for major online pharmacies in Germany in 2021, Doc Morris – which is a pure online pharmarcy – ranked first with a revenue of 783.3 million euros, followed by Shop Apotheke in second place with 517.9 million euros. Other online pharmacies such as Medpex,

Medikamente-per-Klick, Apodiscounter, Eurapon, Aponeo, Apotal, Mycare, and Sanicare also reported substantial revenue. Furthermore, it is noteworthy that online pharmacies have experienced consistent growth in their market share within the over-the-counter (OTC) sector. Over recent years, their market share has steadily increased and currently stands at approximately 20% (Statista, 2023). This upward trend indicates the growing importance of online pharmacies as a preferred option for consumers seeking both non-prescription as well as prescription medications. Hence, with the focus on electronic prescriptions, it will be important to have a profound understanding of the effects and implications so that practitioners can ensure that they remain relevant and thus attract customers in the future.

Therefore, the purpose of this study is to investigate the factors that influence the adoption of electronic prescriptions at community pharmacies in Germany.

Rationale and focus of study

Recognizing the vital role public that pharmacies play in safeguarding medication supply and patient care in Germany, the introduction of electronic prescriptions represents a substantial advancement with the potential to considerably influence the pharmacy industry. With a focus on digital health, Stephanie and Sharma (2020) conclude that it becomes crucial to examine the potential impact on the industry's future landscape, in light of the emergence of robust, secure, and scalable platforms aligned with new technology frameworks facilitating digital information exchange. Community pharmacies in Germany will be among those strongly affected by this development and – similar to other retail sectors – they will need to develop strategies to follow a patient-centered approach, online as well as offline. Petrakaki et al. (2012) highlight that electronic prescriptions create many possibilities for future

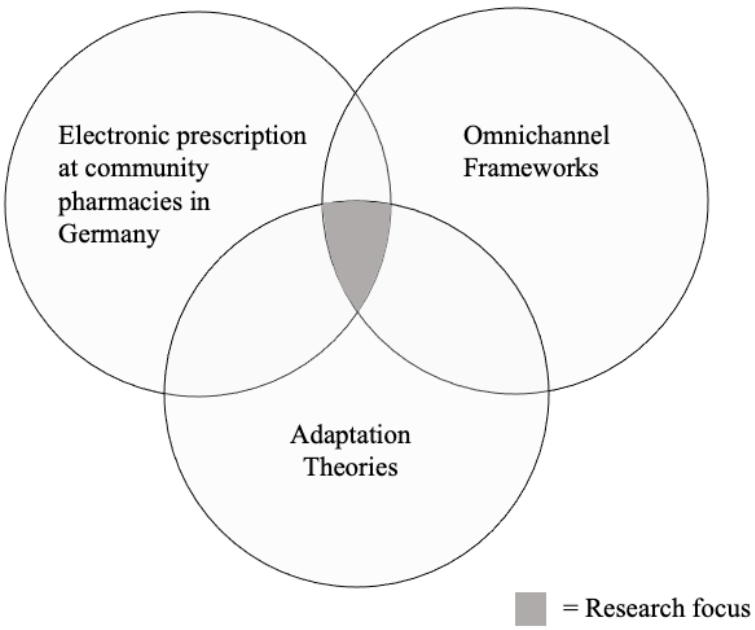
development. Indeed, it is necessary to analyze this promising statement in the context of the implementation of electronic prescriptions in Germany, with a focus on community pharmacies.

According to Cai and Lo (2020), the omnichannel research path lacks a long history and thus there are many undiscovered research areas. Within their recommendations for further research, the authors highlight that the relevance of omnichannel technology requires deeper analysis. They justify this statement through various findings, such as the notion that technology (a) will play a major role to create a seamless omnichannel experience, (b) is the basis for new sales channels, and (c) allows new forms of supply chain interactions like inventory sharing. The existence of these obvious research gaps is also supported by various other authors (Brynjolfsson et al., 2013a; Chen et al., 2018; Shen et al., 2018).

The findings from Petrakaki et al. (2012) and Cai and Lo (2020) fit well with the overall focus and rationale of this study, highlighting the impact of electronic prescriptions and omnichannel technology in the healthcare industry. Furthermore, it points to the need for further research to explore its impact in a specific context, such as community pharmacies in Germany. These aforementioned research gaps also provide a clear justification for the need to investigate the factors that influence the adoption of electronic prescriptions in community pharmacies.

Figure 1 illustrates the central research focus, which is positioned at the intersection of three interrelated topics: the forthcoming implementation of electronic prescription technology in German community pharmacies, the potential increasing relevance of omnichannel frameworks, and academic theories centered around the adoption of novel technological innovations.

Figure 1: Research focus



Hence, the significance of this study is to provide relevant insights into the adoption. Consequently, the author will focus on understanding factors that are relevant in the individual innovation adoption process. Once these factors are identified and validated, it will be possible to derive recommendations for pharmacists to implement relevant omnichannel services that support the adoption of electronic prescriptions. At the end, the author will also focus on developing a projection of adoption.

Research motivation

For centuries, patients have primarily received their medications through a robust network of community pharmacies in Germany. However, this traditional approach has experienced significant changes in recent years. A major legal game-changer was already set in the beginning of 2004 when § 43 Para. 1 of the German Medicines Act (AMG) passed the

German parliament. From that moment onwards, it has been legally allowed to purchase both prescription and non-prescription drugs online, including home delivery. Of course, the order process of prescription drugs remains quite inconvenient since an online pharmacy can only deliver the ordered medicine when it physically receives the paper-based prescription in advance. This not only leads to inconveniences but also relatively long delivery times. It can be assumed that electronic prescriptions will dramatically simplify this process, and their introduction is currently planned for January 2024 (ABDA - Bundesvereinigung Deutscher Apothekerverbände e. V., 2022). The introduction of electronic prescriptions represents the next innovative milestone towards the digitalization of pharmacies' core processes. It has been developed for more than fifteen years and it has the power to significantly change customer behaviour. As explained above, online pharmacies have recorded significant growth not only due to the COVID-19 pandemic but also the high level of convenience that they can offer (Statista, 2023). New digital applications that have the power to further simplify existing processes – such as electronic prescriptions – might even accelerate the strong growth of online pharmacies in the future. However, the success and growth of these tools does not come without a necessary level of adoption and naturally customer acceptance. According to a report by the Federal Union of German Associations of Pharmacists (ABDA - Bundesvereinigung Deutscher Apothekerverbände e. V., 2022), the share of prescription pharmaceutical products ordered online stands at less than 2% (2022). This relatively small proportion suggests that there is significant room for growth and change in this sector. For instance, drawing upon the diffusion of innovations theory by Rogers (2003), it can be argued that we remain within the early adopters stage of online pharmacy usage. As such, we can anticipate a potential 'tipping point' in the future when the convenience and speed offered by digital processes such as electronic prescriptions could trigger a rapid increase in adoption rates.

Drawing on insights from markets where electronic prescriptions are already implemented such as Sweden, Denmark, Estonia and Finland, the proportion of pharmaceutical products requiring a prescription and ordered online in Germany could increase more than fivefold to approximately 10% within 5-10 years (European Union, 2018). A primary driver of this dynamic growth may be the enhanced convenience for patients, who can effortlessly transmit electronic prescriptions to pharmacies. Established online pharmacies such as Docmorris and Shopapotheke – which dominate the German market – possess years of experience in providing digital services. By contrast, most community pharmacies have limited or no e-commerce experience. Consequently, understanding the impact of electronic prescriptions with a particular focus on community pharmacies becomes essential.

The author's personal motivation to undertake this research in the realm of technology and digitalization is deeply anchored in a wealth of professional experience and a firm commitment to expand knowledge frontiers. A cornerstone of this experience is the author's role in founding a company specializing in omnichannel solutions, designed to integrate physical stores with online platforms across diverse markets, notably in the fashion and healthcare sectors. One of the company's notable accomplishments was a pioneering project that effectively connected over 5,000 stores to a leading European fashion marketplace, thereby dramatically expanding their reach. Through these interactions with a diverse range of European businesses – especially those of small and medium size – the author found a driving passion to utilize and extend this expertise in other sectors. This led him to explore the pharmaceutical industry, reflecting a decision that also forms the basis of his current research.

As a result, this research venture represents an engaging opportunity to investigate the understanding of omnichannel solutions within relatively unexplored sectors. This motivation is further fueled by a background in teaching business administration with a strong emphasis on innovation management at a respected German university. The ultimate goal is to generate

and disseminate knowledge that holds practical value for industry professionals while also enriching academic discourse. Specifically, the focus lies on contributing to discussions on innovation within the pharmaceutical industry and its prospective impact on community pharmacies.

Community Pharmacy System in Germany

In Germany, the term "community pharmacy" (In German: Apotheke) refers to the public-facing retail pharmacies that serve local communities. They are distinctly different from hospital pharmacies that are dedicated to supplying medications within hospital settings. Community pharmacies in Germany are predominantly privately owned and operated entities. The terms "community pharmacy" or "public pharmacy" are used interchangeably and mean the same. To be able to operate a community pharmacy in Germany a license that is granted by regional authorities is needed. This aims to ensure the maintenance of certain quality standards and the professional qualifications of the pharmacist in charge. Although privately owned, these pharmacies function within a regulatory framework set by the German government (Haucap et al. 2012).

As of the end of 2022, there were slightly over 18,000 community pharmacies serving the country's population, equating to approximately one pharmacy for every 4,600 residents. The total revenue in the German pharmaceutical market was around 56.5 billion euros in 2022 (ABDA 2022). When evaluating per capita pharmaceutical expenditure, there exists a marginal gender discrepancy. On average, women incurred a cost of €775, while men spent a marginally lower amount of €759 (ABDA 2022). Overall, the market has shown strong growth tendencies, which is reflected by more than doubling of the volume (total market size) over the past five

years. These figures underline the economic significance of pharmacies in the healthcare sector and their importance in the broader German economy. The majority of the revenue for community pharmacies arises from the dispensing of prescription medications, for which they receive reimbursement from statutory health insurance (Gesetzliche Krankenversicherung, GKV) or private health insurance companies, depending on the patient's coverage.

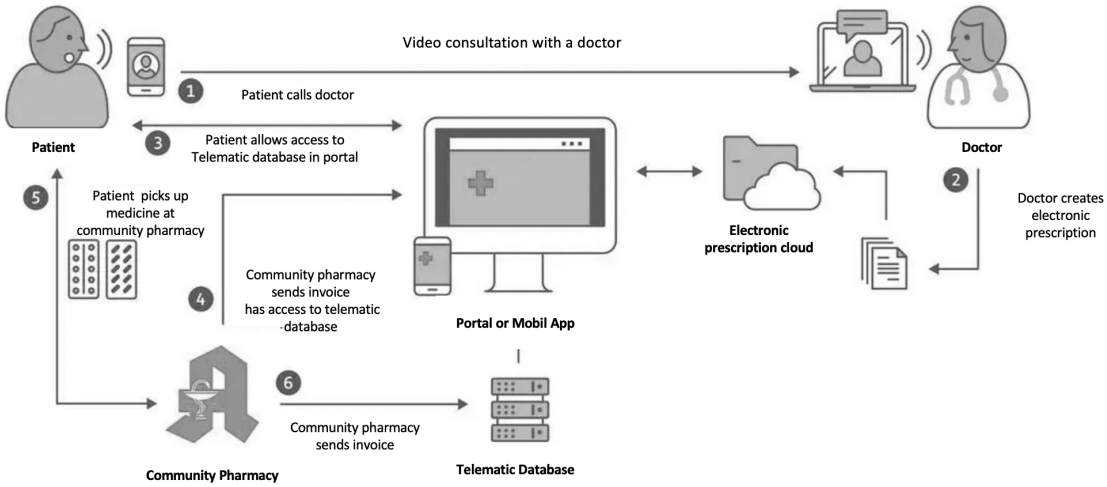
Though community pharmacies are privately owned, German law prohibits large pharmacy chains. This regulation ensures that a pharmacist can own a maximum of up to three branches. In doing so, the government aims to prevent market monopolization as well as to ensure a decentralized distribution of pharmacies. As a result, while there are some small chains and franchise models (marketing franchieses such as Linda Apotheken), the vast majority of community pharmacies are independent businesses (Pioch and Schmidt, 2004).

The reimbursement process is a combination of a fixed fee for dispensing and the cost of the medication. German law mandates that prescription medicine prices are standardized nationwide, irrespective of the pharmacy. Furthermore, community pharmacies also earn revenue from the sale of over-the-counter (OTC) medications, health and wellness products, and other retail items. It is worth noting that competition in the OTC market is particularly intense, both among community pharmacies and against online retailers. Even amazon plays already a strong position in the segment

The prescription process in Germany typically begins with a visit to a healthcare professional (e.g. doctor), who after diagnosing the patient, issues a prescription (either paper-based or electronic). Patients then present this prescription at a community pharmacy of their choice. The pharmacist verifies the prescription, provides the medication, and offers consultation on its use. Figure 2 shows an exemplary process of electronic prescription through video consultation. Initially, a patient initiates a video consultation with a doctor. Following the consultation, the doctor creates an electronic prescription that is stored in an electronic

prescription cloud. The patient then allows access to a central database via a portal or mobile app, which is subsequently accessed by the community pharmacy. After verifying the prescription, the pharmacy prepares the medication for the patient to pick up.

Figure 2: Example of electronic prescription process (Rohrer, 2020)



For medications covered by the Public Health Insurance, the patient pays a nominal co-payment, while the majority of the medication cost is directly reimbursed to the pharmacy by the health insurance fund. Private health insurance schemes do have different reimbursement processes, often involving the patient initially paying the full amount and later getting reimbursed by their insurance provider.

As stated above, the competitive landscape in the German online market primarily pertains to non-prescription or over-the-counter (OTC) medications and other retail products such as wellness products. Given the regulatory standards and the standardized pricing structure, prescription medicines do not witness the same degree of price competition as seen in the OTC segment. However, the adoption of electronic prescriptions could potentially reshape how community pharmacies operate and interact with the digital ecosystem. This might

also further influence the dynamics of competition and customer behavior in both prescription and non-prescription sectors (Gaebert and Staňková, 2020).

In conclusion, community pharmacies in Germany, while private entities, operate within a well-regulated framework ensuring quality and consistency in pharmaceutical care. They play an important role in the healthcare system, bridging the gap between medical practitioners and patients, and so ensuring that individuals receive the right medications and the necessary guidance on their use. In this context, the introduction of electronic prescriptions stands to potentially impact the established operational framework of community pharmacies, which also might affect the broader market structure. This potential shift also underscores the broader societal significance of these changes.

Research aims and objectives

The essence of this research – captured by its title: "Exploring Factors Influencing Adoption of Electronic Prescription at Community Pharmacies in Germany: An Omnichannel Perspective" – is to explore in depth the relevant factors for the adoption of electronic prescriptions within German community pharmacies. This research journey is split into three primary, interconnected research aims:

The first aim (Table 1) focuses on understanding the factors that influence customer usage of electronic prescriptions. It seeks to unravel why customers would opt for online purchases of prescription drugs at community pharmacies in Germany, with an intense focus on the parameters that stimulate or deter this behaviour.

Table 1: Research aim 1

Aim 1: Explore what factors influence customers' usage of electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany
Objectives: 1.1 Identify appropriate innovation adoption models and studies analyzing factors relevant to multi- or omnichannel adoption. 1.2 Design a research model integrating potentially influential factors or factor clusters (constructs). 1.3 Validate and – if necessary – refine the research model based on application results and emergent findings.

The second aim (Table 2) is proactive and strategic, seeking to devise a robust list of recommendations for community pharmacies in Germany. The objective is to empower these pharmacies to foster and enhance the customer acceptance of electronic prescriptions. This aim is envisioned as a strategic toolkit, providing practical, implementable actions to increase adoption rates.

Table 2: Research aim 2

Aim 2: Create a list of recommendations for community pharmacies in Germany to enable them to increase customers' acceptance of electronic prescriptions.
Objectives: 2.1 Identify factors that positively influence the adoption of electronic prescriptions at community pharmacies in Germany. 2.2 Derive recommendations to foster electronic prescription adoption. 2.3 Recognize factors that negatively influence electronic prescription adoption. 2.4 Establish recommendations to minimize the effects of these negative factors.

The third aim (Table 3) looks into the future, attempting to project the extent to which customers will adopt electronic prescriptions for their online purchases of prescription drugs at community pharmacies in Germany.

Table 3: Research aim 3

Aim 3: Project the extent to which customers will adopt electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany.
Objective: 3.1. Develop a structured quantitative study with an appropriate sample size to estimate future adoption.

Summary of contributions

This research study provides an in-depth examination of the factors that influence the adoption of electronic prescriptions at community pharmacies in Germany. Through an exploration of 11 distinct constructs, that are derived from literature, 31 items were illuminated in detail. As a result, a set of rich findings is provided that allows a comprehensive understanding of the phenomena under investitgation. Based on these findings the following sections highlights the distilled major insights.

Omnichannel services are relevant: The empirical data highlights a marked preference for a seamless and integrated omnichannel approach. Services such as home delivery, click & collect, and online stock transparency are integral components supporting the adoption of electronic prescription. Furthermore, a notable majority of respondents underscored the need for a central application which is intuitive, mobile and allows direct communication to address questions and obtain relevant information regarding the prescribed medicine. Contrariwise, a majority of respondents that are generally less likely to adopt electronic prescription do not perceive incremental benefits in relation to traditional paper-based prescription. Hence, it is essential for community pharmacies not only to introduce the electronic prescription system with a certain level of flexibility but also to articulate its advantages clearly amongst their customers.

Trust and technology synergy: Delving into the connection of trust and technology, the study revealed that most of the respondents expects stringent security protocols for digital transmission of prescriptions. This focus on security corresponds with the observation that the majority would base their use of electronic prescriptions on the trustworthiness of the service provider. These findings underscore the necessity for community pharmacists to address trust concerns while maximizing the potential of this technological innovation.

Personalized product offerings versus discounts: Amongst others, the study also further explored respondents' reaction towards receiving personalized product offerings and discounts in the context of electronic prescription usage. While a substantial portion of respondents expresses hesitancy towards receiving personalized discounts in combination with electronic prescriptions, a similar number shows appreciation for personalized product offerings. This shows a preference for non-intrusive personalization that enhances user experience without being overly assertive.

For community pharmacies, the findings from this study present a clear directive: investing in technology is not just about digitization, but about curating a meaningful and secure experience for customers. The obvious preference for a seamless omnichannel experience means that pharmacies should prioritize solutions that integrate online and offline worlds, like efficient stock tracking systems, mobile-friendly applications, as well as intuitive digital communication channels. Especially the emphasis on trust shows that any technological investment should be paired with strong security features. Customers expect their sensitive health data to be transmitted safely. Additionally, the nuanced view on personalization implies that technology investments should allow a segmented user experience. For example, intelligent recommendation systems could be employed to suggest relevant products without being intrusive.

The aforementioned key findings represents just a brief overview of the exploration of the factors and constructs. As the reader ventures deeper into the research, they will be navigated through a systematic exploration of 31 identified factors rooted within 11 constructs. Their interplay and the nuanced differences in their weightage in influencing adoption decisions are critical to understand. Hence, this research presents a multi-dimensional view of the adoption of electronic prescriptions.

Thesis structure

Chapter 1 serves as an overall introduction to this research project, before chapter 2 takes on a dual role. First and foremost, it presents a comprehensive literature review delving into the three key research areas identified in Figure 1: the anticipated introduction of electronic prescription technology in German community pharmacies, the potential rise in significance of omnichannel frameworks, and academic theories focusing on the adoption of new technological innovations. In addition, it highlights the importance and relevance of the research aims and objectives. By evaluating various theoretical models, the chapter also pinpoints the most appropriate approach for this study. Ultimately, the chapter aims to shed light on the ongoing debates in these areas and provide a well-rounded understanding of the research context.

The research methodology and methods are described in chapter 3, beginning with a philosophical discussion of the paradigmatic position of the study. Moreover, the chapter highlights the importance of research paradigms and their impact on the chosen research process. Furthermore, it discusses the applied research design, sampling strategy, and data collection methods. Finally, the author explains the data analysis methods used in both studies, which involved – among others – descriptive statistics and multiple regression analysis.

In chapter 4, the results of the quantitative interviews are presented, identifying the factors that influence the adoption of electronic prescriptions in community pharmacies in Germany. The findings from the interviews were used for developing the online survey in study two, which is presented in chapter 5. Hence, the chapter provides a detailed analysis of the survey results and discusses the significant predictors/factors of adoption, highlighting the importance of addressing concerns around perceived risk and emphasizing the benefits and advantages of electronic prescriptions to increase adoption rates.

Chapter 6 includes a discussion and research contributions. It provides a summary of the key findings, recommendations for practitioners, and presents the projection of adoption. The chapter also examines the integration of the study's findings with existing literature, identifies limitations, and suggests areas for future research.

In conclusion, chapter 7 summarizes the main contributions of the research, provides practical recommendations for community pharmacies, discusses the implications for future research, and emphasizes the need for digital transformation in the pharmaceutical industry.

Chapter 2: Literature review

This second chapter starts by defining electronic prescriptions and elaborating on the process of obtaining and delivering prescriptions to local pharmacies. The chapter further provides an overview of the history of electronic prescriptions in Germany, including their current state of development and the role of politics and other relevant stakeholder groups. Moving forward, the author examines the international level of implementation of electronic prescriptions, highlighting the various approaches taken by different countries.

In addition to exploring the definitions of multi- and omnichannel, the literature review section also delves into innovation diffusion theories, providing a detailed explanation of these theories and differentiating them from others. Rogers' (2003) innovation diffusion theory and its categories are specifically highlighted. To supplement this discussion, the omnichannel characteristics developed by Shi et al. (2020) are also thoroughly explained. Hence, in the final part of this chapter, the eleven dimensions that have been found to influence the decision to adopt electronic prescriptions are thoroughly examined and discussed

Definition of electronic prescriptions

Electronic prescriptions can be simply defined as the digital counterpart to paper-based prescriptions that still exist in many countries, such as Germany at the end of 2020 (Bell and Friedman, 2005). In Germany, several forms of prescriptions exist: (a) standard prescription, (b) private prescription, and (c) non-binding prescription. Each of these forms caters to specific scenarios and insurance arrangements.

The **standard prescription**, recognized by its pink colour, is the conventional form used within the German healthcare setting. Typically, it is the outcome of a physician's assessment, describing the medicinal treatment suitable for a patient's condition. For instance, after diagnosing a patient with bacterial infection symptoms, a physician might utilize this form to prescribe a course of antibiotics.

For context on the **private prescription**, Germany offers two primary health insurance coverage routes: the state health insurance system and private insurance companies. State health insurance, also known as statutory health insurance, is government-regulated and covers a large portion of the population. In contrast, private health insurance is offered by independent companies and often provides more comprehensive coverage options. The reimbursement process varies between the two: for state insurance, healthcare providers bill the insurance directly, while with private insurance, patients might initially pay out-of-pocket and then seek reimbursement from their insurance company. Given these differneces, the "private prescription" manifests differently within the two insurance categories. For patients under the statutory health insurance, a private prescription typically signifies a treatment or medication that is not covered within the regular framework. Consequently, these patients must bear the full costs, with no prospects of insurance reimbursements. On the contrary, individuals with private health insurance frequently encounter private prescriptions. While this means immediate out-of-pocket expenses for treatments, reimbursement patterns differ based on specific insurance contracts. Claims may lead to full, partial, or no reimbursement at all. In both contexts, the private prescription underscores direct patient cost responsibilities, each with its own set of potential reimbursement mechanisms.

The **non-binding prescription**, typically in green colour, primarily functions as a recommendation for over-the-counter medications. It guides patients towards specific non-

prescription pharmaceutical options. For instance, when a patient requires aspirin, a doctor might provide a non-binding prescription to specify the desired formulation or dosage.

Transitioning from prescription forms to the operational procedures, it is essential to also understand the overall steps of the prescription process. The exemplary process of paper-based prescriptions starts with a document generated within a healthcare professional's information technology system, often created by entities such as doctors, physicians, or dentists, generally described as 'prescribers'. This document is then printed out at the premises of the prescriber, containing all relevant information about the medication for the patient. Subsequently, the paper-based prescription is generally handed over to the patient, who continues to physically visit a local community pharmacy to pick up the medicine. The local pharmacy checks all of the information stated on the prescription and hands over the relevant medication. In general terms, electronic prescriptions represent the digitization of the aforementioned process, starting with the issuance of a prescription and extending beyond the receipt of medicine, as – for example – the data can also be shared with insurance companies (Bell and Friedman, 2005). In detail, there are three steps in the electronic prescription process:

1. The prescriber prescribes the medication. To accomplish this, the prescription data is entered electronically into the information management system. Unlike the paper-based prescription process, there is no need to print it out; instead, the prescription is signed electronically within the system. Subsequently, the information is stored in the so-called telematics infrastructure, which is provided through Gematik. Simultaneously, a unique prescription code is generated, granting access to the prescription data. The patient then decides whether to receive this prescription code via an electronic prescription app or as a paper print-out (Gematik, n.d.).

2. Subsequently, the patient can utilize a smartphone app to enter the code and send inquiries to up to three pharmacies. These pharmacies check the availability of the medication and inform the patient accordingly via the app. The patient selects the preferred pharmacy and associates the prescription code with the order. The medication is then reserved for the patient at the chosen pharmacy and can be either collected in person or delivered to their home (Gematik, n.d.).

3. Upon receiving the medication at either the community pharmacy or their premises, the patient is requested to present the paper print-out or the digital prescription code. The pharmacist can verify the prescription data with the prescription code within the telematics infrastructure or the information management system. The medication is then dispensed.

History of electronic prescriptions in Germany

The introduction of electronic prescriptions in Germany has been in discussion for more than two decades. In 1997, the management consulting firm Roland Berger published a comprehensive study of the German electronic health market, which can be defined as a starting point of the discussion around electronic prescriptions in Germany (Berger, 1997). This study aimed to inform decision-makers as well as industry experts about future possibilities and illuminated the first ideas about the required information technology infrastructure, called

“telematics.” Hence, it outlined the costs and benefits because there were considerable discrepancies between possibilities and their realization.

Moreover, community pharmacies started to recognize the opportunities of electronic health systems during the late-1990s. In 1998, Hermann S. Keller – at that time the chairman of the German Pharmacists' Association (DAV) – declared that they were working on a billing system that significantly simplified the overall prescription process (Deiß et al., 2021). Furthermore, he highlighted that the replacement of the paper prescription by an electronic one in combination with the introduction of a new generation of health insurance cards would be soon to come. History has shown that the implementation of the telematic infrastructure took more than 20 years longer than Hermann S. Keller assumed. During this period, practical implementation of certain elements of electronic health system had remained quite limited to certain hospitals, cities or regions (Koch et al., 2011). The initiative "better IT for health" (bIT4health) can be seen as a starting point of these fragmented and isolated series of pilot projects, launched by the German government in September 2003. Strong market experts such as IBM, a Fraunhofer research institute, SAP and ORGA represented the project team (Bunz et al., 2004). The overall aim of the project was to introduce the electronic health card in Germany. Therefore, it was necessary to design, build, and implement the telematics information technology architecture. The project was also strongly supported by Ulla Schmidt, the Federal Minister of Health at that time. She believed in the opportunities of electronic health applications and thus she drove a major health reform in 2003, the so-called GMG - Law for Modernization of the German Health Care System (Bogumil-Uçan and Klenk, 2021), which became effective on January 1, 2004. One key element of this law was the introduction of a new electronic health card, aimed for January 2006. Furthermore, the law also addressed the purpose to push the development of the national telematics infrastructure. The health card was

supposed to integrate various key features including the transmission of personal health data, insurance data as well as electronic prescription data. The underlying technology was the proven chip-card-technology that was already known from other industries such as the banking sector. Based on that law, in March 2004 an additional governmental project office called "protego.net" was initiated to set up an organization working on the realization of the so-called telematics infrastructure. Protego.net was later transformed into the organization that still exists and works on the governmental electronic health initiatives, called Gematik (Drews and Schirmer, 2015a). Moreover, the results of bIT4health became part of the newly formed Gematik. Under the management of Gematik, various elements and application of electronic health have been tested throughout Germany between 2006 and present. Considering the three core project deliverables of (a) the electronic health record, (b) the electronic health card, and (c) electronic prescriptions, only the electronic health card has been implemented thus far. All three project deliverables are characterized by a very long development phase, changing project organizations as well as a divergence of interests between the main stakeholders (Mertes, 2016). According to Mertens (2008) as well as Drews and Schirmer (2015), one reason for the prolonged development times could be insufficient project management skills across a diverse range of sub-projects, as well as a lack of application in real work and real-life situations for industry practitioners and patients. Drews and Schirmer (2015) report that between 2006 and 2009, various tests of the telematics infrastructure were conducted in different regions throughout Germany. However, the results were unsatisfactory, leading major stakeholders – such as insurance companies – to abandon the project. Consequently, in 2009, the government decided to exclude electronic prescriptions from the overall scope of required electronic health applications. Nonetheless, the electronic health card was launched in January 2009, three years after the initially planned date. Nowadays, it serves as a central information tool, connecting

127,000 physicians, 65,000 dentists, 21,000 pharmacies, 2,200 hospitals, and around 200 compulsory and private health insurance companies (ABDA, 2021; Lang and Mertes, 2011).

Despite electronic prescriptions losing focus between 2010 and 2019, numerous tests were still conducted. Similar to earlier test phases, these new pilot projects were also quite limited in terms of regional focus, stakeholder involvement, and applied features. In 2019, the then Federal Minister of Health – Jens Spahn – reintroduced the topic to the political agenda and prepared the "Act for More Security in the Provision of Medicines" (GSAV). The law passed by the German Federal Council in June 2019 mandated that the regulatory prerequisites for electronic prescriptions should be in place by spring 2020. In response, several pilot projects were initiated to test the feasibility and effectiveness of electronic prescriptions. For instance, in spring 2019, one of the largest German health insurance companies launched a regionally limited pilot project on electronic prescriptions in Hamburg. This project enabled 33 participating citizens to redeem their prescriptions via smartphone at a participating pharmacy in their respective district. Like other recent pilot projects, this project delivered some promising results in terms of acceptance and technical functionality (Bundesministerium für Gesundheit, 2020).

According to the Federal Ministry of Health, the telematics infrastructure should be finally ready for the transmission of the electronic prescription by January 2024. By then, patients should be able to manage their electronic prescription via their smartphone in combination with an electronic prescription app and send it digitally to the desired pharmacy. Patients will also be able to receive the required data to redeem their prescription as a paper print-out at their local doctor. Furthermore, it is planned that from January 2024 all prescriptions should be issued electronically via the telematics infrastructure (Bundesministerium für Gesundheit, 2020).

International perspective

With respect to the geographical research focus of this study, the following section will (a) provide a high-level comparison of the implementation status of electronic prescriptions among European countries and (b) justify why Germany will be an interesting research focus in the current decade in comparison to other countries. The author will not address research insights from beyond the European Union because European countries show nearly all levels of potential integration of electronic prescriptions, as highlighted in Table 4. Hence, a European focus provides sufficient information to understand the current level of integration within Germany.

Kierkegaard (2013) asserts that there exists a notable variation in the implementation of electronic prescription systems across European nations. Despite implementing regulations to stimulate the integration of such systems among its constituencies, the European Union faces enduring challenges encompassing data security concerns, issues with technology, complications in cross-border communication, and most notably apprehensions regarding the interoperability of diverse systems (Kierkegaard, 2013). Seven years later, Thiel et al. (2020) confirmed these findings while making a comprehensive comparison of the implementation of various electronic health applications among European countries. The study illuminates four different levels of integration that were assessed among seventeen member states. according to Thiel et al. (2020), these levels of integration were as follows:

- Electronic transmission of prescription data to a pharmacy (electronic prescription)

- Electronic retrieval of a prescription and the dispensing of the medication to patients (electronic dispensation)
- Electronic reporting of dispensing information by the pharmacist after dispensing a medication (report)
- Availability of an electronic medication plan (medication plan)

The results of this study – highlighted in Table 4 – show that Germany is ranked among the states with a relatively low level of integration. Many other European countries are much more advanced in the application and use of electronic patient records, electronic prescriptions or electronic doctor-patient communication. Especially the Nordic countries show a significantly higher level of integration, which indicates that they are more advanced in terms of digitalization of key healthcare processes. Therefore, some of these countries and their digitization strategies could serve as raw models for Germany in the upcoming years.

Table 4: International coverage of electronic health applications, Thiel et al. (2020)

Country	Electronic prescription	electronic dispensation	Electronic prescription report	Medication plan
Germany				
Belgium	Implemented	Implemented		Implemented
Denmark	Implemented	Implemented		Implemented
Estonia	Implemented	Implemented	Implemented	Implemented
France				Implemented
Italy	Partially	Partially		Partially
England	Partially	Partially		Implemented
Netherlands				Partially
Austria				
Poland				
Portugal	Implemented	Implemented	Implemented	Implemented
Sweden	Implemented	Implemented	Implemented	Implemented
Switzerland				
Spain	Partially	Partially	Partially	Partially

These findings also reflect an earlier study from Gall et al. (2016), who analyzed and compared national electronic medication solutions in Germany, Switzerland and Austria. The authors found that all applications and stakeholders need to be fully integrated into one infrastructure so that seamless, secure, and interoperable communication can be ensured. Furthermore, Gall et al. (2016) highlighted that establishing a comprehensive patient medication list requires data feeds from many stakeholders such as electronic patient records, doctors, community pharmacies, hospitals and healthcare professionals as well as nursing documentation systems. The example also clearly shows that electronic prescriptions as a stand-alone health application only provide limited benefits for patients. Only a combination of various applications and stakeholders will provide sufficient data to develop a reliable and comprehensive patient medication list (Gall et al., 2016). The development of these systems is complex and time-intensive, and thus the overall adoption is relatively long. Especially data security requirements, the need of law amendments and political interests significantly slow down the overall implementation in many countries (Thiel et al., 2020). In this context, the introduction of electronic prescriptions represents a major milestone and was imminent at the end of 2021. It can be recognized that Germany addresses various core barriers that had been identified in other countries. One example is the development of one central information technology architecture, called telematics infrastructure (Drews and Schirmer, 2015b; Kierkegaard, 2013).

As Germany has a strong federal system with sixteen regional health institutions, cooperation among these key players is absolutely required for the overall success (Drews and Schirmer, 2015b). The fragmented health system in Germany with many involved stakeholders is also reflected in an ongoing discussion about the topic of digital health. The debate is strongly influenced by different perspectives and various special interests, such as patients, pharmacists,

doctors and various associations (Bogumil-Uçan and Klenk, 2021). Questions that patients in particular have included: Who may access what data, for what purposes, when and how is access controlled? Hence, it is important to analyze the future acceptance of electronic prescriptions to identify critical elements. This will provide valuable insights for practitioners to overcome critical barriers and thus design a successful omnichannel community pharmacy.

The emergence of multichannel retailing

The following section provides an overview of the research literature on omnichannel retailing and its various sub-research fields. It includes studies addressing the impact of new technologies on customer behaviour across different channels, while also highlighting other relevant omnichannel dimensions. This is important for two reasons: first, to ensure that the study covers relevant aspects of omnichannel services (factors) that may influence adoption; and second, to develop recommendations for practitioners based on a holistic understanding of the topic.

Globalization was the start of digitalization and since then digitalization has shown a tremendous impact on many industry sectors and their sales channels. The global retail community started to recognize the potential future impact of digitalization when global marketplaces such as amazon gained significant relevance in specific product segments (e.g. books) at the end of the 20th century (Jindal et al., 2021; Rodriguez, 2018; Zhang et al., 2010). This was the time when digital sales channels started their seemingly unstoppable course of success. Even though the retail landscape had previously changed many times due to new shopping preferences, this event marked a serious strategic turning point for many retailing companies. The competitive advantage of traditional stationary retail stores – relying on the

pure benefit of touching, feeling and testing a certain product – started to compete with the advantage of an e-commerce retail ecosystem that provides an perceived infinite product range in line with optimal price transparency (Cai and Lo, 2020).

The last two decades were not only determined by the rise of strong international platforms but also a growing number of online shops that were launched by many small- and medium-sized retailing companies as well as large retail chains. Brick-and-mortar stores began to no longer offer their assortments simply through the offline store but additionally their digital store, the so-called online shop. Verhoef et al. (2015) conclude that from a customer perspective this development of the retail industry led to a situation where boundaries between the online and offline world became increasingly blurred. When this phenomenon became an inherent part of the retail landscape, academic research started to define and label it as *multichannel retailing*. This means that products are available via more than one channel, but each channel works independently from each other from a customer perspective.

According to Verhoef et al. (2015), the definition of the term multichannel has evolved over time in line with the technology development that enabled new forms of shopping behaviour. While previous research studies from Verhoef et al. (2007) only focus on three main sales channels – (a) offline stores, (b) online channels such as web shops and (c) traditional direct marketing channels, such as catalogs – some more recent studies also include additional sales channels, such as platforms or third-party mobile applications (Lorenzo-Romero et al., 2020). Especially the growing number of mobile channels has gained in importance (Herhausen et al., 2015; Hosseini et al., 2018; Saghiri et al., 2017; Verhoef et al., 2015). In the light of this, Verhoef et al. (2015) define channels as customer touchpoints for interaction to communicate throughout the research and sales process. Thus, if a retailing company uses more than one channel, it can be defined as a multichannel retailing (Neslin et al., 2006). Neslin et al. (2006)

continue to explain that the definition in particular includes the design, deployment, coordination, and evaluation of channels to enhance the overall customer value.

Limitations of multichannel retailing

Even though nowadays different channels and touchpoints are used simultaneously and interchangeably to create a coherent customer experience across various customer touchpoints, multichannel retailing channels work completely independently from each other (Brynjolfsson et al., 2013). Taking the generic elements of a typical customer journey, that involves *need recognition, information search, purchase and after-sales service,* this means that a customer can choose certain channels but not switch channels according to its purchasing needs at a certain time (Neslin et al., 2006). For example, a customer starts to recognize the need for new shoes and thus, starts to search online for the latest fashion trends to find the desired product. The customer then purchases the shoe at a specific online shop. As soon as the product is delivered to the customers' home, the customer recognizes that the shoe does not fit. Within a multichannel framework the customer will be asked to send the product back to the online shop, while within an omnichannel approach the customer could also return the product in one of the offline stores of the respective brand. Hence, a fully integrated omnichannel retailing approach requires well-integrated IT systems across various channels to allow channel shifts. According to Neslin et al. (2006), data integration is a core prerequisite for successful multichannel customer management. The constant evaluation of customer behaviour supports companies to understand customer needs, evaluate channel performance and thus effectively allocate resources across channels. Moreover, Brynjolfsson et al. (2013a) highlighted that data-driven

and analytics-oriented retailers will be able to influence customer behaviour and therefore increase the overall consumer value per channel. By contrast, Verhoef et al. (2015) conclude that companies effectively no longer have control over customers' journey. Therefore, companies need to provide a coherent customer experience among all needed channels that are fully integrated and thus allow customers to switch channels at any given time.

The transition to omnichannel retailing

At this point, the literature draws an important distinction between the customer's shopping behaviour and the functional implementations that companies can provide to create a seamless experience. Overall, it can be said that the integration of touchpoints within the different channels plays a major role in how the customers perceive the shopping experience. Touchpoints describe the direct contact points where customers and companies communicate in either a one- or two-way direction. Zhang et al. (2010) prove that inconsistencies and asymmetries within these touchpoints will hinder the customer from experiencing barrierless channels. This will result in lost sales for retailers that are not able to provide customer a seamless shopping experience.

Table 5: Multichannel versus Omnichannel (Verhoef et al., 2015, p.3)

	Multichannel Management	**Omnichannel Management**
Channel Focus	Interactive channels only	Interactive and mass communication channels
Channel Scope	Retail channels: store, online website, and direct marketing (catalog)	Retail channels: store, online website, and direct marketing, mobile channels

		(i.e. smart phones, tablets, apps), social media Customer Touchpoints (incl. mass communication channels: TV, radio, print, C2C, etc.).
Separation of channels	Separate channels with no overlap	Integrated channels providing seamless retail experiences.
Brand versus channel Customer relationship focus	Customer – retail channel focus	customer – retail channel - brand focus
Channel management	Per channel	Cross-channel
Objectives	Channel objectives (i.e. sales per channel; experience per channel)	Cross-channel objectives (i.e. overall retail customer experience, total sales over channels)

Of course, the ongoing evolution from multichannel towards omnichannel retailing has reached different evolutionary stages in various retail sectors, especially according to the degree of available digital sales channels (Table 5). Therefore, various research studies (Kim et al., 2018; Tambo, 2014; Zhang et al., 2010) illuminate this phenomenon in general and some others focus already on very specific effects. In this context Verhoef et al. (2015) identified three primary research fields: (a) the impact of channels on performance, (b) customer behaviour across channels, and (c) the retail mix across channels. They concluded that in retail sectors that are in the early stages of this transition, research often focuses on the impact of a single additional sales channel. However, in more mature sectors that have adopted omnichannel retailing, the impact of multiple channels is considered.

Studies such as Kim et al. (2018) have tackled multiple research perspectives, exploring the impact of omnichannel retailing on brick-and-mortar stores, retail chains, and the overall

customer experience. The second research field, customer behavior in relation to omnichannel retailing, specifically examines potential channel shifts within the customer journey and the subsequent implications for retail businesses (Cai and Lo, 2020). Here, many studies place a strong focus on the role of mobile usage in relation to the new marketing approaches, such as social media (e.g. Manser Payne et al., 2017). According to Verhoef et al. (2015), the third research field is the least developed one and addresses the economic impact of integrated sales channel (channel mix) on the overall business performance. Previous research studies in a similar context such as Herhausen et al. (2015), Zhang et al. (2010) or Yang et al. (2013) place the research focus on analyzing potential synergies between channels.

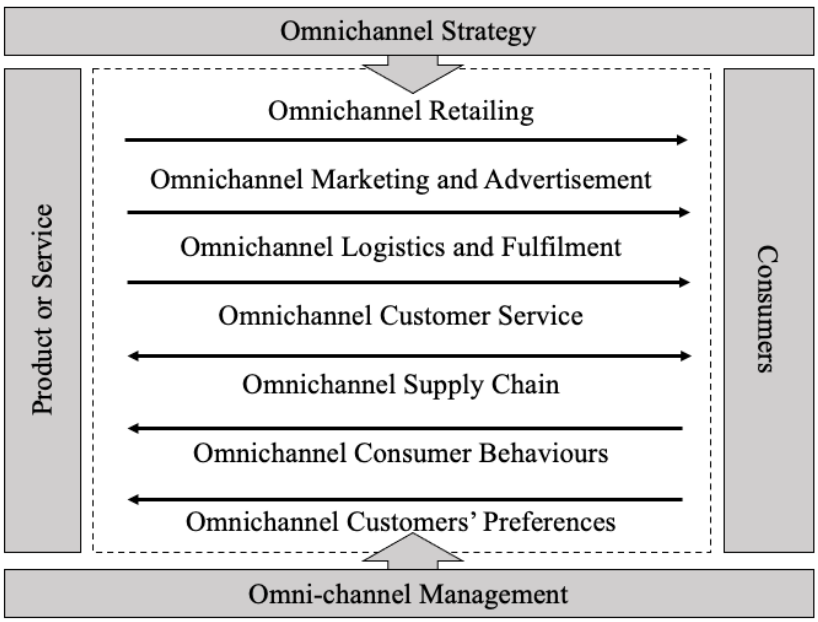
While Verhoef et al. (2015) recognized a stronger research contribution to multichannel retailing, Cai and Lo (2020) concluded five years later that most of the current and past research work has a clear omnichannel focus. This reflects the evolutionary process from multichannel towards omnichannel retailing highlighted above. Verhoef et al. (2015, p.3) define omnichannel management as "the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized."

The omnichannel framework

Cai and Lo (2020) presents slightly different research dimension. The authors analyzed with a systematic literature review more than 192 research studies focusing on omnichannel. Thereby, seven sub-research areas were identified that are worth for further review, due to the fact that this analysis provides a more precise classification into relevant search topics. Cai and

Lo (2020) generally differentiate between research work focusing on omnichannel strategy and rather operational topics. On the operational level the authors categorize existing research work into the following main research paths: (a) omnichannel retailing, (b) omnichannel service, (c) omnichannel logistics and fulfillment, (d) omnichannel marketing and advertisement, (e) omnichannel consumer behaviors, and (f) omnichannel customers' preferences. As a concluding remark, the authors added two additional research field's that will require further research focus in the future: (f) omnichannel supply chain and (g) omni-tech management. The latter can be considered as relevant with the focus of the research of this study.

Figure 3: Omnichannel Framework (Cai and Lo, 2020, p.8)



Omnichannel strategy is mentioned as one of the major research fields. Cai and Lo (2020) summarize research studies – including from Gabisch and Gwebu (2011), Shen et al. (2018) as well as Zhang et al. (2018) – ascertaining that the successful implementation of an omnichannel strategy highly depends on the complexity of the given retailing model. The

authors suggest further investigating the effects throughout the value chain as well as how to gain competitive advantage while implementing an omnichannel model. Therefore, it is also necessary to illuminate the relation between complexity and a successful implementation of an omnichannel strategy within the German community pharmacy market.

The analysis of omnichannel retailing includes among others research work from Bell et al. (2014), Brynjolfsson et al. (2013), Gao and Su (2017), Gallino et al. (2017), Bell et al. (2014) and Zhang et al. (2018). The authors address from various perspectives how a certain product or service is purchased by consumers. Throughout their analyses they touch on the role of technology (Brynjolfsson et al., 2013), the impact of various key factors like pricing (Bell et al., 2014) as well as the development of some relevant omnichannel models, e.g. ship-from-store (Gallino et al. , 2017). As already mentioned above, throughout all studies it is explicitly highlighted that further analysis of the impact of new technologies within the field of omnichannel retailing will lead to a more profound understanding. The implementation of the electronic prescriptions and the accompanying impact for community pharmacies can be seen as a further analysis that addresses the suggestion for further assessment.

Cai and Lo (2020) also assess the given literature on omnichannel customer service. The authors highlight various studies that have mainly been conducted with the focus of cross-channel effects. In this context, Yang et al. (2013) come to the conclusion that there are positive as well as negative implications so that synergies are limited and practitioners need to be aware about the potential effects while implementing an omnichannel strategy. Cai and Lo (2020) recommend further investigating (a) how to increase customer loyalty within an omnichannel framework as well as (b) what is needed to provide customers with a seamless omnichannel experience.

According to Cai and Lo (2020, p.9), omnichannel logistics and fulfillment is a broad sub-research field as it combines important issues, such as logistics service, logistics network design, warehouse operations and design, retail fulfillment processes, and last-mile distribution. The authors reveal that the further consideration of the role of manufacturer will most likely change in future research as new forms of distribution also allows direct shipment from manufacturer towards customers.

Cai and Lo (2020) highlight that research on omnichannel marketing has not only investigated the opportunities and challenges arising from new technologies like augmented reality (AR), but also search engine advertising, marketing resource allocation, and cross-channel effects. In this context, Verhoef et al. (2017) explore the role of mobile devices, which, due to their interconnectivity, enable connections with (a) objects, (b) people, and (c) the physical environment. These three dimensions of connectivity create new network forms that can significantly impact omnichannel retailers' marketing strategies. Verhoef et al. (2017) also emphasize that utilizing data is an essential prerequisite for effectively implementing and leveraging these new network dimensions. They further suggest that future research should examine how mobile technologies influence both online and offline customer behavior. As the connection between on- and offline retail grows, it will be intriguing to study how phenomena like webrooming can be applied in community pharmacies. Searching for products online, accessing detailed product information, and receiving real-time inventory updates are not yet common shopping behaviors in the German community pharmacy market (ABDA, 2019).

There exist a wide range of studies that illuminate the research path of omnichannel customers' preferences (e.g. Brynjolfsson et al., 2009). The research topics vary from factors that influence product selection towards price sensitivity analysis or the role of online-to-offline platforms (O2O). Brynjolfsson et al. (2009) found out that brick-and-mortar retailers can

compete with online retailers, but the offered product assortment plays a significant role. The study proves that the competition on mainstream products is fierce between both channels, but niche products open up room for differentiation strategies, especially through the online channel. This might be a valuable insight for community pharmacies as they offer both, mainstream products as well as strong niche products that are only available at certain community pharmacies.

As this study aims to illuminate the extent to which customers and patients will adopt electronic prescriptions, the research stream of omnichannel customer behavior represents a major research stream for this study. According to Cai and Lo (2020), many authors such as Herhausen et al. (2015) or Mosquera et al. (2018) analyze certain customer reactions towards specific aspects of omnichannel retailing. For example, Shen et al. (2018) address the question concerning the extent to which the overall shopping experience might influence channel shift. study, Shen et al. (2018) proved that the more strongly a retailer interacts with its customers via various channels, the higher the overall level satisfaction and loyalty.

Impact of omnichannel experience on shopping intentions

Furthermore, a recent study from Shi et al. (2020) provides a comprehensive and accurate framework to analyze the impact of omnichannel experience on the overall shopping intention. The authors discovered that most key determinants, including (a) connectivity, (b) integration, (c) consistency, (d) flexibility, and (e) personalization, influence the overall omnichannel shopping experience. Additionally, the holistic research structure proposed by Shi et al. also illuminates the link between omnichannel services and the respective shopping

intention. Therefore, this model also forms a cornerstone in the research framework of this study, and its integral elements will be touched upon in the subsequent section titled 'Explanation of constructs'. The following descriptions provide a preliminary insight into these dimensions:

- **Connectivity**: It concerns the seamlessness of cross-channel service content and information. In simpler terms, it ensures that customers can effortlessly switch between channels to find the most suitable method for a particular task during their shopping journey.

- **Integration:** This dimension is about creating a unified brand and information experience. It ensures that no matter where the customer interacts with the retailer, either online or offline, the information systems and operational undertakings appear cohesive.

- **Consistency:** At the heart of consistency is the notion that customers should encounter uniformity. This can be in product offerings, information, or service, irrespective of the channel they choose.

- **Flexibility:** Flexibility is about offering continuous service even when a customer migrates from one channel to another. For example, it encompasses the ability to buy a product online and obtain after-sales service at a physical store.

- **Personalization:** The essence of personalization is treating each customer as unique. This dimension ensures that shopping experiences are tailored based on individual behaviors, like providing product recommendations derived from online purchase histories

Delving deeper into the findngs from Shi et al. (2020) it is evident that customers' perceived compatibility, connectivity, integration, and consistency in omnichannel experiences positively correlate with their intentions to engage in omnichannel services, whereas perceived risks inversely impact these intentions. The study further revealed that a customer's previous interactions with a particular omnichannel retailer also play a significant role in shaping their future intentions to utilize omnichannel services.

Furthermore, according to Shi et al. (2020), the successful implementation of omnichannel is not exclusively a customer-facing endeavour. Equal attention must be dedicated to ensuring a robust and synergized back-end system. This involves that information systems and management operations across all channels are synchronized to maintain a cohesive brand and shopping experience. Such integration guarantees consistency in customer data, inventory, and order management systems at every touchpoint. Consequently, retailers are equipped to offer real-time inventory updates, uniform pricing, and reliable order tracking across various channels. This aligns with Brynjolfsson et al.'s (2013) earlier assertion that seamless and connected touchpoints throughout the customer journey will rapidly transform the omnichannel retailing landscape.

Shi et al. (2020) as well as Amaro and Duarte (2015) base their research on the Diffusion of Innovation Theory (Rogers, 2003). Rogers developed a commonly used theory that helps to answer the question of whether a new technological innovation will be adopted. The theory – which was initially published in 1962 – includes in his most recent work (Rogers, 2003) five different criteria that of course need to be analyzed through the lens of the respective customer. Therefore, he proposes rating the extent to which customers perceive:

(a) the relative advantage of the innovation compared to existing solutions;

(b) the compatibility of the innovation with the focus on existing needs;

(c) the complexity to use the new innovation;

(d) the overall trialability of the innovation;

(e) the observability, meaning how direct customers can directly see the benefit.

According to Rogers (2003), the success of an innovation's adoption depends not just on its inherent qualities but also on how well it aligns with the perceptions, expectations, and needs of potential users. When customers see a technology or product as advantageous (relative advantage), fitting seamlessly into their existing lives (compatibility), simple to use (low complexity), easy to test out (trialability), and offering clear, visible benefits (observability), they are more likely to embrace it. This alignment between the innovation's attributes and the user's perspectives drastically increases its chances of gaining widespread acceptance.

Drawing parallels from this, Shi et al. (2020) and Amaro and Duarte (2015) have leveraged this framework to predict consumer behavior in their respective research context. Amaro and Duarte (2015) adopted the model of Rogers (2003) to illuminate various research hypotheses all aiming to answer the overall question concerning what factors influence consumers intentions to purchase travel online, empirically proved, that perceived relative advantage or risks can be used to forecast customer behavior towards omnichannel purchase indentations. Hence, based on these insights, Rogers' framework can similarly be employed to gauge the extent to which patients in Germany might be inclined to adopt electronic prescriptions through new sales channels.

Building on the crucial insights from Shi et al. (2020) and Amaro and Duarte (2015) about the significant influence of omnichannel experience and the diffusion of innovations on

shopping intentions, it is essential to also delve deeper into the concepts of innovation and diffusion themselves. These concepts are vital for understanding the adoption of new technologies like electronic prescriptions and thus provide the foundational backbone for the evaluation of potential impacts on customer behavior and shopping intentions. Transitioning into the next section, the intricacies of these concepts, as explained by Rogers (2003), will be unraveled. These understandings will provide a richer context to explore their critical implications for the adoption of electronic prescriptions.

Innovation and diffusion

Both terms, innovation as well as diffusion, can be found in many academic studies. Innovation often refers to the development and implementation of a new type of problem solution. Once this problem solution is developed, the diffusion process starts with subsequent dissemination of the solution (Rogers, 2003).

Rogers (2003, p.28) defines diffusion as follows: “Diffusion is the process in which an innovation is communicated through certain channels over time among the members of a social system.” Therefore, the diffusion process describes the success or failure of a certain innovation and thus it can be used to identify relevant success factors.

In distinction to diffusion, Rogers (2003, p.35) defines innovation as follows: “An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption“. Hence, there is a direct connection between innovation and diffusion. While Rogers innovation definition focuses on the perception of a certain idea there also exist a wide range of much broader definitions that also addresses facets such as invention or phases of the

actual implementation (Morad et al., 2021). According to Gopalakrishnan and Damanpour (1997), it is quite difficult to precisely define the terminology of innovation. Since many academic disciplines have a specific research focus, the accompanying definitions of innovation also strongly vary. Morad et al. (2021) confirm this, as some of the existing definitions simply ignore fundamental phases of the innovation process. Therefore, Morad et al. (2021) propose to generally differentiate between (a) generation of innovation and (b) adoption of innovation. The adoption of innovation is described as a process of change that results in the assimilation of the innovative outcome (Damanpour, 2014).

Building on these insights from Rogers, Morad, and Damanpour, the present research dives into the intricacies of innovation and diffusion. In the context of the German community pharmacy sector, the innovation in focus is the adoption of electronic prescription systems. In investigating this process, the study does not limit itself to the generation of this innovation but extends its scope also to the adoption of the innovation across the sector.

Innovation diffusion theory

As described earlier, innovation diffusion is one part of the overall innovation process, starting with the decision to launch a certain innovation and ending with either a success or failure, reflected by market acceptance or rejection (Morad et al., 2021). Everett M. Roger's work "Diffusion of Innovation" (1962) is considered to be one of the most relevant theories on diffusion. According to Rogers (2003), there are four main elements of the diffusion process (a) the nature of innovation, (b) communication channel, (c) time and (d) the members of the social system. These four characteristics mainly describe the process of diffusion that can result

in adoption. For the purpose of this study adoption is defined by a growing number of users of a certain innovation.

As highlighted above Rogers defines innovation as a perception of an idea either by an individual or a group. According to Rogers (2003), the **nature of innovation** can be described with the following variables:

(a) **Relative advantage** refers to "the degree to which an innovation is perceived as being better than the idea it supersedes" Rogers (2003, p. 15). The definition reflects the advantage of the innovation. For example, this can be a better design, better usability, or a higher convenience. Of course, the higher the subjectively perceived relative advantage of an innovation, the faster proceeds its adoption.

(b) **Compatibility** of an innovation that addresses existing needs. This presupposes a fundamental familiarity with the overall context in which the innovation is embedded. According to Rogers (2003, p.15), combability refers to "the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters" The greater the compatibility of an innovation, the greater the speed of adoption.

(c) **Complexity** describes "the degree to which an innovation is perceived as relatively difficult to understand and use" Rogers (2003, p. 15). If a potential user perceives a high level of complexity that comes along with the innovation, the less likely it will be adopted. Complexity manifests itself in the learning effort required to use an innovation.

(d) The overall **trialability** refers to the possibility of trying out. This can reduce the perceived risk for adopters associated with an innovation. According to Rogers (2003, p.16), trialability refers to "the degree to which an innovation may be experimented" Rogers (2003, p.16). The greater the trialability, the greater the speed of adoption.

(e) The **observability** refers to "the degree to which the results of an innovation are visible to others" Rogers (2003, p.16). To the extent that the results of an innovation and its benefits are observable, the likelihood of adoption of the innovation increases.

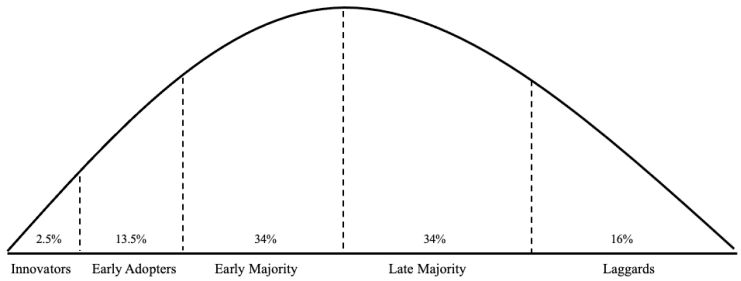
Communication channels have a significant impact because they are needed to spread the word and communicate an innovation to an individual or a group. According to Rogers. (2003), role models (peers), social networks and the underlying communication structures also influence the information level and knowledge regarding a certain innovation. Therefore, it is important to integrate opinion leaders that have a strong impact on the adoption decision of individuals.

Also, time plays a major role in the decision-making process to adopt a certain innovation. Rogers refers in his definition of innovation to the fact that the innovation is perceived as a novelty by potential adopters. But adopters continuously gather additional information and thus extend their individual knowledge and a constant basis. Like this, with more time individuals can gather more information about an innovation and thus reduce uncertainty.

As described above, the speed of adoption is mainly determined by the way how individuals perceive the characteristics of an innovation. Hence, the speed of adoption also correlates with the members of the social system to whom the innovation is being

communicated. Rogers (2003) classified the members of the social system into five categories as presented in Figure 4, namely (a) innovators, (b) early adopters, (c) early majority, (d) late majority and (e) laggards. Each category has a different level of innovativeness and thus it describes how fast they adopt a certain innovation. According to Rogers (2003, p.22), "innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system." This implies that within each category of the adopter model, individuals respond differently to varying levels of innovativeness.

Figure 4: Innovation adopter categories (Rogers, 2003)



Innovators are described as individuum's or a group that enjoy experiencing new ideas (Rogers, 2003). Therefore, this group accepts a high level of uncertainty and so is willing to cope with both, the success or failure of a certain idea. Even though this group might not experience a high level of acceptance by the rest of the population, they act as gatekeepers to bring new innovations to the market.

Early adopters often serve as opinion leaders. While they are less risk-averse than innovators, they still embrace a leadership role by staying at the forefront of new innovations. This group has a significant impact on the success of an innovation.

The early majority, less risk-averse than early adopters but still open to new experiences, typically does not take a leadership role and instead follows the lead of early adopters. This

group's relatively large size and strong network effects make it crucial for the success of an innovation.

The late majority typically adopts an innovation after the early majority has already embraced it. They take much longer and need a high level of security to adopt an innovation.

Laggards have, according to Rogers (2003), a very traditional and conservative view of the world. Laggards normally have close personal networks with limited opportunities for external inspirations. Therefore, laggards will normally wait for a long time to reduce risk and be sure to adopt an innovation.

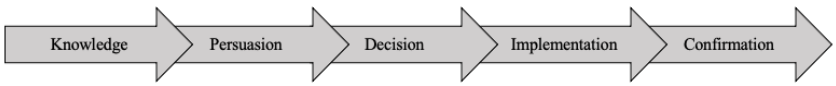
Although the adopter categories are very generic, it clearly shows that at the beginning only a few people are willing to adopt an innovation. With ongoing time, the number of adopters increases until a peak is finally reached. At the end of the process, the number of adopters decreases again, as the saturation level is reached. This is the end of the diffusion process. Hence, adoption is the positive aggregated result of all four elements of innovation diffusion. “The critical mass occurs at that point at which a sufficient number of individuals in a system have adopted an innovation, so that the innovations further rate of adoption becomes sustaining” (Rogers 2003, p. 343).

Bearing these dynamics in mind, this study also aims to explore the likelihood of adopting electronic prescriptions within the German community pharmacy sector. By gauging this likelihood, the study will shed light on how different adopter groups may assign varying degrees of importance to certain factors influencing their adoption decisions. This nuanced analysis aims to uncover a deeper understanding of the adoption process by examining the relative values that different adopter groups place on the factors impacting their choice whether to adopt electronic prescriptions.

Innovation decision process

The innovation decision process is described by Rogers (2003, p. 172) as “an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation” Therefore, the decision-making process does not take place in one big step. It is rather determined by phases (Figure 5) such as (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation (Rogers, 2003). Of course, depending on the importance of the effects of a certain decision to adopt or not, the individual phases will vary in time and intensity.

Figure 5: Innovation decision process (Rogers, 2003)



The knowledge phase of the innovation decision process is characterized by learning. The individual is trying to gather all basic information about the innovation to increase the overall knowledge Rogers (2003). Rogers (2003) further differentiates knowledge and distinguishes between awareness-knowledge, how-to-knowledge, and principles-knowledge. While the awareness-knowledge describes the knowledge of the existence of an innovation, the how-to-knowledge and principles-knowledge enables the correct application of it. The persuasion phase describes the stage in which the individual develops a certain attitude towards the innovation. This attitude is strongly influenced by the knowledge that has been gained in the earlier phase and can vary from adoption to rejection. According to Rogers (2003), this phase is more affective centered and thus based on feelings, beliefs or opinions. The decision

stage reflects the actual decision either to reject or adopt a certain innovation. A decision to adopt usually occurs during the decision stage. In contrast to that, a rejection can occur in any phase of the decisions making process (Rogers, 2003). Furthermore, Rogers differentiates between 'active' and 'passive rejection.' Throughout the implementation phase, the innovation will be actively adopted, and according to Rogers (2003) the confirmation phase is only relevant when the individual needs additional advice or help.

This understanding of the innovation decision process serves as a critical foundation for chapter 6 of this study, which presents recommendations for practitioners. Drawing on insights from the analysis of this process, a model will be proposed that provides practical strategies for each phase of the decision process.

Alternative diffusion models

Diffusion theories and accompanying research models can be found for many years in several academic disciplines, such as economics, social sciences, or business informatics. Rogers' book *The Diffusion of Innovations* (DOI) from 1962 represents a starting point for many diffusions theories that were slightly adopted and changed over time. For example, based on behavioral science, Davis developed the theory of reasoned action with the so-called Technology Acceptance Model (TAM), which still can be found in many academic studies. Research studies that use the Technology Acceptance Model often focus on the overall acceptance of new technologies such as mobile phones.

Both, the Theory of Planned Behavior (TPB) – developed by Ajzen in 1985 – as well as the Technology Acceptance Model – developed by Fishbein and Ajzen in 1975 – place a

strong focus on the actual user of innovation and therefore integrated factors such as attitude, subjective norms, and perceived behavioral control. Therefore, Technology Acceptance Model and Theory of Planned Behavior is rather used in studies that illuminate individual behavior as a reaction towards a set of factors that influence personal beliefs. In contrast to this, Roger's innovation diffusion theory, combines both, the individual internal perspective as well as the external perspective. The internal perspective can be analyzed throughout the innovation decision-making process (as described above) and the external perspective is reflected in the social system. Moore and Benbasat (1991) developed a model of technological innovation acceptance also based on diffusion theory called Perceived Characteristics of Innovating (PCI). PCI aims to explore the importance of perceived characteristics for future usage decisions and usage intensity. Hence, they further developed Rogers' DOI, which also allows forecasting different levels of usage intensity.

Shih and Venkatesh (2004) established the use diffusion model, which includes the following diffusion-specific determinants: the social household context, the technology, the consumer's personality, and external influences (Shih and Venkatesh, 2004).

Considering these models, the evolution of diffusion theory is evident, with each model adding unique perspectives and variables to the equation. The Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Theory of Reasoned Action (TRA) and Preceived Charcateristics of Innovating (PCI) all provide valuable insights into individual behavior and the dynamics of innovation acceptance. Nevertheless, the relevance of Rogers' innovation diffusion theory (DOI) remains undiminished and serves as the backbone of many diffusion research studies. Rogers' theory encompasses both the internal and external perspective of innovation diffusion, merging individual decision-making with the broader societal context.

Therefore, despite criticism and alternative models, DOI continues to serve as a reliable and holistic framework for understanding the diffusion of innovations.

Given this background, the following section will delve into the rationale for the application of DOI in this research.

Justification of innovation diffusion theory

The Diffusion of Innovation Theory (DOI) is a widely used framework for understanding the adoption of new technologies. One of the key justifications for its application in research is its proven reliability and applicability, as demonstrated by numerous studies (e.g., Chang et al., 2019; Herhausen et al., 2015; Amaro and Duarte, 2015). Hence, it can be recognized that DOI is well established and can provide reliable results. Furthermore, this thoery provides a systematic and comprehensive approach to understanding how new technologies diffuse through different adopter groups, from innovators to laggards. Cao and Li (2018) support that argument and add the fact that because the diffusion of technology occurs in stages, it is useful to adopt DOI to channel-related research questions.

Within the framework of diffusion, community pharmacies serve as key components of the interconnected social ecosystem. Their extensive interactions with both the healthcare system, such as supplier of medications, as well as the patients place them at a unique and important point. Community pharmacies, in this context, serve as influential nodes in the social system. Especailly, their interactions with customers, their standing in the community, and the trust they command make them crucial touchpoints for the dissemination and acceptance of innovations like electronic prescriptions. As customers often rely on pharmacies for advice,

guidance, and information related to medications and health, the role of these establishments in shaping perceptions and facilitating the diffusion of electronic prescriptions also justifies the application of DOI. For example, depending on the results of the study, community pharmacies might need to change various aspects of their existing distribution and communication approach. Hence, it will be useful for both, academia, and practitioners, to have a comprehensive and in-depth understanding about each stage of the decision-making process in relation to the respective adopter groups.

Of course, apart from the advantages it is also important to identify some of its weaknesses. DOI has some limits when an innovation changes throughout the decision-making process. This can be the case when an early prototype or product is changed during the market launch. If this occurs, later adopters decide adoption based on product attributes that changed compared to the original product. Therefore, the diffusion theory generally assumes that a rapid and complete spread of an innovation is desirable (Rogers, 2003).

Although Rogers' approach to Diffusion of Innovations has been criticized, it remains one of the most relevant research approaches and is frequently utilized in academic and professional research contexts due to its high applicability.

Explanation of constructs

Drawing on the section above, this study will be primarly based on Innovation Diffusion Theory (DOI). Therefore, the following section of the literature review will explain and derive the research constructs based on the DOI characteristics. According to Rogers (2003), the characteristics of innovation are defined as (a) relative advantage, (b) compatibility, (c)

complexity, (d) trialability and (e) observability. In addition to these characteristics, this study will extend Roger's characteristics by additional characteristics that are relevant specifically for the adoption of omnichannel services. By extending the characteristics of Rogers, the author aims to identify and include additional factors that influence the adoption of electronic prescriptions in the specific context of this research.

In this context, Shi et al. (2020) undertook a qualitative research study with the objective to identify relevant characteristics of omnichannel experience. They found out that (a) connectivity, (b) integration, (c) consistency, (d) flexibility, and (c) personalization are relevant dimensions to describe the omnichannel experience from a customer point of view. With the introduction of electronic prescriptions in Germany, community pharmacies will have the chance to offer various omnichannel services such as click & collect, online purchase including home delivery or online display about availability of stationary stock. Therefore, alongside Rogers DOI characteristics, these omnichannel characteristics will be integrated into the present study.

Further, the nature of electronic health products often address a level of perceived risk among potential users (Bansal et al., 2010; Suykerbuyk et al., 2018). Therefore, this construct is also considered crucial for this investigation and will be incorporated into the model. This approach aligns with the study from (Amaro and Duarte, 2015) which effectively integrated multiple theories to analyze the determinants of online travel purchases. Amaro and Duarte's study was grounded in the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), and the Diffsuion of Innovaiton (DOI). They empirically tested an integrated model to determine which factors affect the intention to purchase travel online using partial least squares structural equation modeling.

Their research – conducted among a sample of 1,732 internet users – indicated that the intention to purchase travel online is significantly influenced by attitude, compatibility, and perceived risk. By incorporating these factors, including perceived risk, into their model, Amaro and Duarte were able to provide a more nuanced understanding of the complexities surrounding online travel shopping. By drawing from this approach, the present study also uses perceived risk as one key construct.

Relative advantage

Relative advantage is one of the key dimensions of Rogers Innovation Diffusion Theory. When consumers evaluate a certain innovation – for example, a new technology – and believe that it is more useful than an existing solution, it is more likely that they will adopt this new technology. Hence, as Rogers (2003) contends, the perceived relative advantage of an innovation is directly linked to its rate of adoption. In this case, the advantages of electronic prescriptions over traditional paper-based prescriptions are numerous.

According to Suykerbuyk et al. (2018), electronic prescriptions provide various relevant benefits to certain stakeholders in the health sector, such as patients, healthcare professionals, and of course pharmacies. First, the adoption of electronic prescriptions significantly enhances the overall efficiency by streamlining the prescription process. By eliminating the need for manual transcription and interpretation of prescriptions, the likelihood of human error is reduced (Suykerbuyk et al., 2018). Second, the convenience and time-saving nature of electronic prescriptions are particularly appealing to customers. They can receive their prescriptions electronically without having to visit their doctors physically, which is

particularly advantageous for those with mobility challenges or those living in remote areas. Furthermore, Suykerbuyk et al. (2018) also found out that especially younger age groups appreciated electronic prescriptions because they could obtain a prescription without the need for a physical appointment. This suggests that the rate of adoption may be influenced by the demographic composition of the target population.

In summary, the construct of relative advantage is integral to understanding the factors that contribute to the adoption of electronic prescriptions in community pharmacies in Germany. The various benefits, including increased efficiency, time-saving, improved prescribing quality, and reduced medication errors, demonstrate the potential advantages of electronic prescriptions over traditional paper-based methods.

Compatibility

According to (Rogers, 2003, p. 240), compatibility refers to "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters." Thus, if an innovation aligns with past experiences, values and needs, it is more likely to be rapidly adopted. Conversely, if an innovation is perceived as incompatible, it may lead to confusion, as customers simply do not know how to utilize it effectively.

Tavares and Oliveira (2018) analyzed the factors that are relevant for the adoption of the electronic health record in Portugal. In their study, compatibility emerged as a significant construct that helps to explore factors influencing the adoption of EHR. Additionally, their data demonstrated that perceived compatibility not only significantly impacts customer behaviour but also the overall performance and effort expectancy (Tavares and Oliveira, 2018). The

authors suggest that this positive correlation between compatibility and adoption may be rely on previous experiences with online portals or mobile applications where consumers are accustomed to having access to their data from any location.

Focusing on the given study, these findings support the conclusion that (a) perceived compatibility is a relevant construct for assessing the adoption of digital health applications and (b) it may positively correlate with the adoption of electronic prescriptions in Germany. These assumptions are also supported through previous work by Zhang et al. (2015), who analyzed factors impacting the acceptance and use of electronic health innovations. In a similar vein, these authors discovered that tradition and habits can significantly influence adoption in both directions. For instance, their findings indicate that patients prefer using the phone to discuss complicated issues with their doctors rather than utilizing digital tools. Despite the the fact that scope and quality of feedback being the same, customers exhibited a certain level of hesitation to adopt new methods, simply because they were accustomed to different practices in the past. Both examples demonstrate that compatibility can be a relevant predictor of the behavioral intention to adopt electronic prescriptions.

Complexity

Rogers (2003) describes complexity as customer perceptions' of how difficult it is to use a particular product. He posits that an increase in perceived difficulty results in a lower rate of adoption for the product in question. Hence, if a customer needs to learn many new skills to use a particular innovative product, the less likely is the immediate usage.

Numerous authors in the academic literature agree that a product is adopted more quickly if the consumer understands it immediately and has no questions about its application (Amaro and Duarte, 2015; Chauhan et al., 2018; Wei and Li, 2020). In this vein, Yuen et al. (2020) discovered that decreasing complexity can result in a significant enhancement in perceived customer value. The researchers examined the adoption of autonomous vehicles and found out that the perceived complexity of technology usage ranked as one of the most crucial factors for embracing self-driving cars. As a result, it is important to ensure that new innovations are designed in a way that minimizes initial barriers to adoption for customers.

Similarly, Ehn et al. (2021) investigated the design requirements for electronic health applications, stressing that these digital health solutions must address real-world complexity from the early stages of the design process while maintaining user-friendliness and ease of navigation. This approach promotes broader adoption and aligns with the findings of previously mentioned researchers. However, a simplistic product that does not address real-world complexity or meet customer needs will struggle to gain widespread acceptance. In summary, complexity is a crucial factor that must be taken into account during research and design processes.

Trialability

The impact of trialability in the context of electronic prescriptions can be characterized by the ease with which users can receive, process and transmit electronic prescriptions to their preferred community pharmacy. Trialability is one of the previously highlighted dimensions that were also defined by Rogers (2003). Rogers simply explains that the possibility of trying

out reduces the perceived risk for adopters associated with an innovation. According to Min et al. (2019), the exploration of trialability as one characteristic of innovation can provide relevant findings especially, when the sample population has had little or no experience of adoption yet. This is relevant to the current research as electronic prescriptions has not yet been implemented nationwide in Germany.

Instead of focusing on general factors of adoption, Lin and Bautista (2017) explicitly analyzed the role of trialability with the focus on the usage of mobile health application. As it is planned in Germany that electronic prescriptions will be available via a mobile application, the work from Lin and Bautista (2017) provides some valuable findings because the research focus is very close to this given study. Both authors conducted a survey with 295 participants in Singapore. The study focused on relatively young users that were well-educated (students), and technology savvy. With this group of users, it came out that young users are more likely to be easily influenced by each other if a mobile application can be tried out in simple way. In this respect, free access, or limited free access over a specific period of time had a very positive effect on the level of adoption. Hence, this study validated that trialability of mobile health application has a positive effect on the initial adoption at least among young users in different geographical regions.

In conclusion, it would be interesting to investigate the extent to which these findings can also be applied to research scope of the present study. Understanding the role of trialability in the adoption of electronic prescriptions, especially among diverse populations, could provide valuable insights for designing and implementing successful strategies to encourage adoption.

Observability

Rogers (2013) defines observability as the degree to which the results of an innovation are visible to others. In terms of electronic prescriptions, observability could be reflected in the fact that potential users can easily see the effects or benefits of transmitting the prescription digitally. In the planned application for electronic prescriptions in Germany, customers can see various relevant information on the status of the prescription such as *sent, in progress*, *to be ready to pick up* (Bundesministerium für Gesundheit, 2021). These features improve user observability and aim to increase adoption.

Nevertheless, there are also studies that apply DOI, in which the construct of observability is excluded. One example is the work from Tan and Teo (2000). Both authors analyzed the adoption of internet banking and did not take observability into consideration as they argued that private banking goes along with a high level of privacy. One could argue that transmitting prescription data to community pharmacies is typically conducted in a private context, making it difficult to observe others engaging in this process. However, on the other hand, customers who have used the service can recommend its benefits to their community, indirectly allowing others to observe the advantages.

This argumentation is also supported by Chauhan et al. (2018), who analyzed factors that influence customers' decision to use a mobile application. Within their research design they explained observability with the following two examples "Friends around me discuss the use of mobile apps" and "I know someone who is using mobile apps" (Chauhan et al., 2018, p.16). These examples show that within the academic literature observability can have various facets in the way that benefits can be observed passively by others or communicated actively to others.

In both cases, the result is an observation of the benefits of a certain innovation. Consequently, in the context of this research, the author suggests that observability should be examined to determine its applicability for the second study (quantitative). If participants in study one can clearly distinguish this construct from others and identify relevant factors that can be grouped under observability, it will be utilized in the subsequent study.

Connectivity

According to Hsia et al. (2020), a growing number of customers request a seamless shopping experience, which means that customer can expect a coherent level and depth of information throughout various channels and touchpoints. Furthermore, as stated earlier, an integrated multi- or omnichannel systems also allows customers to switch channels throughout the customer journey according to their individual needs (Verhoef et al., 2017). While transferring these findings to community pharmacies in Germany and the technology evolvement of the implantation of electronic prescriptions, it can be concluded that especially connectivity of information might play a significant role. Pharmaceutical products, especially prescription medicine requires a high level and depth of information flow (Goundrey-Smith, 2018). This fact also corresponds to the findings stated earlier of Mou et al. (2017) and leads to the assumption that (a) if patient can obtain a high and coherent level of information via the respective community pharmacy and (b) if the patient can switch communication channels, it positively influences the intention of using electronic prescriptions. Hence, connectivity might play an important role and will be applied in the present study.

Integration

Traditionally, classical brick-and-mortar retail as well as community pharmacies operate separate sales channels such as online and offline channels in different technology ecosystems (Herhausen et al., 2015; Galino and Moreno, 2014; Cao and Li, 2018). Technology ecosystems are determined in this context by both software as well as hardware (Brynjolfsson et al., 2009). On the one hand, this separation of systems leads to a silo structured IT landscape and thus generates significant inefficiencies (Lo, Fan and Zhang 2016). On the other hand, it creates from a customer point of view, a fragmented brand perception, due to the fact that neither product information nor product availability is fully harmonized among various channels (Carvalho and Campomar, 2014). As an example, a customer may find online different prices for a certain product than offline. This often occurs when different IT systems are involved or when the technical integration is executed in a very low level. A low integration level can be identified when – for example – pricing updates between the primary offline and online technology systems only occur once per day. Additionally, inconsistencies in product information, such as availability, delivery times or current marketing and sales initiatives like sales promotions across different sales channels may also indicate a low level of integration. These practical examples highlight that it is important for practitioners to constantly gain relevant insights on current and future omnichannel customer behavior, so that retail strategies and sales approaches can be adopted accordingly. As highlighted earlier, the technical integration of various sales channels is one crucial evaluation phase from multi- towards omnichannel retailing. According to Cao and Li (2015, p. 200), cross-channel integration can therefore be defined as “the degree to which a firm coordinates the objectives, design, and deployment of its channels to create synergies for the firm and offer particular benefits to its

consumers." This definition reflects both sides, the customer as well as company perspective and can be applied for marketing as well as sales purposes.

Despite acknowledged importance of the research topic from the specific perspective of community pharmacies in Germany, there exists a research gap specifically concerning the potential effect of channel integration on the overall shopping intention of customers. However, there are studies available that focus on similar questions in other retail segments and therefore can also be used to postulate assumptions for community pharmacies in Germany. For example, Pantano and Viassone (2015) examined the extent to which consumers are willing to switch channels throughout the customer's journey in a multichannel environment of fashion stores. The authors based their research approach on previous studies (e.g. Floh and Madlberger, 2013) that illuminated the influences of various factors on the shopping behavior in classical store environments. Hence, Pantano and Viassone (2015) applied a similar research approach but transferred their study into a multichannel context and investigated, among other research questions, the willingness of customers to switch sales channels within a physical store. In doing so, the authors developed a framework that helps to analyze the extent to which the dimensions of (a) perceived service quality (b) satisfaction and (c) attitude influence the shopping intention via various channels. As a result, it can be summarized that channel integration is one key factor that positively correlates with the willingness of customers to use different sales channels. In their specific research setting, the digital sales channel was not an online channel, instead it was a digital in-store sales tool where customer could choose various products on a digital screen. Pantano and Viassone (2015) explicitly discovered that customers require an easy and convenient method for locating not only the desired product but also all related information. This implies that if an additional sales channel fails to offer a high degree of convenience and compatibility, it will not fully realize its potential. In the study conducted

by Pantano and Viassone (2015), perceived convenience and service quality were primarily attributed to human salespersons who could offer guidance during the digital sales process within the store. Building on this line of research, Cao and Li (2015) empirically examined a conceptual model that sheds light on crucial factors influencing channel integration. In this context, the authors focused on three main factors (a) technology, (b) organization and (c) environment. Even though this research focuses on improving the decision-making process of practitioners whether to increase channel integration or not, it also provides some valuable insights for this planned research work.

First, Cao and Li (2015) determined that the decision to integrate various sales channels is primarily based not on financial resources but rather on the overarching belief that investing in technology will enhance competitive advantage in the future. This also suggests a general conviction among participants in the growing demand for integrated omnichannel solutions, even though the specific technology solution required remains unclear.

Second, organizational structures and resources significantly influence the ability to provide integrated sales channels. However, Cao and Li (2015) also found out that this effect can be mitigated through innovative technologies, which enable implementation with fewer resources. As community pharmacies in Germany are generally small- and medium-sized companies, they are often more agile and adoptable compared to larger organizations. This might enable them to more quickly and effectively incorporate new technologies and strategies for integrating online and offline channels. One example is the growing availability of affordable and user-friendly digital tools, such as standard online or mobile shops, which makes it easier for smaller pharmacies to adopt channel integration.

Third, in a market with low concentration, the willingness to innovate and consequently, offer integrated sales channels tends to be relatively high (Cao and Li, 2015). In the fragmented

community pharmacy market in Germany, where multiple pharmacies often compete within the same district, it is crucial for practitioners to continuously innovate to differentiate themselves from their competitors. Embracing electronic prescriptions and integrating online channels can provide community pharmacies with a competitive edge; for instance, by offering enhanced convenience through services as home delivery for their customers.

While the above-mentioned factors predominantly address a company's internal perspective and motivation to develop cross-channel integration, Cao and Li (2018) also conducted an analysis to determine whether cross-channel integration indeed results in increased revenue. Additionally, they sought to identify the critical success factors that contribute to enhanced profitability through the implementation of integrated sales channels. In doing so, Cao and Li (2018) derived five elements from existing literature to test the potential impact of channel integration on a companies' sales growth. It was assumed that four of these elements will have a positive impact such as (a) improved trust, (b) increase customer loyalty (c) higher consumer conversion rates and (d) greater opportunities to cross-sell. One element was taken into consideration with a potential negative impact on sales growth such as (e) the risk to cannibalize sales volume trough additional integrated sales channels. As a result, the authors concluded and confirmed that if companies offer well-coordinated and integrated sales channels this leads to increasing trust, customer loyalty, higher conversion rates as well as increasing revenue through active cross-selling. Furthermore, in the same study Cao and Li (2018) showed that companies with an existing strong focus and success in one specific channel have difficulties to benefit in the same way from channel integration than companies that have already quite balanced revenue streams from different sales channels. Hence, companies that have been highly successful in one channel may be more resistant to change, as their existing success could make them slower to adopt new strategies.

Given these findings, it underscores the importance of examining the influence of electronic prescriptions in combination with new sales channels in the context of community pharmacies in Germany. Customers have traditionally relied on local pharmacies for acquiring medicine and there exist little knowledge whether these insights can be applied and if the incorporation of new channels leads to revenue growth.

The discussion above explores different perspectives on whether improved integration of multiple sales channels leads to higher sales. Integration is a crucial aspect to consider, and the study's objective is to identify relevant factors within the unique context and scope of this research.

Consistency

According to Shi et al. (2020, p. 329), consistency can be defined as "the extent to which customers experience both content and process consistency of interactions across channels." Recent studies such as Martínez et al. (2022) have tested the omnichannel dimensions from Shi et al. (2020) and found that connectivity, consistency and flexibility were good predictors associated with brand trust, which further influence customer shopping intention. Hence, it can be argued that these dimensions positively influence the customer behaviour towards the adoption of multi- and omnichannel sales channels.

These findings support the results from earlier studies such as Kopot and Cude (2021), who analyzed data from 552 customers who shopped at fashion department stores in the US. Their comprehensive results also verified that content and process consistency positively affect the choice of channel usage as customers perceive a relatively high level of channel fluency.

Consistency during channel transition is therefore highly important for customers while using various sales channels.

Shen et al. (2018) define process and content consistency slightly different. They say that "process consistency refers to consistency between relevant and comparable process attributes of different channels and content consistency refers to consistency of information exchanged between different channels" (Shen et al., 2018, p. 64). However, even with this definition Shen et al. (2018) reach the same conclusion that both process and content consistency have a significant impact on channel adoption due to the fact that the overall trust increases. Therefore, it will be applied in the present study.

Flexibility

Flexibility is essential in online retailing because it allows businesses to adopt to changing consumer preferences and expectations. With the ever-changing landscape of e-commerce, customers expect a seamless shopping experience, and companies must be agile to meet those demands.

In many studies such as Oh et al. (2012), Verhoef et al. (2017) or Martínez et al. (2022), flexibility refers to channel agnostic services with seamless customer experience. One of the main keywords mentioned in this context is customer empowerment. This means that customers can decide what kind of content they would like to see on a specific channel.

Connected purchase channels offer another example, enabling customers to select their preferred channel at any stage of the purchasing process. Various hybrid retail services have emerged over time, including click-and-collect, reserve-and-collect, buy online with in-store

returns and service click-and-meet. In 2021, a German retail institute called EHI analyzed how many retail companies are already offering flexible omnichannel services. Out of 531 multichannel retail companies that were explored, 332 companies offered both integrated sales channels, content, and service (EHI, 2021). Furthermore, the analysis showed that click-and-collect is the most frequently communicated service with 87.7% of companies offering it. Additionally, 77.9% of respondents provided in-store returns, and 64.9% displayed in-store stock availability. Thus, it can be argued that flexible omnichannel services are widespread within the German retail landscape.

According to Shi et al. (2020, p.329), flexibility can be defined as "The extent to which customers are provided with flexible options and experience the continuity when migrating tasks from one channel to another channel."

Shakir Goraya et al. (2022) illuminated the effect of showrooming and webrooming in the context of integrated sales channels and found out that integrated channels have a positive economic effect. The authors also found out that customers like to have the control about their channel choices. Therefore, it can be argued that increased flexibility might lead to greater customer empowerment, which can ultimately result in higher adoption. Hence, it is recommended to conduct further analysis to determine whether, by providing a diverse range of flexible options and services, community pharmacies can effectively increase the adoption of electronic prescriptions.

Personalization

The importance of data collection and personalization in the retail sector has long been a topic of interest among practitioners and academics alike (e.g. Riegger et al., 2021; Tyrväinen et al., 2020). Shi et al. (2020) describe personalization as the extent to which customers feel that retailers offer individualized attention, which can include personalized shopping suggestions and customized incentives, such as special discounts on their birthdays.

Considering that customers' perception of personalization is not confined to specific channels, numerous studies have explored the role and importance of personalization in both online and offline retail environments. For instance, Gwinner et al. (2005) analyzed the critical role of service employees and the effect on face-to-face personalization in physical stores. By contrast, more recent studies have increasingly concentrated on the role of technology and data-driven personalization in online retail settings (Riegger et al., 2021).

However, there is strong controversy about personalization in this context. On the one hand, some researchers have demonstrated that personalization can enhance customer loyalty, leading to significant benefits such as increased revenue per customer or reduced churn rate (Tyrväinen et al., 2020). On the other hand, there are studies that highlighted the negative effects of personalization (Pizzi and Scarpi, 2020; Tucker, 2012). Pizzi and Scarpi (2020) support previous findings validating that new retail technologies – such as beacons, facial recognition, smart mirrors, and automatic checkout – might lead to significant customer privacy concerns.

Even though these new technologies allow an increasing level of personalization as well as an additional perceived benefit, customers might react ambivalent. This means that even though customers are generally willing to share personal information to gain a specific benefit

such as personalized offers, the willingness to share data highly depends on the perceived benefit (Pizzi and Scarpi, 2020). Therefore, the hedonism associated with new retail technologies is not the only factor influencing customer behaviour; retailer trustworthiness and privacy perceptions also play significant roles in the technology adoption process.

Moreover, Wetzlinger et al. (2017) investigated the impact of personalization on privacy concerns and customers' intentions to adopt services in brick-and-mortar retail stores and online shops. Their findings revealed that customers' intentions to adopt personalized services were significantly higher in an online shop than in a physical retail store. This insight suggests that community pharmacies could potentially increase the adoption of electronic prescriptions through an online shop by enhancing the level of personalized offerings or communication.

In conclusion, based on the above-mentioned studies, personalization represents a relevant construct, either with positive or negative impact, when exploring the adoption of a new technology. In the context of electronic prescriptions, factors under the construct may include features such as personalized marketing, medication reminders, customized dosage instructions, or tailored drug recommendations based on patients' medical history. The present study will therefore aim to identify relevant factors in this construct and determine if there play a significant role.

Perceived risk

Many authors such as Mou and Shin (2018) and Ehn et al. (2021) describe the growing importance of the electronic healthcare market (e-health). Eysenbach (2001, p. 2) defined e-health in the early days of this upcoming phenomena as “an emerging field in the intersection

of medical informatics, public health and business, referring to health services and information delivered or enhanced through the internet and related technologies." Eysenbach's (2001) early definition of e-health as an emerging field still reflects the broad spectrum of topics encompassed by e-health today. Of course, the planned implementation of electronic prescriptions in Germany, as one facet of this ongoing trend, brings opportunities for efficiency and effectiveness. However, this process also entails the electronic transfer of highly sensitive personal information, similar to industries such as online banking or online insurance (Van Laere et al., 2020; Geebren et al., 2021)).

As electronic prescriptions are planned to be implemented in Germany in the beginning of 2024, customers do not have any experience with this new technology so far (ABDA - Bundesvereinigung Deutscher Apothekerverbände e. V., 2020). Hence, perceived risk and the corresponding trust or distrust might have a significant impact on the potential adoption of the new technology. In this context, Bansal et al. (2010) confirm that patients with poor health have higher data security requirements in the e-health market. Mou et al. (2017) support those findings and additionally highlight that it is important to illuminate the inter-relationships between e-health systems, success factors and the corresponding trust.

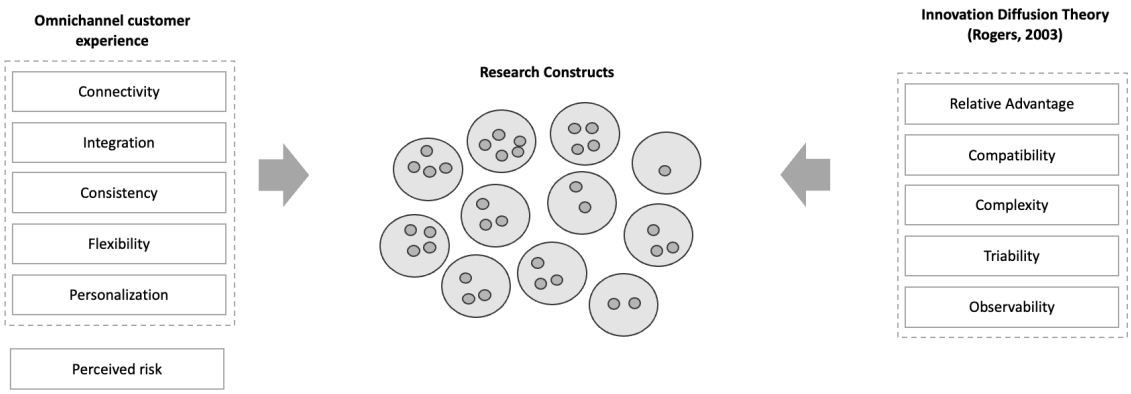
Aware of the fact that trust building is a sustainable long-term process, Mou et al. (2017) developed a longitudinal model through a multi-dimensional examination. This model demonstrated that pre-existing trust in an e-health provider significantly impacts acceptance, while also revealing that trust in the e-health system is more dynamic and evolves over time. It can be transferred from the e-health provider, but does not completely align with it. In the context of this study, the community pharmacy acts as the e-health provider, and the electronic prescription system represents the e-health system.

Mou et al. (2017) recommend that e-health providers implement privacy protection systems to establish and improve a reliable reputation. Community pharmacies, particularly in comparison to large online pharmacies, may have limited resources to build such systems. Therefore, it is crucial to understand whether patients perceive a significant risk in obtaining medicine through digital sales channels at their local pharmacy. Hence, perceived risk will be included in the present study as one relevant construct.

Conclusion

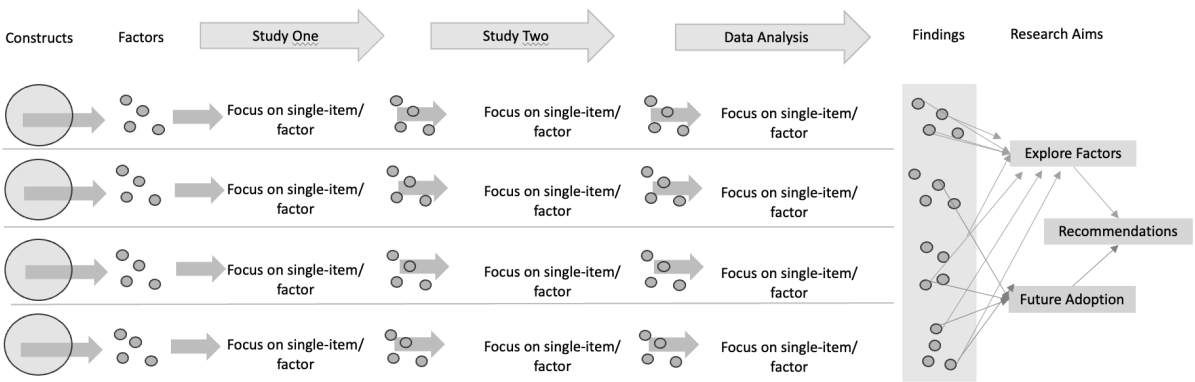
The above stated sections meticulously identified and explained eleven constructs that are crucial for a deeper understanding of the adoption of electronic prescriptions. Drawing from DOI and including additonal elements unique to omnichannel services, these constructs are (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, (5) observability, (6) connectivity, (7) integration, (8) consistency, (9) flexibility, (10) personalization, and (11) perceived risk. The exploration of these constructs contributes to a holistic understanding of the context, acting as an integral foundation for the upcoming chapters. Figure 6 shows the foundational constructs that form the theoretical basis for the study. These constructs are a confluence of the Diffusion of Innovation Theorey as proposed by Rogers (2003) and the additional dimensions presented by Shi et al. (2020), extended by the construct of 'perceived risk'.

Figure 6: Research framework with 11 constructs



In addition to that, Figure 7 shows the interplay between constructs and the specific factors within them, setting the stage for a structured research approach. The constructs serve as comprehensive categories that contain distinct factors, which ensures that each aspect of the study is grounded in theory and systematically examined.

Figure 7: Constructs and factors in the context of research process



This structured focus for each study phase ensures a granular examination of every element,

and so allows a more in-depth understanding. Consequently, by systematically addressing each factor, the study becomes well-equipped to achieve its three research aims.

Transitioning into Chapter 3, the focus shifts from theoretical understanding to the practical approach of the research. This chapter will elaborate on the research design and outline its alignment with the study's aims. In particular, it will illustrate how the identified constructs contribute to the development of a comprehensive research model and the subsequent application and validation in studies one and two, respectively.

Chapter 3: Research approach

Introduction

In the previous chapter, the author identified and explained the main constructs based on existing literature. This chapter will elaborate on the research design and its alignment with the focus and objectives of the study. Additionally, this study will provide insight into how the constructs contribute to the development of a comprehensive research model and the subsequent validation (Study One) and application (Study Two) of this model. The author will also describe the data collection methods employed in both studies and provide a rationale for the software used in the analysis.

The following paragraph also establishes the context by outlining the philosophical approach that underpins both studies. In constructing the research design, the author follows a specific philosophical approach that combines ontological and theoretical perspectives. This combined perspective enables the research to incorporate both inductive and deductive elements, which are essential for a comprehensive understanding of the subject matter.

After discussing the philosophical approach, the chapter is structured into two main sections, focusing on study one and study two. In the first section, study one's research design, methodology and data collection will be discussed. This part of the research focuses on validating the relationships between the constructs identified from the literature review as well as understanding the factors regarding the adoption of electronic prescriptions. The second section will delve into study two, elaborating on its research design, methodology and data collection process. Study two aims to test the validated constructs and factors on a larger population.

Philosophical approach

After finalizing a substantial literature review, Chapter 2 also showed that DOI has a long history of application in various research studies. The consistent usage of DOI in such studies attests to its effectiveness in highlighting the determinants that facilitate or hinder the adoption of specific innovations. Hence, on the one hand, it can be concluded that a deductive research approach will lead to reliable findings.

Nevertheless, on the other hand, the author also identified studies, such as Amaro and Duarte (2015) that used a refined mixed-method approach based on DOI. The relevance of Amaro and Duarte's study for the current research lies in its methodological rigor and its unique application of DOI. In their study, Amaro and Duarte first developed a research framework informed by DOI. They then validated the proposed DOI dimensions and factors through the use of qualitative interviews. This initial step applied a deductive approach, aiming to confirm whether the proposed DOI factors were accurately described and encompassed all relevant elements. In the second phase of their study, Amaro and Duarte utilized the validated model from the first phase and applied it to a large-scale sample using quantitative surveys. This step marked a shift to inductive reasoning, with the overarching research question addressed through empirical data collection and analysis. The methodology adopted by Amaro and Duarte serves as a robust model for the present study. Their two-step process allows for a comprehensive understanding of the factors influencing the adoption of innovation, combining theoretical grounding with empirical validation. This approach underscores the necessity for both the in-depth examination of theoretical constructs and their subsequent empirical testing, which is also essential to the current study's examination of electronic prescriptions adoption. Therefore, the

insights from Amaro and Duarte's work can offer critical guidance to the current investigation's design and implementation.

Thus, it can be concluded, that a two-step research approach combining qualitative as well as quantitative research elements has various advantages such as (a) it improves the overall research quality as it increases the probability to address relevant factors that can be identified in the qualitative research study, (b) it helps reaching a common understanding and definition of the DOI dimensions that are otherwise only generally described and need to be adopted to the specific research question and environment. Hence, a mixed-method approach combining qualitative and quantitative research elements within a cross-sectional time frame is applied in this presented study. Furthermore, abductive reasoning is used due to the fact that (a) study one is not purely about confirming a pre-existing theory (deductive) or building a new theory from observations (inductive) but rather about exploring and understanding the observations to seek the most coherent explanation, and (b) abductive reasoning allows the flexibility to adapt DOI based on new information. The move from qualitative exploration to quantitative measures in the second phase reflects this flexibility. This empirical testing, based on the initial exploration, aligns with the nature of abductive reasoning (Charmaz, 2008).

The initial understanding of the methods, methodology, and techniques paves the way for a deeper investigation into the theoretical perspectives and epistemological underpinnings of the study. The research philosophy according to Saunders et al. (2015) outlines a system of beliefs and assumptions crucial to knowledge creation. In this context, it is also important to understand the individual beliefs and assumptions at each stage of the research process as these factors might change in different research steps. According to Crotty (1998), consistency in research can be reached through a well reflected and differentiated adoption of main research philosophy (a) ontology, (b) epistemology and (c) axiology.

Ontology describes the root set of assumptions that determine the overall interpretation of “what is” (Crotty, 1998). Hence, the ontological assumptions significantly shape how the author start to look at a certain research question and the gathered data throughout the research process. As the overall research question of this study is to illuminate the future adoption of electronic prescriptions at community pharmacies in Germany, the ontological authors point of view is that there is a new technology with an inherent question of adoption.

As we transition from ontology to epistemology, it is important to note that the distinction between these two is not always clear-cut. For example, Crotty (1998, p.8) strongly links ontology to epistemology – defined as “what it means to know” – whereby he argues that a person’s ontological point of view cannot be defined independently of the epistemological view. Crotty confirms this statement referring to work from Guba and Lincoln (1994). Both authors say that in a real world where humans are conscious about the real objects, realism is necessary linked to objectivism. Crotty (1998) further asserts that distinguishing between realism, defined ontologically as the belief in realities existing independently of the mind, and objectivism, defined epistemologically as the view that meaning resides in objects separate from consciousness, may be inherently complex. This suggests a interrelation between how we perceive existence (ontology) and how we comprehend it (epistemology). In other words, our understanding of what exists and how we can know it are inherently interconnected. Therefore a 'pure' separation of ontology and epistemology might be difficult.

Concerning the present research study, the ontological assumption is that there is a new technology (electronic prescriptions) and there is an inherent question about its adoption by community pharmacies in Germany. This means starting from a realist perspective, where there is a certain belief in an external reality that exists independent of human understanding. This ontological view shapes the choosen research methods.

Of course, epistemology, concerning the understanding and interpretation of knowledge within data, is integral to any study. In this context, Saunders et al. (2015) state that data can have various forms such as numerical, textual and visual data. They further add narratives, observations and conclusions to their definition of data. Hence, the epistemology of this present study is reflected in the qualitative and quantitative study and the corresponding findings. Moreover, Crotty (1998) concluded that the appropriate methodology to gather the desired data is an inherent part of the overall research process. He also identified and explains various forms of epistemologies such as constructionism, objectivism, positivism, realism, interpretivism, pragmatism and subjectivism. In the following paragraph, those forms are explained and the epistemology in the eye of the given study is analyzed.

(a) **Constructionism** is defined by Crotty (1998) as a form of epistemology where the meaning is a result of the analysis of an object. Hence, different researchers can come to different conclusions. An object itself has no single truth. This might be important with the focus on electronic prescriptions as different cultures could have a certain tendency to adopt innovations either faster or slower.

(b) **Objectivist** epistemology assumes a natural sense of objects. That means that there is no room for interpretation. The researcher can only identify a result that is already given by the nature of the object (Crotty, 1998).

(c) **Positivism** incorporates a total neutral view of the object that is being analyzed. There are usually no assumptions or hypothesis, and the positivism coined studies are distinguished by inductive research approaches. As the given study has a rather

deductive research approach the author argues that positivism cannot sufficiently describe the epistemology (Saunders et al., 2015).

(d) From the **realist** point of view, objects have their own reality that strongly depends on the fact how they are perceived by human beings. In this context, it can be concluded that there is no objective view of an object.

(e) While positivists assume that knowledge is independent of the object being studied, **interpretivists** claim to have their own perception and understanding based – for example – on cultural or historical experiences. Hence, positivist researchers seek to find new patterns that can help to forecast future and answer upcoming questions based on the data that has been analyzed. Instead, interpretivist studies are often qualitative in nature and focus on putting findings into a greater perspective of the knowledge that is already given.

(f) **Pragmatism** research philosophy allows a combination of positivism and interpretivism, as pragmatics adopt a certain epistemology according to the context of research. Therefore, it is often reflected in the combination of deductive and inductive research methods. In this context, the research findings could be of an objective as well as subjective character (Rorty, 2007). Pragmatists deny there is single reality and thus they argue that research methodology needs to adopt to certain aims and stages of the research process.

(g) In **subjectivism,** the meaning is purely developed by the person who analyses the data. Objectivism is exactly the opposite as all meaning comes from the object itself and there are no subjective influences (Crotty, 1998).

Of course, for the purpose of completion many other epistemological philosophies exist, such as anti-pragmatism (Crotty, 1989). The author did not discuss those differences given that these theories were mainly addressed in very specific research environments and thus did not reach a larger popularity (Saunders et al., 2015).

According to Saunders et al. (2015), (c) axiology reflects the value of the researcher in each stage. In that regard, it can be said that there is broad range of value-based research that starts with a pure level of subjectivism and ends with a value laden objectivism. Hence, it is important to have a clear picture regarding the extent to which the values of the researcher influence the interpretation of the findings. For example, a realism- or interpretivism-based research philosophy is highly influenced by the way in which the researcher sees the world. His or her experience can either help to interpret certain findings or limit the analysis.

In conclusion, the epistemological stance in this study is rooted in both objectivism and subjectivism, recognizing that knowledge may exist independently of individuals (objectivism), but also acknowledging that personal experiences and interpretations shape our understanding of that knowledge (subjectivism). Utilizing both approaches will help to address the overall research aims effectively. The subjectivist lens permits an exploration of personal perceptions and the contextual understanding of the constructs and factors relevant for the adoption of electronic prescriptions. Meanwhile, the objectivist lens supports study two's more empirical analysis, focusing on the identification of significant correlations and the projection of future levels of adoption. By employing this dual approach, the research gains depth, reaching a more

comprehensive understanding of the phenomena under study. Furthermore, it aligns with the mixed-methods research design, allowing for a nuanced analysis that can accommodate different perspectives and methods. In terms of axiology, the researcher's values and biases will be carefully considered and managed, to ensure that they do not unduly influence the interpretation of findings.

After discussing the various epistemological approaches, the selected epistemology will be linked to the research methodology and methods. This connection will illustrate how the philosophical underpinnings of the study guide the research design, data collection and data analysis processes.

Research aims and objectives

Before having a detailed view on the research methodology, it is crucial to align the research aims of this study with the detailed research objectives. According to Crotty (1998), a cohesive and adequate research strategy needs to be designed according to the aims and objectives. The primary focus of this research, as indicated by the thesis title: *Exploring Factors Influencing Adoption of Electronic Prescription at Community Pharmacies in Germany: An Omnichannel Perspective* is to investigate factors that impact the adoption of electronic prescriptions in community pharmacies within Germany. To ensure a comprehensive exploration, this broad focus has been decomposed into three distinct research aims:

1. Explore what factors influence customers' usage of electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany.

2. Create a list of recommendations for community pharmacies in Germany to enable them to increase customers' acceptance of electronic prescriptions.
3. Project the extent to which customers will adopt electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany.

Each of these aims is systematically broken down into more specific research objectives. These objectives will then serve as a guide for developing the methodology that follows.

The first research aim – *explore what factors influence customers' usage of electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany* – aims to identify relevant factors that have either a positive or negative predictive value for the adoption of electronic prescriptions. The market segment is determined by the focus on community pharmacies, and the geographical region is defined by focusing on Germany. To achieve this first research aim, a set of specific research objectives were defined:

1.1 Identify appropriate (a) innovation adoption models and (b) studies that analyses factors that are relevant in the context of multi- and or omnichannel adoption.
1.2 Using appropriate secondary sources including the existing literature review to design a research model including factors or factor cluster (constructs) that might have an impact on the adoption of electronic prescriptions.
1.3 Apply and validate the designed research model and constructs and factors.
1.4 If needed, adopt research framework. This might be needed; for example, if the new factors are identified, if factors or dimensions have a different meaning in the context of this study or if it emerges that certain factors are not relevant.

The second research aim – *create a list of recommendations for community pharmacies in Germany to enable them to increase customers' acceptance of electronic prescriptions* – leads to the following research objectives:

2.1 Identify relevant factors that positively influence the adoption of electronic prescriptions at community pharmacies in Germany.
2.2 Derive and propose recommendations to increase adoption of electronic prescriptions.
2.3 Identify relevant factors that negatively influence the adoption of electronic prescriptions at community pharmacies in Germany.
2.4 Derive and propose recommendations to minimize the effect of negative factors.

The third research aim – *project the extent to whicht customers will adopt electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany* – leads to the following research objectives:

3.1 Develop a structured quantitative study with a sample size and quality to estimate future adoption.

In conclusion, this section has clearly explained the specific objectives attached to each of the three primary research aims. Moving forward, the upcoming section will expound on the research methods and methodologies deployed in this research.

Research methods and methodologies

The upcoming section will detail the methods and techniques employed during the research process, which used a mixed-method approach involving both qualitative (first study) and quantitative (second study) research methods to comprehensively address the overall research aims. The following text will be divided into two sections, with the first section detailing study one and the second section highlighting study two.

Study one - introduction

In the following sections, the methodology employed in the first study is described. The aim of the study one is to identify and understand the relevant constructs and factors that impact the adoption of electronic prescriptions at community pharmacies in Germany.

Qualitative research design, which was used to achieve the first research aim, is a suitable approach when exploring new areas or when little is known about the phenomenon under investigation (Bryman and Bell, 2011). This approach enables a comprehensive exploration of participants' perspectives, experiences, and insights and so leads to the generation of insightful data.

In the present study, the research design did not rely on any pre-existing hypotheses but rather aimed to identify and conceptualize relevant constructs and accompanying factors related to the adoption of electronic prescriptions. The sample for the study consisted of ten individuals (ordinary citizen) who did not have prior experience with electronic prescriptions but had a good understanding of prescription medication at community pharmacies. The data collection

involved in-depth interviews conducted between April and June 2022, and the data analysis followed an open coding approach. The findings of the study revealed 31 factors that were relevant to the adoption of electronic prescriptions and provided a foundation for the subsequent study two. Moreover, one out of eleven constructs was excluded after the initial study one, primarily because participants struggled to clearly distinguish it from the other constructs.

In that light, the next sections provide an overview of the research design, data collection, and analysis procedures employed in the first study.

Study one – method

The focus of the study, as explained earlier, is to identify and understand factors that are relevant for the adoption of electronic prescriptions at community pharmacies in Germany. Furthermore, it was needed to obtain more in-depth information on desired omnichannel services to derive recommendations for community pharmacies. These insights will facilitate the derivation of concrete recommendations to enhance electronic prescription services. For this purpose, study one employed a qualitative research approach, undertaking detailed interviews with ten individuals. The decision to conduct ten interviews was based on the principle of data saturation, which is a widely accepted concept in qualitative research and proven in recent studies with a similar focus (e.g. Riegger et al., 2021). Data saturation occurs when no new information (codes) emerges from additional interviews. If this occurs, it shows that the sample size is sufficient to capture the breadth and depth of perspectives related to the research topic. In the given study, the aim was to gather comprehensive insights from a diverse range of participants to ensure a rich understanding of the factors influencing the adoption and throughout the final three interviews, no substantial new insights emerged.

In-depth interviews have several advantages in qualitative research (Johns & Lee-Ross, 1998). First, they provide a personalized and detailed exploration of participants' viewpoints and experiences, allowing for a nuanced understanding of the research topic. The interactive nature of interviews enables researchers to clarify responses as well as to seek for deeper insights. Moreover, interviews allow participants to express themselves in their own words, and so it might reveal unexpected facets. Additionally, interviews provide a certain level of flexibility and so allows the researcher to adopt the questioning based on the individual responses.

However, in-depth interviews also have some limitations. They require significant time and effort, both in terms of conducting the interviews and analyzing the data. The subjective nature of interviews may introduce bias, as participants may provide socially desirable responses. Despite these limitations, in-depth interviews remain a valuable method for gaining rich insights into participants' perspectives and motivations.

In the beginning, it was planned to do the interviews with persons, that have had already experiences in using electronic prescriptions at community pharmacies. Thus, it was needed to identify interviewees that were part of one of the ongoing or past pilot projects and test regions. Therefore, the author contacted Gematik in April 2022, the company that is in charge to develop the technology infrastructure for electronic prescriptions in Germany. A responsible senior manager of Gematik provided the author with contact details of various relevant stakeholders that were part of different pilot projects to test electronic prescriptions. Based on this information, the author contacted three doctors and explained the overall research project. In all three meetings the doctors offered their support for the project. However, it also became obvious that it will be a challenge to identify potential interviewees, mainly due to General Data Protection Regulation (GDPR) restrictions and potential time constraints. How would the

process look like? The doctor would need to provide a detailed explanation of the research project to the patient and address any outstanding questions at the conclusion of the therapy session. Subsequently, they must obtain written consent to either share the patient's contact information or provide the patient with the researcher's contact details. This would necessitate extra time in an already tight schedule, as well as adjustments to processes and increased documentation efforts. As a result, all three physicians were unable to identify potential interview participants.

In May 2022, the author contacted Gematik again and obtained a list of community pharmacists that also were part of the pilot projects. After contacting two pharmacists, a quite similar picture emerged. Even though both pharmacists revealed their strong interest in the project, they also saw challenges to obtain the right to use the personal information as health information in general is a very sensitive area in Germany. Nevertheless, one pharmacist offered the opportunity to place a billboard at the counter. The idea was to passively promote the research study. The billboard was designed by the author and explained the research purpose in a nutshell. On top of that, the author designed a leaflet with contact information for those who are interested in participating in the study. After four weeks with no reaction the author decided together with the pharmacist to stop the promotion of the study. We can only speculate about the reasons for the low level of interest, as there was no direct feedback from patients. According to the pharmacist, some patients took the information with them but did not get in touch afterwards. Hence, it can be assumed that some patients were interested in participating in the study but did not find the time to do so afterwards or were no longer interested.

After these experiences, the author discussed with his supervisor again about the possibilities of sample design. In addition, the author has once again searched the academic literature for comparable studies to gain an idea whether it is necessary to validatea research

model that aims to illuminate innovation adoption using DOI with people who already have experience with the adoption of the specific innovation in advance. The additional research led to the result that both exists, studies that apply DOI and include a pre-testing of the research model with persons that have had experience with the innovation beforehand as well as without. One recent example for a similar study is the work from Ahn and Park (2022). Both authors also used an DOI based research framework to answer the question, what factors determine user' intention to use sustainable transportation systems? Ahn and Park (2022) pre-tested their research model with twenty persons who already had experience using sustainable transportation. Their research approach is based on work from Rousseau et al. (1998) who argue that when individuals lack experience with newly adopted services or technologies, their perceptions of the service or technology are mainly affected by trust. Therefore, the authors choose to include participants with experience in using sustainable transportation systems.

An example of research involving participants with no prior experience with a particular innovation is the study by Park and Chen (2007). Using theoretical frameworks such as Technology Acceptance Model (TAM) and DOI, the researchers examined the users' perceptions, attitudes, and behavioral intentions towards smartphones in the context of medical doctors and nurses. The findings indicate that perceived usefulness and attitude towards smartphone usage significantly influence adoption decisions. Despite only 9% of the sample having previous experience with smartphones, the study's results were of high quality. This demonstrates the robustness and significance of their findings, even with a limited number of participants with prior smartphone experience.

Hence, both research approaches can be found in the academic landscape with valid results and thus the author concluded that a validation of the research model can also be conducted with persons who have no or little experience and knowledge in the field of

electronic prescriptions. Additionally, it can be argued that it is rather important that the interviewees have experience and knowledge about prescriptive medicine in general. Consequently, study one was executed with ten participants that did not have any experience in using electronic prescriptions.

Study one – sample

The target population is theoretically all German habitants, aged 18 or more with experience in using prescription medicine at community pharmacies. As described above, initially, the author tried to identify interviewees with experience in using electrotonic prescription at community pharmacies. As this could not be realized, potential interviewees were carefully selected with the support of a local community pharmacy. The author was allowed to ask persons that left the community pharmacy and ask them if they were willing to take part in a short interview. Out of approximately 35 persons, ten interview partners were identified (Table 6). Most common answer for not participating in the interview was "I do not have time." Furthermore, after a general explanation of the interviewer all respondents indicated both, a good understanding about the type as well as use of the innovation of electronic description. Hence, the interviewees had sufficient understanding of the topic to answer the questions of study one. Additionally, the author clarified if all interview partners had at least once purchased prescription medicine at a community pharmacy.

Table 6: Demographic background participants study one

	Age	**Gender**	**Experience in Prescription**
P1	22	M	Yes
P2	40	M	Yes

P3	36	F	Yes
P4	85	F	Yes
P5	67	M	Yes
P6	32	M	Yes
P7	28	F	Yes
P8	50	N	Yes
P9	20	M	Yes
P10	42	M	Yes

Study one – pilot interviews

While preparing the interviews, the author conducted two extensive test interviews. The aim of these test interviews was to check if the interview structure allows a good conversation. Thereby, the persons to be interviewed should not feel restricted or influenced in their answers and thus have sufficient freedom to express their own thoughts and opinions. The author identified two people in his personal network who already had experience in submitting prescription medication to community pharmacies and were willing to discuss the interview agenda together. During the first interview, the author found out that the introduction and the introductory questions were far too extensive. Therefore, between the first and the second interview, the questions were adjusted. The second test interview showed that it makes sense to briefly explain the context of the question in each dimension. For example, if the respondent was asked which personalization of the offer he or she would like to see, the author showed him or her a selection of personalization alternatives. Another example is the question of whether the individual use of electronic prescriptions would increase if a special discount were offered on additional items that do not require a prescription. The author then illustrated such an example and showed, if possible, how a certain process could look like.

In the observation of the author, this led to the fact that the respondents could better imagine the specific situation of the question. Furthermore, the author did not have the impression that the additional explanations negatively influenced the answers. Instead, it led to a higher quality of answers. This quality could be assessed through a higher depth and length of answers.

Study one - data collection

Data collection took place between May and June 2022. Seven interviews were conducted in person. Three interviews were conducted via Microsoft Teams. The interview sessions lasted approximately 30 to 45 minutes. Based on the experience from the pilot interviews, this duration was deemed appropriate to ensure comprehensive and in-depth exploration of the topic. All interviews were recorded and subsequently transcribed using Amberscript software. After transcription, the author meticulously edited the documents, ensuring that while errors were rectified, the content's integrity remained unchanged. Text passages that did not contribute relevant content were removed for clarity and conciseness.All interviews were recorded and subsequently transcribed using Amberscript software. Afterwards, these documents were edited by the author in the way that nothing significant was changed in terms of content, but errors in the transcriptions were improved. In addition, text passages without any relevant content were deleted.

At the beginning of each interview, the author explained the purpose and context of the interviews to the interviewees. The interviewees were then able to clarify any open questions. Additionally, during this phase, the data processing declaration was signed by each participant to ensure the ethical conduct of the research. Furthermore, the author pointed out that each

interviewee could terminate the interview at any time and, request deletion of the data at any time. None of the interviewees made use of these rights. As already described, the author provided a brief introduction to the topic. After that, he addressed each of the eleven dimensions. There was maximum three questions per dimension. In some exceptional cases, due to the structure of an open interview, there were some further bilateral discussions per dimensions. Towards the end of the interview, there was one additional open and general question including the proactive request of the author to express any ideas, feelings, or opinions on the topic. This approach frequently sparked interesting responses, particularly towards the end of the interviews.

Some participants, who had initially responded quite formally to the questions about the eleven dimensions, began to express deeper emotions and thoughts towards the end of the interview. For instance, one participant shared that she would cease patronizing her pharmacy if she were to receive any form of advertising from them. She held a firm belief that pharmacies should not engage in advertising, and she viewed promotional activities, such as discounts, with significant skepticism. This underscored the value of allowing for open-ended responses, which revealed deeper sentiments and perspectives that might not have emerged in response to more specific questions.

Study one – data analysis and measurement

The choice between a quantitative or qualitative research approach is influenced by the researcher's epistemological beliefs, as noted by Bryman and Bell (2011). Building on this understanding, the current study adopts a mixed-method approach that combines both objectivist and subjectivist epistemologies. Consequently, the methodology employed in study

one adopts a thematic deductive analysis approach to identify relevant factors influencing the adoption of electronic prescriptions. While this approach does not rely on specific hypotheses, it utilizes the eleven predefined constructs (based on the literature review) as a framework for the analysis. Hence, these constructs serve as the basis for organizing and classifying the data an of course, to identify relevant factors.

The interviews utilized open-ended questions that specifically target to identify factors, while providing rich qualitative data for analysis. The interview questions can be found in Appendix 1. During the analysis process, an open coding approach was applied in each construct. Therefore, it was possible to assign various codes to the respective construct, allowing the identification of common themes and patterns within the data. This thematic deductive analysis approach in Study One offered several advantages. It provided a systematic and structured framework for analyzing qualitative data and so allowed the identification of relevant factors within the predefined constructs. Furthermore, this approach helped to maintain a clear and focus on the first research aim.

However, it is worth noting that the thematic deductive analysis approach also carries certain limitations. One key issue is its reliance on predefined constructs, which potentially results in the exception of factors not encompassed within the initial framework. In other words, this approach could overlook or miss significant themes or patterns that do not fit precisely within the predefined categories. This is important for the given research because it could affect the validity and richness of the findings. To mitigate this limitation, the researcher ensured a comprehensive literature review to form a thorough set of constructs. Additionally, an open question (question 14) was included in the interview to capture any emergent themes that did not fit into the predefined constructs. This approach allowed for flexibility in accommodating data that fell outside the initial framework, thereby increasing the robustness of the findings.

In conclusion, the study employed a thematic deductive analysis approach to identify factors affecting the adoption of electronic prescriptions. Table 7 provides examples of codes that were identified for each construct (up to two).

Table 7: Example of codes in study one

Construct	**Examples of open codes from interviews**
Relative Advantage	I can save time using electronic prescriptions
	I can order online and have the medication delivered to my home
Compatibility	The new process corresponds exactly to my ideas of recipe use
	There are significant advantages compared to the classic paper prescription process
Trialability	The provider is trustworthy
	I would receive a comprehensive explanation from my local pharmacy beforehand
Connectivity	All possible communication channels (webshop, mobile app) are connected with each other
	General advice can also be obtained via a digital channel (chat, video call)
Integration	I can view all relevant information online (interactions, etc.)
	Marketing and sales offers can be used both, offline and online
Consistency	I want to receive all relevant information regarding the medication
Flexibility	As many processes as possible are integrated between online and offline
Personalization	Personalized discounts during the usage of electronic prescriptions
	I do not want to receive personalized discounts
Perceived risk	The digital transmission of e-prescription data is not a problem for me
	The digital transmission of e-prescription data should meet the highest safety standards

Study one – reliability and validity

Study one is based on qualitative research methods that involved conducting semi-structured interviews with ten participants to identify relevant factors that positively or negatively impact the adoption of electronic prescriptions in community pharmacies in Germany. As with any research method, it is crucial to assess the reliability and validity of the data collected through these interviews (Creswell & Miller, 2000).

In terms of data reliability, several measures were taken to maintain consistency throughout the research process. Interviews were conducted using a uniform protocol featuring open-ended questions to uncover pertinent factors, opinions, perceived opportunities, and risks in the decision-making process of adoption, as well as the identification of general underlying needs. In this context, Yin (2009) suggests that a clear protocol and consistent procedures across all aspects of data collection are key in maintaining reliability in qualitative research.

The interview recordings were transcribed, and an open coding approach was employed to analyze the gathered data. The axial coding method was then utilized to group the factors according to the constructs outlined in Chapter 2.

In terms of data validity, various steps were taken to guarantee that the results accurately represented the participants' experiences and opinions. First, the sample size of ten participants was deemed appropriate for qualitative research, as it enabled a thorough investigation of the research topic based on existing findings (Guest, Bunce & Johnson, 2006). Guest, Brunce and Johnson argue that data saturation in qualitative research often occurs within the first twelve interviews. This choice was further justified as no new factors emerged during the latter interviews, indicating a saturation of data. Second, participant selection considered sociodemographic criteria, such as age and gender. Third, a strict protocol was followed during

the interviews, utilizing open-ended questions to encourage participants to freely express their thoughts and opinions. Finally, the data analysis process incorporated multiple coding and analysis rounds to ensure that the results accurately portrayed the participants' experiences and opinions.

Study two – introduction

Study two aims to further investigate the factors influencing the adoption of electronic prescriptions in community pharmacies in Germany through empirical quantitative research. The research methodology employed a quantitative approach, utilizing a questionnaire derived from study one and distributed online. The sample population was carefully designed to reflect the potential customer base of German community pharmacies. Hence, the author considered factors such as age, residence, and gender to ensure representation across different demographic groups. Data collection took place from November to December 2022 and resulted in a total of 500 responses, including 26 obtained through offline interviews. The following sections provide a detailed explanation of the methodology, including the questionnaire design, data collection process, and measurement methods used.

Study two – method

The starting point of the quantitative study is the research model, including various dimensions and factors, that were validated in study one. Therefore, study two aims to illuminate what kind of factors have a significant impact on the level of adoption of electronic prescriptions and – if applicable – to identify different groups according to Rogers' (2003)

innovation adopter groups. Furthermore, it will help to understand which factors are relevant to increase customer acceptance of electronic prescriptions at community pharmacies in Germany. As a result, a quantitative research approach was selected to effectively address the study's aims and objectives. The factors examined were all derived from study one and translated into a questionnaire that was distributed online. The survey took place in November and December 2022 and will be explained in the following sections.

Study two – sample

With the focus on the overall research aim of this study, it was important that the sample population reflects the potential customer base of a German community pharmacy. Having this in mind, the following sample criteria were defined:

- **Age**: Aged eighteen or over, and the different age groups should be represented in a similar way as they are currently existing in Germany.
- **Residence**: Place of residence should reflect the distribution of population in Germany.
- **Gender**: Both genders should be evenly distributed.

Consideration was also given to targeting the survey solely to individuals with previous experience using prescription medication or existing customers of a local pharmacy. However, the decision was made to survey a population that is representative of the entire local pharmacy market, as theoretically, anyone aged 18 or older could potentially use electronic prescriptions in the future. For this reason, the population must reflect the total market and it is specifically

important that all age groups over the age of eighteen are included in the survey. Therefore, to ensure a diverse sample, the survey was designed to have a certain geographical spread across all German federal states. To achieve this, the questionnaire did not include any screening questions at the beginning that could potentially exclude certain persons or groups. The only requirement was that participants be at least 18 years old, and additional questions were included to gather information on gender and region of origin.

The survey instrument was made accessible through three different channels. The first method involved creating a short link that could be shared on social media and led to a survey site optimized for both mobile and desktop devices. The second method consisted of developing a QR code that could be printed out and displayed at local pharmacies for respondents to scan and access the survey. Finally, the author conducted a few in-person interviews with individuals who were not willing or able to complete the digital survey, primarily from the age group (70-79 years). This was undertaken to ensure adequate representation of all age groups in the sample.

The data collection method utilized a non-probabilistic and convenience sampling approach, which is further elaborated on in the next section titled "Study Two - Data Collection."

Study two - data collection

After the development of the questionnaire (Appendix 2), which took place at the end of October 2022, the author conducted a pilot study with the purpose to prove the survey design, general understanding of questions, the time taken to complete the questionniare as well as the overall process flow. For this reason, the author created an online questionnaire with Microsoft

Forms and tested the survey with neutral contacts. A total of eight test runs were conducted and the author identified some unclear formulations that were improved afterwards. In order to increase the probability to generate reliable and valid data, it was very important to use simple and clear language so that the respondents have a common understanding about each item.

Furthermore, it was recognized that the overall structure of the survey needs to be optimized. Instead of having a long list of questions using a Likert scale, the author restructured the survey towards a design with four main sections. Each section contained Likert-scale questions in alternation with alternative forms of questions, which improved the overall research perception as being more convenient and more interesting to answer. Table 8 (section: study two – reliability analysis) highlights the overall structure of the survey. These changes significantly improved the process to answer the questions and created a more user-friendly survey design. The reworked questionnaire was again tested and validated with neutral contacts of the author. Overall, three test interviews were conducted. The results were promising as the respondents understood all questions and stated that the process to answer the survey was convenient.

In November 2022, after the final questionnaire was developed, e-mail invitations were sent to friends, colleagues, students, personal as well as professional contacts. The e-mail invitations provided respondents with information on the purpose of the study, the approximate time to fill out the questionnaire as well as the link to the survey. At the same time, the author shared the link to the survey via his own as well as some friends' social media channels. These channels included LinkedIn, Xing, WhatsApp and Facebook. Since the study only refers to the German market, the survey was only available in German language and the call for participation was also only provided in German language. In addition to the initial questions regarding the

residence, at the beginning of the questionnaire, this also ensured that only German residents participated in answering the questionnaire.

The survey was accessible online between November 5th and December 17th, 2022. During this time, a total of 500 responses were collected. Out of these 500 responses, 26 were collected through offline interviews conducted by the author. These 26 surveys addressed older participants, as the proportion of respondents aged between 70 and 79 years was insufficient. These 26 interview partners were selected and contacted by the author. In those cases, the author called the interview partner and filled out the online questionnaire based on the desired answers of the respondents.

Study two – questionnaire design and measurement

The questionnaire was divided into five main sections. The first section contained a short introduction to the topic including the necessary GDPR information, contact details as well as a personal presentation of the author. Furthermore, section one clarified age, gender as well as place of residence (federal states).

Section two included a list of factors that were identified in study one. The respondents were able to score each item using a Likert scale with 1 being “I strongly disagree” and 5 “I strongly agree.” This section tested seven specific factors.

Section three also started with a set of questions directed to scale items. The Likert scale was designed in the same way as explained above in section two. Overall, three additional factors were tested. Subsequently, the survey respondents were asked to rate seven factors in a row from very important to less important. At the end of section three, another section with two

items was presented on a Likert scale with 1 being “I strongly disagree” and 5 “I strongly agree.” Both items focused on a specific dimension.

At the beginning of section four, nine additional items were presented to the survey participants to rate on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). Additionally, a "slider" question was included, where participants were asked to rate how much information they would like to receive in combination with the electronic prescription on a scale from 1 (just the most relevant information) to 7 (as much as possible).

The final section contained two questions. First, the survey participants were asked to rate the extent to which they expect to adopt electronic prescriptions. The scale from 1 to 5 was defined with 1 being *very likely* towards 5 being *very unlikely*. Second, in this section and as a final question, the author asked for further comments in a free text field.

Study two – response rate and time

All responses from study two were collected via the Microsoft Forms server. Overall, more than 3,000 persons were contacted, either directly via e-mail (including follow-up e-mails.), WhatsApp, personal messages or indirectly via posts on social media platforms. As the latter cannot be tracked precisely, this number can only be seen as an estimation. Furthermore, the author placed in local pharmacies small displays with QR codes to the survey. Hence, the response rate was approximately 16% (based on the the assumptation 3.000). The average answering time was 3:21 minutes, according to Microsoft Forms.

Study two – reliability analysis

Before the author began the analysis, the data was assessed regarding reliability and validity. According to Gäde et al. (2020), whenever a certain characteristic is measured, the measurement instrument used for this purpose should have the highest possible measurement accuracy. A measuring instrument has a high measurement accuracy if the resulting measurement results are subject to only a small measurement error. Hence, reliability can be defined as the measurement of accuracy of what is being measured (Gäde et al., 2020). Therefore, it can be said that in a perfect survey environment a measuring instrument is perfectly reliable if the resulting measured values are free of random measurement errors. The assessment of Likert-items and the measurement accuracy of the resulting data has been widely discussed and critically argued. According to Willits Fern et al. (2016), researchers from different disciplines came to different implications regarding quality of outcome while looking at different factors of Likert-based surveys such as (a) necessary items, (b) the number and nature of the response categories, or (c) the uses of the summated and item scores.

Willits Fern et al. (2016) support earlier researchers, saying that with an increasing number of items in the scale – for example, *strongly agree*, *agree* or *disagree* – the general reliability measures increase. In this context, Diamantopoulos et al. (2012) evaluated conditions favoring the use of single- versus multi-item scales in terms of predictive validity. They also concluded that a multi-item scale containing minimum four items provide more reliable results than single item scales. Table 8 highlights the survey structure of the present study in terms of question format (single question and question batteries) as well as the applied item scales. It can be seen that only multi-item scaled questions with a minimum of five scale items were used.

Furthermore, the number of items per question or batteries of questions varies between two (question battery nr. 10) and nine (question battery nr. 8).

In the light of this study, the advantage of these multi-item scales is that complex constructs of adoption can be investigated in line with different factors that serve to measure the latent construct. Additionally, the relatively large number of items – 31 overall – helped to relativize measurement errors. As stated earlier, the author included rating and slider questions to reduce the perception of having too many multi-item scale questions, which might lead to a negative perception and fatigue of the respondents. Hence, the response time might be perceived better, and the changing question design helped to keep the level of concentration high. This was also the feedback from the above-mentioned test survey participants after the second test run.

Table 8: Survey structure and item scale study two

Question/ Question Battery	**Construct**	**Items**	**Item scale**
1	Age	AG	Numeric value: 1-99
2	Gender	GR	Values: 1-3 (male, female, diverse)
3	Residence	RS	Values: 1-16 (federal states)
4	Relative Advantage	RA1-7	Multi-item scale (values: 1-5) - symmetric agree-disagree scale
5	Compatibility	PC1-3	Multi-item scale (values: 1-5) - symmetric agree-disagree scale
6	Complexity	CX1-6	Rating scale (values: 1-7) (1=most important)
	Personalization	CXTR1	See above
7	Trialability	TRI 2-3	Multi-item scale (values: 1-5) - symmetric agree-disagree scale
8	Connectivity	CON1-3	Multi-item scale (values: 1-5) - symmetric agree-disagree scale

	Integration	CONINT 1-3	See above
	Flexibility	CONF	See above
	Personalization	CONPS 1-2	See above
9	Consistency	CSR1	Slider question (1-7)
10	Perceived risk	PRPR 1-2	Multi-item scale (values: 1-5) - symmetric agree-disagree scale
11	Adoption	AB1	Multi-item scale (values: 1-5) - symmetric agree-disagree scale
12	Open text	AB2	Value: open text response

As Willits Fern et al. (2016) highlight, especially in social science, the most common format of response categories are *strongly agree, agree, undecided, disagree and strongly disagree* using a 1 to 5 scale. Regardless of the frequency of this scale, it has been critically discussed among researchers. Joshi et al. (2015) argue that a seven-point scale offers more varieties to answer and therefore may perform better. Thus, it reveals more facets and allows a more sophisticated analysis, as the additional options enable the researcher to come closer to the original view of the respondent and thus reduce the role of ambiguity in the responses (Joshi et al., 2015). Despite the fact that a seven-point scale offers more alternatives to answer, a five-point scale has the advantage that it is easy to understand and it takes less time to complete (Dawes, 2008). Dawes (2008) analyzed the impact of scale categories on responses to questions. In his study, he compared five-, seven- and ten- point numerical scale formats and found that all three scales show no appreciable differences in terms of standard deviation, skewness or kurtosis. Therefore, the author of this study decided to apply a five-point Likert scale, so that the survey is most convenient to be filled out. Dawes (2008) also identified that none of the three formats is less desirable from the viewpoint of reliability.

Probably the best known and most frequently used reliability measure is Cronbach's alpha (Cronbach, 1951). Cronbach's alpha or α coefficient is a widely used reliability measure that assesses the internal consistency of questions in a survey, with values ranging between 0 and 1, and a value greater than 0.70 it is typically considered as acceptable. In the proposed study, the alpha coefficient for the Likert-scale questions obtained is 0.765, which indicates an acceptable ability of the items of the questionnaire to evaluate the same latent factor of the adoption of electronic prescriptions (Table 9). Due to the fact that the survey contains, apart from the Likert-scale questions, also rating and slider questions, the author also calculated Cronbach's alpha only for the Likert-scale questions. The result shows a higher α coefficient with 0.911. Hence, the results of both question types "rating and slider questions" have a negative impact on the overall reliability of the study. According to Gäde et al. (2020), Cronbach's alpha should not be below 0.6, while values above 0.7 are considered as acceptable. However, the Cronbach's alpha should also not be much greater than 0.9 if possible. Therefore, Cronbach's alpha of 0.765 is acceptable and no items needed to be revealed from further analysis.

Table 9: Reliability analysis study two

Construct	**Item**	**Cronbach' alpha (if item deleted)**
Relative Advantage	RARA1	0.743
	RARA2a	0.743
	RARA3	0.747
	RARA4	0.745
	RARA5	0.743
	RARA6	0.750
	RARA7	0.743

Compatibility	PCPC1	0.745
	PCPC2	0.747
	PCPC3	0.751
Complexity	CXCX1	0.786
	CXCX2	0.787
	CXCX3	0.787
	CXCX4	0.785
	CXCX5	0.785
	CXCX6	0.789
	CXTRI1	0.798
Trialability	TRITRI2	0.752
	TRITRI3	0.752
Connectivity	CONCON1	0.749
	CONCON2	0.748
	CONCON3	0.750
Integration	CONINT1	0.748
	CONINT2	0.751
	CONINT3	0.751
Consistency	CSR1	0.787
Flexibility	CONF1	0.751
Personalization	CXTRI1	0.775
	CONPS1	0.775
	CONPS2	0.751
Perceived risk	PRPR1	0.747
	PRPR2	0.759

Validity refers to the extent to which a measure adequately represents the underlying construct that it is supposed to be measured (Joshi et al., 2015). In other words, validity describes how well one can trust the results of a survey as it answers the desired question with a relatively high accuracy (Cook and Beckman, 2006). Furthermore, Joshi et al. (2015) pointed out that the overall validity of Likert-scale surveys highly depends on the applicability of the topic concerned. This means that it is very important that the respondents have a good and clear understanding of context of the research, so that they can answer the questions precisely and that there is no room for misinterpretation. In that vein, it can be said that the context or scope should be defined as narrow as possible. Regarding the given study, it can be concluded that in the beginning of the questionnaire the author explained the research scope as follows: "*Today's survey is about electric prescriptions. The electronic prescription is set to replace the current paper prescriptions. So, in the future it will be possible to send an electronic prescription to any pharmacy via your smartphone or computer. The desired medication can then either be picked up at the pharmacy or delivered to the patient's home."* The author tested the understanding of the introduction during the testing phase and obtained positive feedback, as all test persons had a concrete understanding of the overall scope of the survey.

Study two – data analysis

Based on the results of study one, 31 factors out of eleven dimensions were formulated and tested in study two. Before choosing an appropriate method of analysis it is important to categorize the generated data. According to Göb et al. (2007), despite the fact that Likert-scale-based surveys are commonly used to explore and measure a wide variety of phenomena's, such as attitudes, preferences or decisions, there exist no common standard for correct interpretation

and analysis of the data. A central element of the controversy discussion is the categorization of the data, that varies in different researchers' assessment from being ordinal data towards nominal or interval data (Louangrath, 2018). In 1946, S.S. Stevens defined different forms of measurement as follows:

- nominal scale: categories without numerical representation
- ordinal scales: ranking of items without information concerning the distance between them
- interval scales: measure of an item with ordering and distance indicators
- ratio scales: interval-type scales with an absolute zero value

Stevens (1946) explains that measurement is defined as the assignment of numerals according to specific rules and that these numerals can be assigned under different rules, which in the end leads to different scales. Hence, it is important that the rules of the assignment of numerals and the scale fits with the applied statistical operation. According to the definition of Stevens (1946), Likert-scale data can be defined as ordinal data as it reflects items without information concerning the distance between them. Researchers still disagree on whether parametric tests with ordinal data will yield valid results or not. In this ongoing discussion, Norman (2010) concluded that Likert data including unequal variances can be used with parametric statistics, such as Pearson's correlation and regression analysis. While some researchers question whether parametric tests with ordinal data yield valid results (Sullivan & Artino, 2013), others, like Norman (2010), have shown that Likert data with unequal variances can be used with parametric statistics. Hence, in this study the author chose to handle the data

also as interval data, which is a scale that includes ordering, distance indicators and equal intervals between points.

The author chose to use stepwise multiple regression analysis to examine the data, which is a common method of analysis for interval data. Therefore, stepwise multiple regression was applied as statistical analysis method in study two of the research project, aiming to identify significant correlation of independent variables and the dependent variable. In this case, the dependent variable is the adoption of electronic prescriptions and the independent variables are the different factors identified in study one. The method involves iteratively adding or removing variables to the regression model based on their statistical significance until the best model is achieved.

Ethical considerations

Throughout research one and two, the author ensured that adequate standards are rigorously met from both, a scientific, as well as from an ethical perspective. The following section will describe the principles that guided the research process and explain the deriving practical implications during the research execution. According to Cohen et al. (2000), ethical issues can occur at various stages of the research process such as in the nature of the project, the context of the research, the applied procedures, and methods of data collection or in the nature of the participants. In the given study, the nature of the research is determined by the overall research objectives that focuses on innovation adoption. Even though, the title of this research might suggest that the study deals with health-related information and therefore, with very sensitive and personal information, the study rather focuses on technology adoption in the field of digital health applications. However, as the participants could perceive the study as

being health related, the author explicitly highlighted in both studies that no personal information would be stored, as well as outlining the overall aim of this study, namely to illuminate the adoption of electronic prescriptions at community pharmacies in Germany.

As both studies involve human participants information, consent was obtained from all involved persons. In study one, the author obtained from all participants a signed form of consent. Furthermore, the author pointed out that at any time, especially after the interviews, the participants can contact the author and ask to delete any information. No participant contacted the author after the interviews. In the second quantitative study, the author explained the overall topic in a short paragraph and provided his personal contact details so that any participant who had a question or any concern after taking part in survey had the opportunity of contacting. Neither after this study, the author received any feedback.

Regarding the processing of the data, it can be said that all data was stored and processed anonymously. The obtained personal data from the qualitative interviews such as name and contact details were not stored in combination with the obtained research data. Furthermore, the data set was pseudonymized. Within the quantitative survey, no personal information such as name, contact details or IP address were stored. Hence, the data was received and processed anonymously. The author supported 26 participants in filling out the online survey on their behalf, because these participants were unable to fill out the online survey. Here, the author neither stored any personal information in relation to the gathered data. Moreover, in both interviews the author informed the participants, beforehand, about the estimated duration of the interview or survey. Therefore, it can be concluded that, during all parts of the study, GDPA rights as well as the university's' Ethics Policy were fully respected.

Ethical approval to proceed with the survey was granted by the Northumbria University after completing an application for ethical approval (submission ref. 43084). Furthermore, a

formal letter of approval was received from the Department of Ethics (e-mail 16.02.2022 19:58 CET).

Chapter 4: Data analysis and findings study one

Introduction

Chapter 4 provides a detailed analysis of the data collected in the first study. The aim of the study is to identify and understand the factors that are relevant for the adoption of electronic prescriptions at community pharmacies in Germany. Thus, the chapter presents the findings of study one, which include the identification of 31 factors that impact the adoption of electronic prescriptions. At the later stage these 31 factors will serve to develop the quantitative study two.

The chapter is organized into sections corresponding to the eleven constructs identified during the literature review. Each section begins with a description of the construct, followed by a detailed analysis of the factors within that construct. The factors are discussed in relation to their occurrence and significance based on the interview data. This structure reflects the thematic deductive analysis method employed during the data analysis process, which involved coding the interview data according to the predefined constructs and identifying common themes and patterns within each.

To provide a richer understanding of participants' perspectives, quotes from the interviews are included throughout the analysis. These quotes serve as illustrative examples, capturing participants' viewpoints and experiences related to these factors. The selection of quotes is based on their relevance and representativeness in demonstrating the codes identified throughout the analysis. According to this, the relevance of quotes is determined based on two factors, either the number of participants who raised a similar theme or the depth of nuance that allows a better understanding of the context.

Furthermore, the key findings tables presented after each construct provide a concise overview of the identified factors influencing the adoption of electronic prescriptions. Each key finding is represented by a unique code derived from the coding process. Hence, these Tables should serve as a reference point, allowing readers to quickly grasp the main findings and identify patterns across the data.

Relative advantage

In the dimension of perceived relative advantages, it is the author's impression that most participants found it easier to name numerous relevant benefits.

The most frequently mentioned advantage was the fact to save time. P2 (Participant 2, please see Table 6) described the advantage as follows "*in the past with a paper-based prescription I always needed to go first to my doctor. There I received the paper prescription. Then I took the paper prescription to my local pharmacy. The pharmacist told me often that the medication that it stated on the prescription was not available and that I should come back at a later. I hope with the electronic prescription that I no longer must make these trips and the prescription is fully automated sent from the doctor to the pharmacy. And the pharmacy will either deliver it directly to me or give me a notice when it is ready to be picked up. That would be great."* In addition, P1 (male, 22y) put it in a nutshell, saying *"we all save paper, I save time*."

Another factor that was mentioned by P2 (male, 40y) , P7 (female, 28y), P8 (neutral, 50y) and P10 (male, 42y) is the shorter delivery time while ordering online. P3 said *"I think it would be great if I could order something from my local pharmacy with the electronic*

prescription, because I assume that the availability is much better locally than at the large online pharmacies. That means I would get my medicine faster without the need to visit the pharmacy in person." In this context it was mentioned by four participants that they would appreciate using electronic prescriptions and order medicine online so that they do not stick to the regular opening times.

The possibility to do click-and-collect was also mentioned by eight participants. Based on their individual experiences, these participants explained that many times, they went to the pharmacy and the medication they wanted was not in stock. The pharmacy then informed them that they should come back later. Accordingly, quick, and reliable information about availability would be desirable, so that patients can simply pick up the medication when it is ready for collection.

P2 (male, 40y), P6 (male, 32y) and P7 (female, 28y) pointed out that they would like to receive additional offers based on the usage of electronic prescriptions. In this vein, P9 (male, 20y) mentioned that "*it would be a good idea if I would get personalized offers based on the information that is stated on the prescription."* As P2 (male, 40y) belongs to a relatively younger customer segment, he continued to explain that he is used to additional offers on various e-commerce channels that he uses for shopping.

Another relevant factor that was mentioned by the participants was *transparency.* One participant described this point in such a way that access to the electronic prescription is available at any time and from any location, as well as the ability to view the respective processing status. This would provide a feeling of security, eliminating the need to file paper-based prescriptions separately. A summary of the key findings is presented in Table 10.

Table 10: Key findings - Relative advantage construct

RA1	Compared to paper-based prescriptions, I save a lot of time using electronic prescriptions
RA2	Order online and Quick delivery from your community pharmacy / home delivery
RA3	I do not depend on opening times
RA4	Click-and-collect
RA5	Early and reliable information about stock information
RA6	Personalized offers
RA7	Transparency about my prescription processing status
RA8	Overview central storage

Compatibility

As perceived compatibility relates to the extent of how consumers or patients perceive the new process of handling electronic prescriptions is compatible to their previous experiences or traditions, the interviewee explained this new process before starting to discuss. This was especially important for those who have no or little experience in using electronic prescriptions. One participant responded, after listening carefully how the new process will look like and answered, *"I do not really care how the process looks like, but it is very important for me that it does not take longer than the paper-based-process".* This was somehow a stand-alone argumentation as all other participants had slightly different opinions. There was one group (i.e. P8, P5) who noted that the new process should be significantly easier and faster than the old one. They said if it would be as complicated as the paper-based-process they would not use it. One of the participants (P2 - male, 40y) described it as follows *"... that would have to be an absolute different process, which is much simpler. Because if I go there with my cell phone and I must show a prescription, but it's on my cell phone. That's the same as if I hand in a piece of paper"* Based on this quote, one can see very well that this group of participants is rather concerned that new process of handling electronic prescriptions is too close to the existing ones

and so does not make use of all the potential benefits. In their eyes, the higher both processes differ, the higher the degree of adoption.

Another group of participants (i.e. P5, P8) expressed concerns when they heard and understood the new process, as they saw some problems in the new process. This may be especially true for participants who have private insurance. This is a special case in Germany, as those participants with private insurance must submit their prescriptions directly to their respective health insurance company. Therefore, the prescription is not just a document that you hand in at the pharmacy. Rather, it is a document that you need for a follow-up process of reconciliation. One of the participants (P5 – male, 67y) described his challenge as follows: *Since I have a private insurance, and I must pay for the prescriptions myself, it is important for me to get a proper receipt. The receipt must be suitable for my health insurance company so that they accept this when submitting. This may look different than it does today. Today it is relatively trivial. Today it is a stamped paper-based-receipt. The refundable amounts are printed on the prescription and a stamp of the community pharmacy shows that I picked it up and paid it. So, there must be a confirmation that this prescription has been used and that was paid for it. And in a way that is accepted by the health insurance companies"* This participant immediately compared the old process to the new one and obviously could not imagine how to submit his digital prescription to his health insurance company. The present study's findings are consistent with the literature review, which suggests that participants tend to feel confused when they perceive a lack of compatibility between their familiar processes and new technology. Based on these findings, the author recommends that the construct of compatibility should be considered as an influential factor in the adoption of electronic prescriptions. Table 11 summarizes the key findings.

Table 11: Key findings - Compatibility construct

PC1	The electronic prescription application fits well with the way I like to do my medicine purchase
PC2	The electronic prescription application is much better than the paper-based prescription
PC3	Electronic prescriptions should allow similar features as the existing one

Complexity

The survey on the dimension complexity revealed many insights. These findings can be divided into four factor clusters, namely (a) general ease of use, (b) intuitive user interface, (c) interoperability on multiple devices and (d) no media changes.

Within the first category, *general ease of use*, it was important for most of the participants (i.e. , P3) that the new process of sending electronic prescriptions from the doctor to the community pharmacy via a digital tool needs to be managed with a high level of automatization. In this context, P3 (female, 36y) said that "*it should be possible to send the electronic prescription to the pharmacy with a maximum of two clicks."* P1 (male, 22y) described a process that he would perceive as too complex, saying "*, if I had to call the local pharmacy and I had to say a code and then they say bring that code with you when you pick up your medicine. That would not be simple for me. So purely easy for me would be if the pharmacy has an app or an access in the app where I can upload my electronic prescription in three clicks. Okay. That's a start"* He further pointed out *"simple and digital, that would be a big deal. For example, if I do not need to go to the doctor anymore to receive my blood pressure medication. That would be great. Instead, I can receive my electronic prescription in an application, send it to the community pharmacy and just go there to pick it up."* P2 (male, 40y) described the level of automatization in relation to complexity as follows *"First of all, ease of*

use is super important to me. And ease of use for me includes that the prescription can get sent automatically from my doctor to either the closest or a specific pharmacy. The doctor should save the desired process so that he can forward all prescriptions directly to that pharmacy electronically." The above-mentioned examples clearly show that general ease of use of the electronic prescription is very important for many participants. The ease of use is reflected in both elements a high-level of digitalization as well as a high degree of process automatization. The answers show, especially around automatization, that various participants have very different ideas and views on the nature and degree of automation. One participant sees completely automated transmission of electronic prescriptions from the doctor to the local pharmacy, another participant sees only specifics parts of the transmission process. In conclusion, it can be argued that both, a *high degree of automatization in the transmission of electronic prescriptions* (CX1) as well as a *high degree of digitalization* (CX2), which is mainly reflected by the integration of digital instruments such as mobile phones (P2 - male, 40y) or online portal (P4 - female, 85y), can be identified as two essential factors.

A second relevant category, that was identified with the focus on complexity, was a *simple and intuitive user interface*. One participant (P1 - male, 22y) stated that a "*simple and clear designed user interface"* is a critical success factor that "*enables different user groups to easily use the electronic prescription*." Another participant concretized this by going into detail about criteria that make user interface simple to use. On the one hand, she said that there should be easy access to the app. As an example, she mentioned that there should be a mobile application available for on all common smartphones. On the other hand, the mobile application should not offer too many functions so that even those who rarely use the application can find their way around. For this reason, both the *intuitive and simple user interface* (CX3) as well as *the availability of mobile application* (CX4) can also defined as relevant factors. Furthermore,

based on the findings, the author also recommends taking “application focus on easy sending of electronic prescriptions” as CX5 into consideration.

With the focus on (c), *interoperability on multiple devices*, P1 (male, 22y), P2 (male, 40y) and P3 (female, 36y) said that it is very important to them that there is a mobile application as well as a desktop application. It should be possible to start the process online but also to continue it on the desktop computer. In this respect, interoperability on different devices can be identified as a relevant success factor. Here, participants also indicated that if there would not be a consistent design including consistent processes in different tools, they would see increased complexity and so use less electronic prescriptions. In this respect, it is important that the *design as well as the functionality is uniform on different end devices and tools* (CX5).

In addition to this, participants also said that *media changes* (d) would also be perceived as too complex. One participant explained that factor as follows “*the electronic prescription must be sent automatically on my cell phone. I can then send it to the pharmacy with a click or simply show it there via my cell phone”* Another one pointed out *“It is very important for me that I do not have to create or print out or PDF. Instead, I would like to see that everything can be done via a central application on my phone. Even if I must show something at the local pharmacy, I would like to see that this is also possible via the app, so no media changes needed.”* Therefore, it can be stated that the *organization and execution of all relevant processes around the electronic prescription from one central application,* CX6 represent an essential success factor. Table 12 summarizes the key findings.

Table 12: Key findings - Complexity construct

CX1	high degree of automatization in the transmission of electronic prescriptions
CX2	high degree of digitalization (mainly reflected by the integration of digital instruments such as mobile phones or online portal)
CX3	intuitive and simple user interface

CX4	availability of mobile application
CX5	design as well as the functionality is uniform on different end devices and tools
CX6	organization and execution of all relevant processes around the electronic prescription from one central application

Trialability

In relation to trialability, several relevant factors were highlighted by the participants. These factors coincide with the factors presented in the literature review, where the author stated that with financial intensification, the adoption of an innovation can also increase. One participant explained that as follows *"As already mentioned, we were curios. Once, we saw a promotion at on online pharmacy, where we got 10% off anything. During that, we just ordered some medical products and tried that out"* (P2 - male, 40y). Hence, discounts that are linked to the usage of electronic prescriptions can be identified as one potential factor that positively correlates with the adoption.

Another participant P3 (female, 36y) pointed out that she would only try it if she had confidence and trust in the mobile application or online shop that is provided by the local pharmacy. She pointed out that in her opinion, health data is very sensitive, and she would only use a certain digital channel where she can see the provider and origin. According to her explanation, trust can be seen as a prerequisite for trying out electronic prescriptions. Hence, trust can be identified as one potential factor.

A larger group of participants P1 (male, 22y), P2 (male, 40y), P5 (male, 67) and P8 (neutral, 50y) indicated, in relation to experimenting with the electronic prescription, that they would only do so if they would receive an explanation at the local community pharmacy up front. One participant explained his view as follows *"if an employee at my pharmacy would*

give me an QR code card, explain the overall process and be open for questions. I believe I would try it in the same way." P5 supported that in saying *"I trust my pharmacist, so if she would explain that to me it would be great."* P8 (neutral, 50y) did support that factor for himself instead, he explained that he believes that his father would only try electronic prescriptions if his pharmacist explained this to him in advance. Hence, supplementary local advice and explanation through the pharmacist can be identified as a relevant factor that positively influences trialability. Table 13 summarizes the key findings.

Table 13: Key findings - Trialability construct

TRI1	Discounts and promotions.
TRI2	Trust in provide or mobile application and web shop.
TRI3	supplementary local advice and explanation through the pharmacist.

Observability

Regarding observability it was very difficult to identify relevant factors throughout the interviews. This was primarily because many participants expressed benefits and advantages of using electronic prescriptions. Almost all participants who explained a certain benefit, such as time savings or greater transparency as to weather a drug is available or not, said that if they would see such a benefit at others using electronic prescriptions, they would also adopt it.

Therefore, it can be assumed that the benefits are observable and that they correlate positively with the use of the electronic prescription.

Connectivity

Within the dimension of *connectivity,* the author explored two main areas. First, it was questioned, if the overall coherence and level of information via digital communication channels has an impact on the usage of electronic prescriptions. Followed by the second assumption looking at the question if customers expect that sales channels are connected. This means – for example – that customer can stop at any time in one channel and change to another one. Imagine a customer can obtain online various information regarding a certain medicine. Now he or she would like to obtain more information and thus calls the community pharmacy. The employees at a community pharmacy can see the same medicine online including all information and are therefore able to provide further information via the phone. After the call, the customer goes back to the online sales channel of the community pharmacy and places the final order. This requires that all product related information is stored centrally, so that information content and depth can be managed and communicated synchronically. Furthermore, in case a community pharmacy would have a mobile application as well as a webpage and would like to offer connected sales channels it would require various central system such as a customer database including similar login files on different applications. *Connectivity among different communication channel* was rated as very important from most interview partners. In most cases the interviewees mentioned that they understand connectivity mainly with the focus of being able to transmit the electronic prescription from the doctor via a mobile application towards the desired community pharmacy. A quote from on respondents perfectly sums it up "*it would be a dream if my prescription can be sent in advance with my computer to the community pharmacy. And if I enter the community pharmacy it is already ready for me in the entrance. You can simply still take it with you, that's cool."*

One person mentioned another facet of *connectivity* saying: *"sometimes you have a situation where you don't know exactly if you must go to the doctor or not, but you could just call the pharmacy and ask for help. This should also be possible in a digital format."* Hence, *connectivity* could also be interpretated according to the level of *general advice that is available on different channels*. This potential factor was also addressed by one interview partner that expressed his desire to see real-time inventory to know in advance if he can pick up his medication. He said this would have *"a positive effect on my use of electronic prescription."*

Also, the form of channels was addressed. 20% of the respondents said that they like to use WhatsApp and therefore would like to use different connected communication channels to both transmit electronic prescriptions as well as clarify questions regarding the prescription. Hereafter, *convenient communication channels can increase the adoption of electronic prescriptions* can also be identified as a relevant factor. Table 14 shows three identified factors that positively correlated with the adoption of electronic prescriptions.

Table 14: Key findings - construct connectivity

CON1	Connectivity among different communication channel is very important for me so that I can sent my prescription
CON2	I like to see general advice that is available on different communication channels
CON3	Convenient communication channels can increase my adoption of electronic prescriptions

Integration

According to Shen et al. (2018, p.329), channel integration is defined as *"the extent to which customer perceives all information systems and management operations are unified and integrated well across channels."* Based on this, the author showed in the literature review two central streams of argumentation: (a) integration has a positive impact on the adoption of

electronic prescriptions because the perceived integration leads to higher level of trust, and (b) integration has basically no or a very limited influence on the adoption of electronic prescriptions.

In this manner, six out of ten (60%) interviewees mentioned that the level of integration might have a positive influence of their usage of electronic prescriptions. Integration was described by the interviewees as either the description of products is integrated among different channels or promotion activities, such as discounts, are available in different channels. Therefore, both elements can be used as relevant factors for the research model in study two: *The description of medicine should be integrated across different channels so that I can order medicine online* (INT1) and *I want to see the same promotion activities online as offline* (INT2). None of the interview partner mentioned in that discussion the word "trust." Hence, based on these findings the author cannot argue that level of integration positively influences the overall level of trust.

Another interesting factor that was raised within the conversations around the dimension of integration was the *integration of payment alternatives.* One interviewee described that factor as follows: *imagine ordering something online, picking it up at the pharmacy, and at the pharmacy with PayPal.* Consequently, *I would like to be able to pay regardless of the sales channel* (INT3) can also be indicated as a potentially relevant factor. Table 15 shows three identified factors that positively correlated with the adoption of electronic prescriptions.

Table 15: Key findings - Integration construct

INT1	The description of medicine should be integrated across different channels so that I can order medicine online
INT2	I want to see the same promotion activities online as offline
INT3	I would like to be able to pay regardless of the sales channel

Consistency

In terms of consistency, the author focused on process and channel consistency as explained in Chapter 2. Throughout the interviews, another factor was discussed, which is the consistency of the quality and scope of advice of the pharmacists. There are basically two lines of argumentation.

One part of the respondents saw no advantage at all in additional or similar advice that is provided via a digital channel. The other side of the interview partner expected almost the same level of advice that they are used to get when they physically visit the community pharmacy.

For example, one participant (P7 - female, 28y) said: *"I don't really care if I get the same advice via a digital channel. I know that already from DocMorris. When you receive your medication, there is a special note stuck on the box showing what you should pay attention to. That is enough for me".*

On the contrary, one of the participants (P3) placed the following counter thesis: "*in fact, I do not care at all. In all cases, I always get an advice and information from the doctor who is treating me. And he also tells me the dosage. He tells me possible side effects and how I must take it."* This was supported by one respondent (P8 – neutral, 50y) who said: "*if there is additional information available, it would have to be short. And be limited to the essentials and be understandable."* From these two statements you can see that there are ambivalent opinions about it. Therefore, the author proposes to examine this more deeply in study two. Hence, the author proposes to include two factors, as follows. *The depth and breadth of information (information on the use of medications) that I receive from my local pharmacy via a digital channel has no impact on the use of the electronic prescription* (CS1) as well as *the depth and breadth of information (information on the use of medications) that I receive from my local*

pharmacy via a digital channel has a significant impact on the use of the electronic prescription (CS2*).*

Another interesting aspect that was raised by an interview partner during the discussion around consistency was that desire for bilateral dialog with the pharmacist. He further explained that saying: *Since I do not always take the medicine which is exactly on the prescription but rather would like to buy generics, I need to talk to the pharmacists to get advice for alternative medicines with the same effect."* In his view, the consultation process should be consistent across all channels and offer the opportunity to address specific questions. Therefore, *the possibility to address questions and convers regarding the medication is important for me to use electronic prescriptions* (CS3) can be identified as a potential factor that positively influences the adoption of electronic prescriptions. This also supports the earlier described findings from Shen et al. (2018). The authors argued that the process attributes in the respective channels must be similar to increase channel adoption.

In this context, about half of all respondents said that even if there were digital sales channels for the use of electronic prescriptions, they would still regularly come to the pharmacy for advice on health issues. When asked whether this would have either a positive or negative effect on the use of the electronic prescription, almost everyone said that it would have no effect in either on of both directions. Accordingly, it will not be taken as an additional factor. Table 16 summarizes the key findings.

Table 16: Key findings - Consistency construct

CS1	The depth and breadth of information (information on the use of medications) that I receive from my local pharmacy via a digital channel has no impact on the use of the electronic prescription
CS2	The depth and breadth of information (information on the use of medications) that I receive from my local pharmacy via a digital channel has a significant impact on the use of the electronic prescription

CS3	The possibility to address questions and convers regarding the medication is important for me to use electronic prescriptions

Flexibility

During the survey, it turned out that the interviewees had very different definitions of what flexibility means in the context of the adoption of electronic prescriptions at local pharmacies. This was reflected in the fact that seven out of ten interviewees, reacted to the question, *"Do you expect flexible omnichannel services offered by your community pharmacy? And if yes, what kind of services would motivate you to use electronic prescriptions"* with a counter question saying, *"what exactly do you mean with flexible omnichannel service."* The interviewer then listed various forms of omnichannel services, such as click-and-collect, reserve-and-click, or buy online and return in-store. Additionally, there were a few queries as to what exactly this meant, especially, from the age group 60+. Once, a common understanding of the different forms was established between the interviewer and the respondents, almost all interviewees showed a high level of interest in the previously mentioned services. Six out of ten respondents stated that many times they went to the community pharmacy and the prescription drug was not in stock or available at the pharmacy. Therefore, theses respondents highlighted that it would be useful to adopt click-and-collect. Since also the payment could already be made online beforehand, those interviewees saw huge potential to spend some valuable time. One of the interviewees also mentioned in this context that he would very much appreciate if he could buy the medication online and while he is picking it up at the community pharmacy, he does not even have to go to the counter but instead it could be picked up directly at the entrance area already packed in a bag.

None of the respondents mentioned the fact that marketing content should be seamless linked online and offline. However, two of the interviewees pointed out that if there were certain vouchers available online or offline, they would also like to redeem them both online and offline. They stated that if this were separated, it would lead to the fact that they would not use the online channel with the electronic prescription. In addition, one respondent expressed the desire to have more flexibility in terms of communication channels. She had explained how she already likes to communicate with various service providers or retail companies via WhatsApp, and that in her opinion it works excellently. She said that she would like to be able to query inventories or clarify queries about medications via WhatsApp. The discussion with almost all respondents showed that each of them has an individual understanding and need for flexibility of services at community pharmacies. In this context, the conversations also showed that a strong integration of online offline services would lead to more frequent use of the electronic prescription. Almost all respondents confirmed this. Table 17 highlights the key findings.

Table 17: Key findings - Flexibility construct

F1	Flexible and integrated online and offline services enhance customer experience and so lead to an increasing adoption of electronic prescriptions.
F2	Voucher and marketing campaigns should be offered holistically in online and offline channels, so that the customer is not disadvantaged when using the electronic prescription.

Personalization

The dimension of personalization was determined through ambivalent statements throughout the interviews. Generally, this supports the findings stated in the literature review of this study. There was one part of the participants who said that a higher degree of personalization would be seen as a benefit and therefore lead to an increasing usage of

electronic prescriptions and another part who expressed rejection towards receiving personalized communication or offers based on the usage of electronic prescriptions. During the study, a participant (P1) expressed his desire to avoid personalized marketing communications. P1 (male, 22y) explained that he actively tries to limit the flow of marketing e-mails and newsletters containing personalized advertising as he already receives enough of these messages, including special offers. In a similar vein, P2 (male, 40y) added to this *"I am still very sceptical and reserved at the moment, as I do not want to get marketing based on my medicine. Therefore, I would not use that.".* Hence, *receiving personalized marketing offers and commercials* (PS1) can be identified as a potential factor that negatively influences the adoption of electronic prescriptions.

On the other end, one participant said *"I think to receive personalized information is a nice side effect. I know exactly which medications may complement and support each other with my prescribed medication. And it may also be pointed out directly to me - great. Or medications that have negative interactions with my prescribed medication wouldn't be offered automatically. Here, I do see advantages and so I would be rather pleased. A nice side effect."* This argumentation was also supported by P3 (female, 36y) who mentioned *"Maybe I have a disease where I am unsure about the medication which I should take. Then I would appreciate to get some personalized information based on the information of my electronic prescription. That would be very helpful."*

These quotes show that a group of participants (i.e. P3, P6) sees a significant benefit in receiving additional advice based on the information that can be derived from the electronic prescription data. An interesting facet in this context was the idea to automatically adopt the online offered products, so that the customer can only see and buy products that have no negative change effects with the prescribed drug. Complementary can be remarked that the

same group of participants did not explicitly see a benefit in receiving personalized offers but instead they rather see a benefit in the improved quality of advice and additional information. Their main motivation is to make sure that they prevent negative change effects, buy complementary medical products and so *"feel better and more secure"* (P7 - female, 28y). In conclusion it can be said that *personalized information that help customer to be aware of positive and negative change affects increases the value and so the adoption of electronic prescriptions* (P2, male, 40y). Table 18 summarizes the key findings.

Table 18: Key findings - Personalization construct

PS1	The receipt of personalized marketing offers and commercials (PS1) may be a potential factor that impacts the adoption of electronic prescriptions.
PS2	Providing personalized information to customers about the positive and negative effects of combining additional products with their prescribed medications can increase the value and adoption of electronic prescriptions.

Perceived risk

Interestingly, many participants (for example P2, P3, P6) did not see any risks in using the electronic prescription. One of the reasons given for this was that they assume a high security standard, especially since parts of the IT infrastructure are provided by state-owned companies. Another participant (P3 - female, 36y) explained that already today she gives the paper prescription to the pharmacist and that the pharmacist can also see everything. In his opinion, what happens afterwards with the paper prescription in the local pharmacy can also not be controlled. Another participant (P7 - female, 28y) stated that she already has a lot of very sensitive data stored in various applications and that he has become accustomed to it by now and therefore does not see any risk in using electronic prescriptions.

On the other hand, there were also participants who saw specific risks in using electronic prescriptions. In this context (P10 - male, 42y) said *"I do not feel well using digital ways to get my prescription drug. I see a certain risk that somehow my personal data gets to people, groups of people or institutions without my permission."* P5 (male, 67y) expressed his desired process as follows *"The data security is very important for me. I expected that the minimum needed information is only transmitted between me and the recipient with the greatest possible protection."* Another participant noted in this context that he would only transmit the data from his own WLAN at home because he perceives the risk, especially during transmission, that people can intercept or view the data who are not intended to do so. Moreover, P2 (male, 40y) said that she would appreciate *"end-to-end encryption."* Concluding from these examples, one can also see very well that especially the data transmission represented a greater risk for some participants. Table 19 shows the key findings.

Table 19: Key findings - Perceived risk construct

PR2	I do not see any risk in sharing my data (based on the information on the electronic prescription) electronically
PR2	The transmission of my prescription data needs to be done with high security standards

As this chapter draws to a close, the author will provide a summary of the notable findings from the above stated analysis. The **relative advantage** dimension showed numerous benefits that participants associated with electronic prescriptions such as time efficiency, reduced delivery time, convenience of click-and-collect service, access to personalized offers, and heightened transparency of the prescription process. In the **compatibility** dimension, an exploration of the similarities and differences between electronic and traditional prescriptions revealed diverse perspectives. Some participants expressed in this context strong concerns,

particularly regarding insurance handling with digital prescriptions. Regarding **Complexity** four main themes were identified (a) ease of use, (b) intuitive interface, (c) interoperability, and (d) the avoidance of media changes. The dimension of **Trialability** highlighted factors aligning with the literature review, including the financial aspect of innovation adoption. Key findings included the positive impact of discounts on the adoption of electronic prescriptions (TRI1), trust in the provider or mobile app (TRI2), and the crucial role of the pharmacist in explaining and advising about the electronic prescription (TRI3). **Observability** was a challenging dimension due to the strong participants' focus on the benefits and advantages of electronic prescriptions. Even though it was concluded that observable benefits tend to enhance the adoption rate the author decided to exclude this dimension for study two. Because nearly all participants could not clearly distinguish it from the dimension Relative Advantage. **Connectivity** emerged as a vital aspect with 70% of the interviewees emphasizing its importance. Coherence and information levels through digital channels, and connected sales channels were discussed, which resulted in key findings such as connectivity among different communication channels (CON1), availability of general advice across different channels (CON2), and the convenience of communication channels (CON3) enhancing the adoption of electronic prescriptions. **Integration** of information systems and operations across channels, was also identified as a relevant construct. Key findings included the integration of medicine descriptions (INT1), consistency of promotional activities (INT2), and the ability to pay across sales channels (INT3). The interviews focus on **Consistency** addressed mainly process and channel consistency, as well as consistent quality and scope of advice from pharmacists. Here, the need for bilateral dialog with the pharmacist was identified as a key consistency aspect. **Flexibility**, in the context of electronic prescriptions adoption, revealed diverse expectations among participants, with the integration of online and offline services, and the opportunity to

seamless redeem of vouchers. **Personalization**, the subsequent dimension, also elicited mixed responses. Some respondents found personalized health advice beneficial, while others voiced concerns, especially about receiving personalized marketing. Finally, the **Perceived Risk** dimension unveiled interesting opinions about electronic prescriptions' use. A key finding was the vital need for high security standards like end-to-end encryption in the transmission of prescription data (PR2), to mitigate concerns and foster trust.

Chapter 5: Data analysis and findings study two

Introduction

The purpose of this chapter is to present the results of the second study. As in the previous chapter, the author will highlight the main research findings structured according to the defined constructs and factors. First, the author will provide valuable insights into the sample and how it is structured. Second, in line with aim one of this study, the author will explain the role of each factor in relation to the adoption of electronic prescriptions at community pharmacies in Germany.

Study population

The survey was sent to more than 3,000 persons. A total number of 500 respondents completed the survey. Of the 500 respondents 238 were men (47.60 %) and 259 (51.80%) were women. Three respondents answered “diverse” (0.60%). In terms of age groups, it can be concluded that the sample contains a good spread of all relevant age groups, reflecting the German population. For example, the biggest group in the sample were between 50-59 years old (20.6%). This similar age group is reflected in the total population of Germany with approximately 17% and represents the largest age group (Statistisches Bundesamt, 2023). A detailed overview about the characteristics of the participants is highlighted in Table 20 below.

Table 20: Baseline characteristics of the respondents.

Gender/ Age	**N**	**%**
Gender		
Male	239	47.6%
Female	259	51.8%
Diverse	2	0.6%
Age		
18-29	93	18.6%
30-39	83	16.6%
40-49	81	16.2%
50-59	104	20.6%
60-69	84	16.8%
70-79	56	11.2%

Furthermore, regarding the geographical distribution, the author took care to ensure that all regions in Germany are distributed in a representative manner. This distribution is planned and designed towards ensuring that the respective federal states are similarly distributed in the sample according to their respective population (Statistisches Bundesamt, 2023). This distribution is particularly important since the aims and objectives of this study relates to adoption of electronic prescriptions in Germany. Table 21 highlights the geographical distribution of respondents.

Table 21: Geographical distribution of respondents

Federal States	N	%
Baden-Württemberg	64	12.8%
Bayern	77	15.4%

Berlin	21	4.2%
Brandenburg	13	2.6%
Bremen	6	1.2%
Hamburg	11	2.2%
Hessen	35	7.0%
Mecklenburg-Vorpommern	10	2.0%
Niedersachsen	50	10.0%
Nordrhein-Westfalen	110	22.0%
Rheinland-Pfalz	28	5.6%
Saarland	6	1.2%
Sachsen	24	4.8%
Sachsen-Anhalt	15	3.0%
Schleswig-Holstein	17	3.4%
Thüringen	13	2.6%

In total, eleven relevant constructs were identified throughout the literature review and further explored in study one. Nevertheless, as explained earlier, one dimension, "observability," was excluded in the further research. Within these ten dimensions, 32 factors were found in the qualitative interviews that either indicated a positive or a negative predictive value for the adoption of electronic prescriptions. Stepwise Multiple linear regression analysis was used to test the relevance of construct and items. Table 22 provides an overview about the different dimensions and factors, that were translated into the quantitative survey.

Table 22: Constructs and measurements items

Construct	**Item**	**Description**
Relative Advantage	RARA1	I can save time using electronic prescriptions
	RARA2a	I can order online and have the medication delivered to my home
	RARA3	I am no longer bound to the opening hours
	RARA4	I can order online and pick up the medication at the pharmacy
	RARA5	I can check online whether the medication is available
	RARA6	I can receive personalized offers

	RARA7	I can simply check the delivery status online
Compatibility	PCPC1	The new process corresponds exactly to my ideas of recipe use
	PCPC2	There are significant advantages compared to the classic paper prescription process
	PCPC3	It is very similar to my usual process of purchasing prescription drugs
Complexity	CXCX1	A high degree of automation
	CXCX2	A high degree of digitization
	CXCX3	Simple and intuitive usage
	CXCX4	Availability on mobile devices
	CXCX5	Uniform usage, online and mobile
	CXCX6	All necessary information should be centrally available in one application
	CXTRI1	I would like to receive special discounts and offers when I use it
Trialability	TRITRI2	The provider is trustworthy
	TRITRI3	I would receive a comprehensive explanation from my local pharmacy beforehand
Connectivity	CONCON1	All possible communication channels (webshop, mobile app) are connected with each other
	CONCON2	General advice can also be obtained via a digital channel (chat, video call)
	CONCON3	Communication (questions/consultation) is integrated into all digital channels
Integration	CONINT1	I can view all relevant information online (interactions, etc.)
	CONINT2	Marketing and sales offers can be used both, offline and online
	CONINT3	Payments can be made offline (pick-up) as well as online before pick-up
Consistency	CSR1	I want to receive all relevant information regarding the medication
Flexibility	CONF1	As many processes as possible are integrated between online and offline
Personalization	CXTRI1	Personalized discounts during the usage of electronic prescriptions
	CONPS1	I do not want to receive personalized discounts
	CONPS2	I am informed about possible interactions of the medication
Perceived risk	PRPR1	The digital transmission of e-prescription data is not a problem for me

	PRPR2	The digital transmission of e-prescription data should meet the highest safety standards

Relative advantage

Within the Relative advantage construct study one revealed eight relevant factors that can influence the adoption of electronic prescriptions. Table 23 highlights these factors.

Table 23: Key findings study one - relative advantage

RA1	Compared to paper-based prescriptions, I save a lot of time using electronic prescriptions
RA2	Order online and quick delivery from your community pharmacy / home delivery
RA3	I do not depend on opening times
RA4	Click-and-collect
RA5	Early and reliable information about stock information
RA6	Personalized offers
RA7	Transparency about my prescription processing status
RA8	Overview central storage

According to study one, potential time savings (RA1) is an important factor that can impact an individual's adoption of electronic prescriptions. If customers feel that electronic prescriptions save them a relevant amount of time compared to traditional paper-based prescription, they may be more likely to use the technology and find it overall more efficient. On the other hand, if users feel that electronic prescriptions do not save them much time compared to paper-based prescriptions, they may be less likely to use the technology and may prefer traditional methods. RA1 was converted into RARA1 for study two.

RA2 stands for the possibility of online ordering and home delivery. Study one has demonstrated that this omnichannel service plays a relevant role and so can influence an individual's decision to adopt electronic prescriptions. Thus, it can be hypothesized that if

customers perceive that they can conveniently order their medication online and receive them promptly, they are more willing to use electronic prescriptions at their respective community pharmacy. For study two, RA2 was renamed as RARA2a.

Furthermore, the overall dependency on the opening times was identified in study one as a pain point of customers that goes in line with usage of paper-based prescription (RA3). On the contrary, electronic prescriptions provide a flexible alternative that addresses exactly this issue. As customers can submit prescription requests online at any time, they are not restricted by the pharmacy's opening times. Therefore, customers may be more likely to adopt electronic prescriptions as it provides greater convenience and flexibility than traditional paper prescription. For example, working parents with a busy work schedule may find it challenging to visit the pharmacy during business hours and therefore appreciate that service. In study two, this item was renamed to RARA3.

RA4 describes a service known as "click and collect," which enables individuals to place their prescription orders online and subsequently, retrieve them in person at their local pharmacy. Study one indicated that customers perceive this order possibility as highly convenient and efficient. Hence, it also may represent a critical factor for adoption (RA4 refers in study to RARA4).

Moreover, according to study one, the availability of accurate and prompt stock information is also an essential factor that also can influence the adoption of electronic prescriptions (RA5). By leveraging a centralized online tool, community pharmacies could ensure that stock information is always updated and available to customers, allowing them to make better informed decisions regarding the purchase of their prescriptions (RARA5).

Furthermore, in the context of electronic prescriptions, personalized offers (RA6) can be an element of the marketing strategy that community pharmacies use to further engage

customers and so to increase the adoption of electronic prescriptions. These offers can include a range of promotions, such as discounts, free delivery, loyalty programs and value-added services that are tailored to the individual needs and preferences of each customer. For example, a community pharmacy can send personalized offers to customers who frequently order prescription medications online, inviting them to participate in a loyalty program that rewards them with a discount on their next purchase. This offer not only incentivizes customers to continue using the pharmacy's online prescription services but also provides them with a financial benefit that increases their overall satisfaction and loyalty towards the pharmacy. RA6 converted into RARA6 in study two.

RA7 refers to the transparency of prescription processing status of an order that included electronic prescriptions and is named in study two RARA7. If a community pharmacy provides customers with real-time updates on the processing status of their prescription, such as when the order is received, being prepared, or out for delivery, it can reduce customer uncertainty and anxiety regarding the prescription's progress. This transparency can enhance customer satisfaction and increase their trust in the pharmacy.

Since RA8 (overview about central storage) was very similar to RA5 (early and reliable information about stock information) the author decided to combine both items into one. Hence, study two addressed only seven items that are presented in Table 24. The evaluation of these seven items was based on a Likert scale from 1 to 5, while 1 was defined as *strongly disagree* and 5 as *strongly agree*. The question presented to participants was as follows: *How much do you agree with the following statements? I would use electronic prescriptions at my local pharmacy because (...)*.

Table 24: Construct and measurements items – relative advantage

Construct	Item	Description
Relative Advantage	RARA1	I can save time using electronic prescriptions
	RARA2a	I can order online and have the medication delivered to my home
	RARA3	I am no longer bound to the opening hours
	RARA4	I can order online and pick up the medication at the pharmacy
	RARA5	I can check online whether the medication is available
	RARA6	I can receive personalized offers
	RARA7	I can simply check the delivery status online

Reviewing the data in Table 25 below, it is evident that the majority of factors related to the relative advantage of electronic prescriptions demonstrate strong median scores, suggesting that respondents perceive substantial benefits in the adoption of this innovation. Apart from the RARA6 factor, all others present scores that exceed 3.5, highlighting a general agreement among respondents concerning the convenience and potential advantages of using electronic prescriptions. According to the detailed data, the factor with the highest median score of 3.85 is RARA5, which pertains to the ability of customers to check the availability of their prescribed medication online. This is followed closely by RARA2a, with a median score of 3.78, which highlights the convenience of ordering medication online and having it delivered to the customer's home. RARA4, with a median score of 3.74, represents the option of ordering medication online and picking it up in person at the pharmacy.

Table 25: Items, median and standard deviation - relative advantage

Item	N	Minimum	Maximum	Median	Standard Deviation
RARA1	500	1.000	5.000	3.68	1.101

RARA2a	500	1.000	5.000	3.78	1.092
RARA3	500	1.000	5.000	3.69	1.099
RARA4	500	1.000	5.000	3.74	1.051
RARA5	500	1.000	5.000	3.85	1.028
RARA6	500	1.000	5.000	3.06	1.223
RARA7	500	1.000	5.000	3.68	1.039

Also, the results in Table 26 indicate that RARA5 received a high ranking, with 72.8% of participants reporting that they *strongly agree* or *agree* with the statement. This suggests that many participants would prefer to know whether their required medication is available before physically visiting the community pharmacy. This finding could imply that there may have been instances in the past where the desired medication was not available, leading to a certain level customer frustration. However, further research would be necessary to confirm this hypothesis. By providing customers with the ability to check online for medication availability, community pharmacies could therefore improve customer satisfaction which might result in an increase of adoption of electronic prescriptions.

Table 26:Item overview in percentages- relative advantage

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
RARA1	5.2%	9.6%	21.8%	39.0%	24.4%
RARA2a	5.6%	6.8%	18.6%	41.6%	27.4%
RARA3	5.4%	9.0%	20.8%	40.4%	24.4%
RARA4	4.6%	8.0%	19.6%	44.0%	23.8%
RARA5	3.6%	8.2%	15.4%	45.6%	27.2%
RARA6	14.2%	16.8%	29.6%	27.2%	12.2%
RARA7	4.6%	8.0%	23.2%	43.0%	21.2%

Table 27 presents a comparison of two distinct groups, namely A-low and A-high, based on their degree of adoption of electronic prescriptions (dependent variable in the survey two, labeled AB1). This Table will be used in the following sections of the descriptive analysis for

each construct. The A-low represents participants who reported low levels of adoption of electronic prescriptions, as indicated by a score of 1 or 2 on the AB1 scale. By contrast, the A-high group represents participants who reported high levels of adoption, with a score of 4 or 5 on the AB1 scale. The comparison between the two groups aims to identify any significant differences of their perceptions. In the case of RARA5, Table 27 shows that A-high group rated this item as the most important factor (51.2 % + 37.1 = 88.3%). In comparison to this, only 45,5% of the participants with low indication for adoption (A-Low) rated RARA5 with *'strongly agree'* or *'agree.'*

RARA2a was ranked by 69.0% of the participants as the second most important factor in this dimension, combining the response categories *agree* and *strongly agree* (Table 26). Therefore, the opportunity to simply order online, including home delivery, is clearly linked to the adoption of electronic prescriptions. RARA2a was also ranked as the second most important factor by the A-high group. 82.3% of this group reported that they would use electronic prescriptions at their local pharmacy if online ordering with home delivery would be available. This demonstrates a high level of agreement among adopters. In conclusion, this finding also suggests that offering an online ordering system with home delivery can be a significant motivator for customers to adopt electronic prescriptions. By contrast, RARA2a was ranked as strongly agree or agree by only 44.6% of the A-low group, with 29.8% of this group expressing strongly disagree or disagree. This shows that the importance of this feature is rated relatively low among non- or low adopters of electronic prescriptions.

With a minimal difference to RARA2a, the definition of RARA4 includes the notion that customers can order online using electronic prescriptions and pick up the medication at the local pharmacy instead of having the medicine delivered to home. Among all participants, 67.8% answered that they strongly agree or agree to use electronic prescriptions if their local

pharmacy would offer that service. Moreover, the high rating for RARA4 among the A-high group suggests that customers who are willing to adopt electronic prescriptions value the convenience and flexibility of online ordering and pick-up at their local pharmacy.

With an average relevance score of 3.06 (Table 25), the lower rating of RARA6 stands out in contrast to the high scores of other aspects of relative advantage. RARA6 represents personalized offers associated with the use of electronic prescriptions. However, only a minority of participants, specifically 39.4%, expressed strong agreement or agreement with the importance of this feature. This finding was mirrored in the qualitative phase of the study (study one), where only four out of ten interview participants expressed a desire for personalized offers in the context of electronic prescription use.

This contrast in rating suggests a nuanced interpretation. Personalized offers, while being appreciated by a certain segment of the customer base, do not appear to constitute a crucial factor in the broader adoption of electronic prescriptions for the majority of participants. While the prospect of personalized offers might enhance the appeal of electronic prescriptions for some customers, it does not universally contribute to the perception of relative advantage for the technology. This divergence in the ratings could potentially be attributed to varying attitudes towards personalization or concerns over data privacy and misuse.

It is also possible that this finding might reflect the nature of the medication purchase process. The personalization of offers is more prevalent and valuable in the retail sector where customers have a vast array of choices. However, in the context of prescription drugs, the choices are often determined by physicians, and personalization may not carry the same weight. Therefore, the distinct rating of RARA6 highlights the need for a tailored approach when implementing electronic prescriptions, considering the diverse needs and perspectives of potential users.

RARA7 shows an interesting spread of responses when looking at the different rating among the A-high and A-low groups. Specifically, 49.5% of the A-Low group responded with strongly disagree or disagree when asked whether the ability to check the delivery status online would positively impact their use of electronic prescriptions. By contrast, 49.5% of the A-high group responded with strongly agree or agree to the same question. Additionally, it can be seen that RARA7 is the least important factor for A-high, as all other factors (RARA1-RARA6) received ratings of 79% or higher, combining strongly agree and agree. These findings highlight the importance of tailoring electronic prescription services to meet the specific needs and preferences of different customer groups.

Table 27: Relative advantage construct - percentages comparing the A-high group with A-low

	Strongly disagree		**Disagree**		**Undecided**		**Agree**		**Strongly agree**	
	A low	A high	A low	A high	A low	A high	A low	A high	A low	A high
RARA1: I can save time using electronic prescriptions	13.9%	1.8%	20.8%	5.3%	31.7%	12.4%	16.8%	46.3%	16.8%	34.4%
RARA2a: I can order online and have the medication delivered to my home	14.9%	2.5%	14.9%	3.2%	25.7%	12.0%	31.7%	43.8%	12.9%	38.5%
RARA3: I am no longer bound to the opening hours	14.9%	1.8%	14.9%	5.7%	26.7%	13.1%	25.7%	47.0%	17.8%	32.5%
RARA4: I can order online and pick up the medication at the pharmacy	16.8%	1.1%	16.8%	4.2%	26.7%	8.5%	29.7%	52.3%	9.9%	33.9%
RARA5: I can check online whether the medication is available	10.9%	1.1%	19.8%	3.9%	23.8%	6.7%	29.7%	51.2%	15.8%	37.1%
RARA6: I can receive personalized offers	16.8%	0.7%	11.9%	4.6%	31.7%	13.8%	25.7%	51.9%	12.2%	29.0%
RARA7: I can simply check the delivery status online	27.7%	10.2%	21.8%	12.7%	24.8%	27.6%	15.8%	33.2%	21.2%	16.3%

(A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5) - relative advantage

Compatibility

Perceived compatibility relates to the extent of how consumers or patients perceive the new process of handling electronic prescriptions is compatible to their previous experiences or traditions. Within the dimension "compatibility" study one revealed three findings that are presented in Table 28.

Table 28: Key findings study one - compatibility

PC1	The electronic prescription application fits well with the way I like to do my medicine purchase
PC2	The electronic prescription application is much better than the paper-based prescription
PC3	Electronic prescriptions should allow similar features as the existing one

Study one illuminated that the success of electronic prescriptions can depend on whether the overall usage fits well with an individual's preferred method of purchasing medicine (PC1). Hence, if the application aligns with the customer's preference, they might be more likely to use it regularly. For study two PC1 was converted into PCPC1 "*The new process corresponds exactly to my ideas of recipe use."*

In a similar approach, the finding PC2 is addressed in study two with the item PCPC2. PCPC2 assesses whether electronic prescriptions are perceived to be better than the paper-based prescription process. If a large percentage of respondents in study two strongly agrees or agrees with PCPC2, it indicates that they perceive electronic prescriptions to be a superior method for managing their prescriptions.

The perceived compatibility of the electronic prescription process with the user's desired claim process can also impact the adoption and use of the technology (PC3). If users feel that the electronic prescription process is not reflecting their desired process, they may be less likely to use it and may find it more cumbersome or inefficient than traditional methods. PC3 is renamed to PCPC3 in study two.

These three items (Table 29: PCPC1, PCPC2 and PCPC3) were evaluated using a Likert scale ranging from 1 to 5, with 1 indicating *strongly disagree* and 5 indicating *strongly agree*. The purpose of these items is to gage an individual's perception of the compatibility of the electronic prescription process with their expectations and preferences for prescription use. A higher score on these items indicates a greater level of compatibility with the electronic prescription process. In this context, the applied question was: *And how much do you agree with the following three statements? When using electronic prescriptions, it is important for me that* (...).

Table 29: Constructs and measurements items - compatibility

Construct	**Item**	**Description**
Compatibility	PCPC1	The new process corresponds exactly to my ideas of recipe use
	PCPC2	There are significant advantages compared to the classic paper prescription process
	PCPC3	It is very similar to my usual process of purchasing prescription drugs

In general, the median scores of all three items indicate that the majority of participants have a moderately level of agreement with the three statements. Furthermore, Table 30 below shows that all three factors also show a relatively low standard deviation (close to one), which means that there is a high level of homogeneity in the responses. This can also be seen in Table 31, that presents the spread of answers in percentages. Nevertheless, the highest median value

is 3.71 of the item PCPC2. As PCPC2 refers to '*significant advantages compared to the classic paper prescription process'* this can be seen as an indicator that customers would increasingly use electronic prescriptions when they see significant and relevant advantages and of course, if they understand these advantages. Hence, the communication of these advantages by community pharmacies represents a critical success factor for the overall degree of adoption of electronic prescriptions.

Table 30: Items, median and standard deviation - compatibility

Item	N	Minimum	Maximum	Median	Standard Deviation
PCPC1	500	1.000	5.000	3.62	1.025
PCPC2	500	1.000	5.000	3.71	1.013
PCPC3	500	1.000	5.000	3.48	1.024

For the first statement, 'The new process corresponds exactly to my ideas of recipe use' (PCPC1), the median score was 3.62, with a standard deviation of 1.025. This rating of the participants suggest that the majority has a moderate level of agreement that the electronic prescription process should align with their preferred method of handling electronic prescriptions. This is also evident in Table 31, which shows that 60.40% of participants rated PCPC1 with *agreed* or *strongly agreed*. Therefore, it becomes clear that understanding the specific process expectations of customers is crucial for community pharmacies to tailor their electronic prescription processes and thus provide a high level of customer convenience.

Table 31: Item overview in percentages - compatibility

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
PCPC1	4.6%	8.2%	26.8%	41.8%	18.6%
PCPC2	3.0%	8.8%	25.8%	39.4%	23.0%

PCPC3	6.0%	9.2%	28.2%	44.0%	12.6%

Based on the median score of PCPC2 that is 3.71, it can be seen that the majority of customers believe there should be significant advantages to the electronic prescription process compared to the paper-based process. This could include items that are already addressed under the Relative advantage construct, such as the ability to order medications online and have them delivered to home (RARA2a) or time savings due to reduced waiting times and quicker processing (RARA1). By offering such services, the pharmacy could potentially increase adoption and satisfaction with the electronic prescription process among their customers.

With a median value of 3.48, PCC3 exhibits the most modest score in this dimension. This result suggests that participants are more interested in seeing noticeable improvements in the handling of electronic prescriptions than in maintaining strict similarity to the existing paper-based prescription process. However, it is important to note that the difference in median values is relatively small, indicating that the importance of similarity should not be entirely discounted. Table 32 below shows again the comparison between the two groups: the A-low group (low adoption) and the A-high group (high adoption) regarding the above-mentioned three items: PCPC1, PCPC2, and PCPC3.

Table 32: Compatibility construct - percentages comparing the A-high group with A-low

	Strongly disagree		**Disagree**		**Undecided**		**Agree**		**Strongly agree**	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high
PCPC1: The new process corresponds exactly to my ideas of recipe use	15.8%	1.1%	15.8%	4.2%	27.7%	19.4%	26.7%	50.2%	13.9%	25.1%

PCPC2: There are significant advantages compared to the classic paper prescription process	16.8%	0.4%	16.8%	4.6%	32.7%	15.5%	22.8%	49.1%	15.8%	30.4%
PCPC3: It is very similar to my usual process of purchasing prescription drugs	12.9%	3.2%	12.9%	7.4%	26.7%	23.0%	33.7%	50.5%	10.9%	15.9%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5) - compatibility

For PCPC1, the percentage of those who agreed (50.2%) was significantly higher in the A-high group compared to the A-low group (26.7%). Moreover, when combining *agreed* or *strongly agreed*, 75.1% of the A-high group compared to only 40.6% of the A-low group confirmed that statement. The percentage of those who strongly disagreed (15.8%) was significantly higher in the A-low group compared to the A-high group (1.1%). This disparity in perception between the two groups indicates that the more a person perceives the process as being compatible with their ideas of perception usage, the more likely they are willing to adopt electronic prescriptions. This seems to be the case especially in the A-high group. The precise nature of this relationship, and the potential influence, will be further explored in the subsequent regression analysis.

Furthermore, it was found that the A-low group had a lower percentage of those who strongly disagreed with the statement PCPC2 (16.8%) compared to the A-high group, which had a higher percentage of those who strongly disagreed (0.4%). This suggests that participants that see more clearly the advantages of the technology over the traditional paper-based process are generally more willing to adopt. On the other hand, the A-high group had a higher percentage of those who strongly agreed with the statement PCPC2 (30.4%) compared to the

A-low group (15.8%). This also indicates that those who are willing to adopt electronic prescriptions perceive the technology as having a clear advantage over the traditional process.

Regarding PCPC3, the results indicate a positive relationship between similarity to the customer's usual process and their willingness to adopt electronic prescriptions. The A-high group had a significantly lower percentage (3.2%) of respondents who strongly disagreed compared to the A-low group (12.9%). Additionally, the A-high group had a significantly higher percentage (50.5%) of respondents who agreed compared to the A-low group (33.7%). Hence, customers who see the electronic prescription process as being like their usual process are more likely to adopt it.

Complexity

One important construct within Rogers' DOI is the complexity of an innovation. Rogers (2003) argues that increasing complexity of an innovation reduces the likelihood that it will be quickly and widely recognized and adopted. Therefore, complexity plays a critical role in predicting and understanding the diffusion process of an innovation. Study one revealed 6 factors that are highlighted in Table 33.

Table 33: Complexity construct – key findings study one

CX1	high degree of automatization in the transmission of electronic prescriptions
CX2	high degree of digitalization (mainly reflected by the integration of digital instruments such as mobile phones or online portal)
CX3	intuitive and simple user interface
CX4	availability of mobile application
CX5	design as well as the functionality is uniform on different end devices and tools
CX6	organization and execution of all relevant processes around the electronic prescription from one central application

According to study one, in the eyes of some participants a high degree of automatization (CX1) in the transmission of electronic prescriptions can greatly improve the efficiency and accuracy of the prescription process. CX1 was converted into CXCX1 (A high degree of automation) in study two. Of course, electronic prescriptions can automate and simplify various processes and thus – for example – eliminate the need for manual data entry such as medication name. Additionally, automated transmission can ensure that prescriptions are delivered to the correct recipient in a timely manner. Therefore, both examples show that CXCX1 represents a relevant factor for further analysis in study two.

In a similar manner, a high degree of digitalization (CX2), was also identified as a relevant factor in study one. CX2 was mainly associated by participants with the integration of digital tools, such as mobile phones and online portals, to enable a seamless and convenient prescription ordering process. It also emphasized the importance of minimizing media changes throughout the process to reduce the risk of errors and ensure efficient communication. CX2 was reformulate to CSCX 2 in study two.

CXCX3, which was used in study two, is a revised version of CX3. It relates to the importance of a user-friendly interface for adopting electronic prescriptions. A simple and intuitive user interface can (a) simplify access and reduce the learning curve of the customer, (b) create trust because customers easily find all relevant information, and (c) reduce the risk of errors. An example of a user-friendly interface in the context of community pharmacies and electronic prescriptions could be a clear and organized display of prescription information, easy navigation to different sections of the system, and clear simple instructions for use.

CX4 emphasizes the need for a mobile application. As mobile devices become more prevalent in daily life, some participants in study one stated that a mobile application for electronic prescriptions can also increase their adoption. Therefore, community pharmacies can

simplify access with mobile apps and therefore potentially attract more customers to use electronic prescriptions. This is the case because mobile apps are often designed with a simple and intuitive interface (also see CXCX3) that is easier to use than traditional computer applications. In study two, CX4 was converted to CXCX4.

Another relevant factor in designing and implementing electronic prescription systems is the overall user experience. In both studies, one (CX5) and two (CXCX5), the item addresses the importance of a uniform design and functionality across different devices. By ensuring a uniform design and functionality, community pharmacies can provide a seamless ordering experience. For instance, customers can engage with the digital platform of a community pharmacy via their desktop computer, tablet, or mobile phone, with each interface presenting identical information and functionalities. Consequently, this consistency in design and functionality reduces the likelihood of user errors and facilitates a smoother process of transmitting electronic prescriptions.

In study one, participants also discussed the importance of centralizing the electronic prescription process and executing all relevant processes from one central application. The item was named in study two CXCX6. By having one centralized system, customer can have access to a complete and up-to-date view of prescription history or receive all relevant information about a certain medicine.

The author also included the item CXTRI1 *"I would like to receive special discounts and offers when using electronic prescriptions,"* in the Complexity construct. CXTRI1 was identified in Study 1 under the construct of Trialability. However, as it has a closer relationship to the dimension of Complexity, the author added this factor to this set of questions in the survey.

The seven items are presented in Table 34. The evaluation used a 1 to 7 rating scale, where 1 was the least important and 7 was the most important. The question asked was: *'Which of the following factors would be important and which would be less important to you when using electronic prescriptions?' (...).*

Table 34: Complexity construct - measurements items

Construct	**Item**	**Description**
Complexity	CXCX1	A high degree of automation
	CXCX2	A high degree of digitization
	CXCX3	Simple and intuitive usage
	CXCX4	Availability on mobile devices
	CXCX5	Uniform usage, online and mobile
	CXCX6	All necessary information should be centrally available in one application
	CXTRI1	I would like to receive special discounts and offers when I use it

The analysis results of the construct "complexity" are shown in Table 35. This Table reveals certain patterns in participant responses and variances in ratings. Notably, the standard deviation in this category is higher than in other categories. This observation may be attributed to the use of a seven-point Likert scale, offering a broader range for responses and therefore potentially leading to greater variability. The factor of "simple and intuitive usage" (CXCX3) has the highest median score of 5.28, indicating that participants found it to be a very important aspect of electronic prescribing. The standard deviation of 1.86 indicates that there was relatively low variability in the participants' ratings for this factor. This means that most

participants rated CXCX3 with a similar level of importance. Accordingly, also based on the data that is highlighted in Table 36, the most important item is CXCX3 because a high percentage of respondents (37.2%) consider it as very important (7). Hence, the majority of participants see the factor of simple and intuitive usage as a crucial aspect or condition to adopt electronic prescriptions.

The items "a high degree of automation" (CXCX1) and "a high degree of digitization" (CXCX2) had similar median scores of 3.43 and 3.48. Both factors had a standard deviation of around 1.8, indicating that there was also moderate variability in participants' ratings for these factors. The factors of "availability on mobile *devices*" (CXCX4), "uniform usage, online and mobile" (CXCX5), and " I would like to receive special discounts and offers when I use it" (CXTRI7) had relatively similar median scores of 3.93, 3.86, and 3.76. Finally, the factor of "all necessary information should be centrally available in one application" (CXCX6) had a median score of 4.33. This indicates that participants considered this to be a relatively important factor for adopting electronic prescriptions.

Table 35: Complexity construct - items, median and standard deviation

Item	**N**	**Minimum**	**Maximum**	**Median**	**Standard Deviation**
CXCX1	500	1	7	3.43	1.74
CXCX2	500	1	7	3.48	1.88
CXCX3	500	1	7	5.28	1.86
CXCX4	500	1	7	3.93	1.95
CXCX5	500	1	7	3.86	1.85
CXCX6	500	1	7	4.33	1.95
CXTRI7	500	1	7	3.76	2.08

In summary, the results show that participants found "simple and intuitive usage" and "all necessary information should be centrally available in one application" to be the most important factors for adopting electronic prescriptions, while the factors of "*a high degree of automation*" and "*a high degree of digitization*" were considered less important. The factors of "availability on mobile devices," "uniform usage, online and mobile" were considered relatively similar in importance.

Table 36: Complexity construct – percentages per rating category

Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CXCX1	15.0%	21.2%	17.2%	19.4%	12.2%	9.4%	5.6%
CXCX2	17.0%	19.6%	19.4%	13.6%	12.2%	9.0%	9.2%
CXCX3	5.2%	7.0%	8.2%	8.0%	13.8%	20.6%	37.2%
CXCX4	14.2%	14.6%	15.2%	14.8%	14.2%	15.2%	11.8%
CXCX5	15.0%	11.2%	16.0%	19.0%	15.8%	14.6%	8.4%
CXCX6	11.4%	11.8%	11.4%	12.6%	19.0%	18.2%	15.6%
CXTRI7	22.2%	14.6%	12.6%	12.6%	12.8%	13.0%	12.2%

Based on these findings, community pharmacies should focus on developing online shops with user-friendly and intuitive interfaces. Moreover, offering a mobile app for ordering prescription medicine could increase convenience and accessibility for customers and so increase the level of adoption. When pharmacies decide to offer both, an online as well as a mobile shop solution, it is important that both shop systems are designed as one central system, having similar processes and information available.

While automation and digitization were found to be less important factors, it is necessary to mention that both items were formulated generic which might lead to an average medium rating.

Trialability

Table 37 presents the results of study one in regard to the construct of Trialability, which refers to the overall willingness of consumers to try a new product or service. Study one revealed three items: TRI1 TRI2 and TRI3.

Table 37: Trialability construct – key findings study one

TRI1	Discounts and promotions
TRI2	Trust in provide or mobile application and web shop
TRI3	supplementary local advice and explanation through the pharmacist

TRI1 refers to "discounts and promotions." This item captures the participants' views on whether they would like to receive discounts and promotions (not personalized) when using electronic prescriptions at their local pharmacy. As explained earlier, TRI1 was already addressed in the Complexity construct (item: CXTRI7).

In the context of community pharmacies and its digital channels, trust was identified in study one as crucial factor for the adoption of electronic prescriptions. Hence, the item TRI2 reflects the importance of trust in the adoption of electronic prescriptions in the context of web shops and mobile applications. For example, if a customer has the perception that a community pharmacy has little knowledge in e-commerce, he or she may be hesitant to use it and prefer to rely on traditional paper-based prescriptions. On the other hand, if a customer has a high level of trust in the community pharmacy and their digital prescription process, they may be more willing to adopt electronic prescriptions and use them regularly. Therefore, the trust may be particularly relevant in this context, as it reflects patients' perceptions of the community pharmacy's ability to protect their prescription data and provide a secure and reliable digital

prescription process. TRI2 was subsequently adopted into TRITRI2 for use in study two (the provider is trustworthy).

The importance of customers' reliance on local pharmacists for supplementary advice and explanations was also explored in study one, where it was captured by an item called TRI3. In study two, TRI3 was adopted into TRITRI3. Therefore, TRITRI3 reflects the importance of receiving comprehensive explanations and guidance from local pharmacists about using electronic prescriptions before actually using the online or mobile shop. If customers rate TRITRI3 highly, it leads to the finding that they place a high value on having this type of support from their local pharmacist.

These measurement items, as presented in Table 38, were also evaluated using a Likert scale ranging from 1 to 5, where 1 represented *strongly disagree* and 5 represented *strongly agree*. Respondents were asked to rate their level of agreement with the statement, "I would adopt electronic prescriptions if (...)".

Table 38: Trialability construct - measurement items

Construct	**Item**	**Description**
Triability	TRITRI2	the provider is trustworthy
	TRITRI3	I would receive a comprehensive explanation from my local pharmacy beforehand

The rating of these items, presented in Table 39, indicates that participants generally rated the factor of trust in the provider or the digital platform high, with a median score of 3.59 and a standard deviation of 0.998. This shows that most participants agree or strongly agree with the importance of trust as a precondition for the adoption of electronic prescriptions. Moreover, Table 40 shows that 81% of participants strongly agree or agree with the statement

TRITRI2. Accordingly, a majority of the participants share the opinion that a trustworthy provider would increase the motivation to adopt electronic prescriptions. Having understood this, community pharmacies need to establish themselves as local digital experts in their respective community and thus earn the required image and trust of their customers. One way to achieve this is by providing high-quality digital tools (e.g. mobile application), which can be developed in collaboration with other pharmacies to reduce costs per pharmacy. By doing so, the community pharmacy can increase the likelihood of customers choosing to use their services.

The median of 4.09 for TRITRI3 (I would receive a comprehensive explanation from my local pharmacy beforehand) indicates that participants rated this factor as mostly *strongly agree* or *agree*. Moreover, while looking at the percentages in Table 40 it can be concluded that 61.4% of participants strongly agree or agree with the statement "I would receive a comprehensive explanation from my local pharmacy beforehand."

Table 39: Trialability construct - items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
TRITRI2	500	1	5	3.59	0.998
TRITRI3	500	1	5	4.09	0.919

As a result, to enhance the likelihood of customer adoption of electronic prescriptions, community pharmacies must prioritize providing a comprehensive explanation and local advice through the pharmacist. This can be accomplished by ensuring that the pharmacist always has adequate knowledge about all kind of questions around electronic prescriptions. Furthermore, community pharmacies may offer educational materials or short virtual training sessions (e.g. videos) to customers, outlining the benefits and practical usage of electronic prescriptions. By

providing customers with clear and personalized advice, community pharmacies can establish trust and confidence in the technology.

Table 40: Trialibilty construct - item overview in percentages

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
TRITRI2	2.6%	3.0%	13.4%	44.6%	36.4%
TRITRI3	4.4%	9.2%	25.0%	46.2%	15.2%

Table 41 below comparing the percentages between the A-low and A-high groups shows that participants in the A-high group have a higher level of agreement regarding TRITRI2, with 47.3% strongly agreeing that the community pharmacy should be trustworthy, compared to 20.8% in the A-low group. Furthermore, it is interesting to observe that only 19.8% of the A-high group and 11.9% of the A-low group strongly agreed that they would require a comprehensive explanation from their local pharmacy before adopting electronic prescriptions. One possible reason for this finding could be that some customers already have some level of familiarity with digital technologies and feel confident in their ability to use them. Additionally, customers may be motivated to switch to electronic prescriptions due to the convenience and other benefits that they offer, which could reduce the perceived need for extensive explanations or support.

Table 41: Triability construct - percentages comparing the A-high group with A-low

	Strongly disagree		Disagree		Undecided		Agree		Strongly agree	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high
TRITRI2: The provider is trustworthy	5.9%	1.8%	7.9%	1.1%	19.8%	7.1%	45.5%	42.8%	20.8%	47.3%

TRITRI3: I would receive a comprehensive explanation from my local pharmacy beforehand	8.9%	3.5%	14.9%	8.5%	25.7%	19.8%	38.6%	48.4%	11.9%	19.8%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5)

The results of both items above indicate that to improve the adoption of electronic prescriptions, community pharmacies need to focus on building trust with their customers and providing comprehensive support. This can be achieved by investing in staff training to ensure they have the necessary knowledge to explain the process to customers and improving the user experience of their digital platform, such as the web shop or mobile applications (preferably one central hub – CXCX6).

Connectivity

During the first study, participants primarily focused within the construct of Connectivity, to the level and form of communication across different channels and the importance of a smooth and seamless shopping experience. Participants discussed how community pharmacies can use digital channels, such as web shops and mobile applications, to improve the overall shopping experience for customers. Building on this, the author identified three constructs in study one, which are presented in Table 42.

Table 42: Connectivity construct - key findings study one

CON1	Connectivity among different communication channels is very important for me so that I can send my prescription

CON2	I like to see general advice that is available on different communication channels
CON3	Convenient communication channels can increase my adoption of electronic prescriptions

Regarding CON1, participants of study one mentioned that connectivity among different communication channels is especially important when it comes to the flexibility of sending the electronic prescription. This means that customers desire to choose their preferred channel such as online shop or mobile shop. CON1 was named CONCON1 in study two (All possible communication channels (web shop, mobile app) are connected with each other).

CON2 in study one referred to the availability of general advice across multiple communication channels. This means that customers can access helpful information and resources, such as medication information, dosage instructions, and side effects, through various channels. By providing this information through multiple channels, customers can easily access it from anywhere and at any time. As CON2 represents a relevant factor, it was converted into CONCON2 for study two.

The idea of convenient communication channels influencing the adoption of electronic prescriptions suggests that customers are more willing to use electronic prescriptions if the communication process with the pharmacy is easy and accessible (CON3). This includes basic features such as the option to send and receive prescription electronically, the availability of helpful information and resources, the possibility to address questions and of course, a user-friendly interface for different communication channels. Therefore, in study two, CON3 was renamed as CONCON3, focusing on the level of integration while carrying out communication and consultation. Table 43 provides the description of three constructs that were translated from study one in study two. The three constructs were evaluated using a five-point Likert scale. The question asked was: *'How much do you agree with the following statements? When using electronic prescriptions, I would like to....'*

Table 43: Connectivity construct - construct and measurement items

Construct	Item	Description
Connectivity	CONCON1	All possible communication channels (web shop, mobile app) are connected with each other
	CONCON2	General advice can also be obtained via a digital channel (chat, video call)
	CONCON3	Communication (questions/consultation) is integrated into all digital channels

Based on the results from Table 44, it can be derived that participants rated the importance of connectivity among different communication channels (CONCON1) as medium high with a value of 3.64. Moreover, the results in Table 45 highlight that a majority of participants (45.8%) agree that different communication channels should be connected with each other. In conclusion, the results validate that a majority of participants agree that different communication channels should relate to each other, so that customers can use their desired form of communication. This means that community pharmacies should consider investing in technology that allows easy and seamless communication between different channels, especially online and mobile. This can enhance the customer experience and improve their overall satisfaction with the pharmacy and the process of submitting electronic prescriptions. Additionally, having a connected communication system can also increase efficiency by reducing duplicated efforts within the pharmacy. This might also be important as the handling of medical information requires high security and quality standards.

The importance of availability of general advice across different communication channels (CONCON2) was also rated relatively high with a median of 3.67. This can also be seen while looking at the fact that the majority of participants (63%) agreed or strongly agreed that general advice across different communication channels is desirable, especially when customer use electronic prescriptions.

Table 44: Connectivity construct: items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
CONCON1	500	1	5	3.64	0.963
CONCON2	500	1	5	3.67	0.974
CONCON3	500	1	5	4.03	0.843

For community pharmacies, this means that they should prioritize making general advice easily accessible through a variety of communication channels, such as phone, e-mail, or even social media (e.g. WhatsApp). Especially WhatsApp was mentioned in this context in study one. This can help improve customer satisfaction by providing them with the information they need in a timely and convenient manner. Furthermore, having general advice available across multiple communication channels can increase the accessibility of the advice for a wider range of customers, so that especially older people can easily contact the pharmacy and ask for advice when they have problems to send the electronic prescription. Furthermore, these findings align with the results pertaining to TRITRI2, which suggest that positioning oneself as a trustworthy and knowledgeable digital expert can boost the adoption of electronic prescriptions.

As explained above, CONCON3 specifically assesses the level of integration, so that customers can easily access different communication channels to seek help or address questions. The data from Table 45 shows in this context that the majority of participants (80.8%) agreed or strongly agreed that having immediate access via different communication channels is important. Only 4.6% of participants strongly disagreed or disagreed that this is important. This result highlights that customers of community pharmacies place a high value on having the possibility to communicate directly in an easy and convenient way via digital channels with their pharmacist. For future studies, it might be interesting to gain a more detailed view on what kind of communication channels different customer groups prefer, so that

pharmacists have a profound understanding what channels and form of communication is desired.

Table 45: Connectivity construct: item overview in percentages

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
CONCON1	3.4%	8.0%	26.2%	45.8%	16.6%
CONCON2	3.8%	6.6%	27.0%	44.4%	18.2%
CONCON3	1.8%	2.8%	14.6%	51.8%	29.0%

These findings also show that community pharmacies need to have up-to-date and accurate information available across different communication channels, similar to the verbal communication or advice that is available at the premisses of the pharmacy.

The data in Table 46 illustrates that regarding CONCON1, a higher percentage of the A-high group (70.7%) agreed or strongly agreed that they would like to see communication channels connected while using electronic prescriptions, compared to the A-low group (49.5%). Therefore, community pharmacies should prioritize connecting different communication channels to cater to the preferences of individuals who have a high level of adoption of electronic prescriptions. CONCON2 shows similar percentages in the A-high group and A-Low. In regard to CONCON3, a higher percentage of the A-high group (88.4%) agreed or strongly agreed that they would like to see active communication via digital channels, compared to the A-low group (71.3%). Based on these findings, it can be concluded that in the construct of connectivity there exist similar tendencies in both adopter groups.

Table 46: Connectivity construct - percentages comparing the A-high group with A-low

	Strongly disagree		Disagree		Undecided		Agree		Strongly agree	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high

CONCON1: Connected communication channels	11.9%	0.7%	13.9%	5.3%	24.8%	23.3%	35.6%	50.2%	13.9%	20.5%
CONCON2: Advice via digital channel	10.9%	1.4%	9.9%	5.3%	25.7%	22.6%	37.6%	50.5%	15.8%	20.1%
CONCON3: Communication (questions/consultation) is integrated into all digital channels	5.9%	1.1%	4.0%	1.8%	18.8%	8.8%	41.6%	55.5%	29.7%	32.9%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5)

Integration

In the following section, the author presents the results of study two in the Integration construct. Study one validated that the level of integration is an important construct to analyze, when evaluating factors for adoption of electronic prescriptions at community pharmacies. Integration is defined as the seamless connection between different tools and systems that are involved in the complete the electronic prescription process. In this context, the author examined three factors of integration that were identified in study one (INT1, INT2, and INT3).

Table 47: Integration construct - key findings study one

INT1	The description of medicine should be integrated across different channels so that I can order medicine online
INT2	I want to see the same promotion activities online as offline
INT3	I would like to be able to pay regardless of the sales channel

INT1 from study one corresponds to CONINT2 in study two and refers to the importance of having consistent and accurate information about prescription drugs across all communication channels. For example, if a customer is prescribed a medication that requires specific instructions for use or has potential interactions with other medications, it is important

that the same information is available and consistent across all channels, whether they access it in person at the pharmacy or online through a web shop or mobile app. This consistency ensures that the customer can make informed decisions about their medication, regardless of the channel they choose to use.

The importance of offering the same promotional activities and discounts across all sales channels – regardless of whether customers are shopping online or in person – is addressed with INT2 or CONINT2 in study two. This item focuses on the fact that customers might use electronic prescriptions when they see the same discounts online as in the local pharmacy.

"*I would like to be able to pay regardless of the sales channel*" is INT3 and explores if customers would like to see the option to pay for their medications through various channels, regardless of where they are making the purchase (online or offline). This offers customers a certain level of flexibility in choosing the payment method that works best for them. INT3 was converted to CONINT3 in study two.

The set of questions also used a Likert scale with a range from 1 to 5 to assess participants' opinions on these different aspects of integration. The question asked was: *How much do you agree with the following statements? When using electronic prescriptions, I would like to (...).*

Table 48: Integration construct - measurements items

Construct	**Item**	**Description**
Integration	CONINT1	I can view all relevant information online (interactions, etc.)
	CONINT2	Marketing and sales offers can be used both, offline and online
	CONINT3	Payments can be made offline (pick-up) as well as online before pick-up

Table 49 provides a summary of the data collected of the three items CONINT1, CONINT2 and CONINT3. The median scores indicate a central tendency of the data and in this case, it ranges from 3.66 to 4.04, indicating that most of the participants agreed with the three constructs to some degree.

Table 49: Integration construct - items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
CONINT1	500	1	5	4.04	0.892
CONINT2	500	1	5	3.66	1.001
CONINT3	500	1	5	3.91	0.960

Also, based on the data presented in Table 50, it can be concluded that most participants see the overall importance of the items, as CONINT1, CONINT2 and CONINT3 were rated by more than 60% of the participants with *agreed* or *strongly agreed*.

Table 50: Integration construct - item overview in percentages

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
CONINT1	2.2%	3.6%	13.8%	48.8%	31.6%
CONINT2	4.0%	6.8%	28.0%	41.2%	20.0%
CONINT3	2.8%	4.6%	20.4%	43.4%	28.8%

In conclusion, the data suggests that the majority of participants valued integration as a relevant aspect of electronic prescription adoption, and so agreed that they would like to view all relevant information online, be able to use marketing and sales offers both online and offline and be able to pay for their medication both, online as well as offline. Community pharmacies should therefore focus on ensuring that customers can easily view all relevant information

online such as interactions, side effects, and instructions. This can be achieved by implementing an effective system to integrate all relevant information into one platform and making sure that this information is easily accessible and up to date (also supports the relevance of CXCX7 – one central hub). Regarding CONINT3, it will be important to a certain extent that multiple payment options are being offered, such as online payments, offline payments at the community pharmacy, so that customers have the ability to pay through various channels.

From Table 51, it can be observed that CONINT1 shows a significantly higher percentage of people in the high adoption group (89.7%) agreeing or strongly agreeing that all relevant information should be available at one point online compared to the low adoption group (64.4%). CONINT2 and CONINT3 show similar tendencies but with lower percentages.

Table 51: Integration construct - percentages comparing the A-high group with A-low

	Strongly disagree		**Disagree**		**Undecided**		**Agree**		**Strongly agree**	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high
CONINT1: All information at one point online	7.9%	0.4%	8.9%	1.4%	18.8%	8.5%	44.6%	47.7%	19.8%	42.0%
CONINT2: Marketing and sales offers can be used both, offline and online	8.9%	3.2%	10.9%	6.4%	22.8%	23.0%	38.6%	44.9%	18.8%	22.6%
CONINT3: Payments can be made offline (pick-up) as well as online before pick-up	9.9%	1.1%	6.9%	3.2%	24.8%	14.8%	31.7%	47.3%	26.7%	33.6%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5)

Consistency

According to the findings of study one, customers are looking for a consistent level of information and service across various channels. This includes providing consistent information about the use of medications, as well as the ability to address questions and concerns about the medication through a consistent process. In study one, two items, CS1 and CS2, were identified that are highlighted in Table 52. As C2 was already addressed in the construct connectivity with item CONCON3 the following section only addresses CS1.

Table 52: Consistency construct - key findings study one

CS1	The depth and breadth of information (information on the use of medications) that I receive from my local pharmacy should be consistent regardless of the channel
CS2	The possibility to address questions egarding the medication is important for me to use electronic prescriptions

CS1 was converted into CSR1 (Table 53) for study and as explained earlier in the methodology chapter, it was incorporated int the survey using a slider question design. The minimum value for the item was 1, meaning that some respondents wanted as little information as possible about the medication, while the maximum value was 7, meaning that some respondents wanted as much information as possible about the medication. The advantage of using a slider question in the context of understanding how much information customers want in line with electronic prescriptions is that it provides a more intuitive and user-friendly way of collecting information. In the case of CSR1, the slider question provides more nuanced understanding of how much information customers want in line with the adoption of electronic prescriptions. This will help to derive relevant information about the amount of information that should be provided in combination with electronic prescriptions.

Table 53: Consistency construct - measurements items

Construct	Item	Description
Consistency	CSR1	I want to receive relevant information regarding the medication

Table 55 displays the percentage of participants in each response cluster for item CSR1. The percentages suggest that the majority of participants (over 50%) prefer to have at least a moderate to high amount of information regarding their medications (5,6,7). Only 12.6% of participants indicated a preference for as little information as possible.

Table 54: Consistency construct - items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
CSR1	500	1	7	4.24	1.944

Also, the median score in Table 54 (4.24) reflects this tendency towards the desire of obtaining medium to high information about the respective medication (CSR1).

Table 55: Consistency construct - Percentages per response cluster

Item	1	2	3	4	5	6	7
CSR1	12.6%	11.0%	12.8%	12.2%	19.6%	18.6%	13.2%

(1at least information as possible – 7 as more information as better)

Indeed, an interesting aspect of the responses to CSR1, as shown in Table 55 above, is the relatively even distribution of preferences across the spectrum. Unlike other items, where a majority of respondents tend to cluster around a particular response, the responses for CSR1

are spread more evenly from 1 to 7, each garnering over 10% of the responses. This diversity in responses reflects the different needs and expectations of customers, emphasizing the importance for community pharmacies to offer customizable information delivery to cater to the unique needs of each customer group.

These findings also suggest that providing detailed information about medications is important for community pharmacies to meet the needs and expectations of their customer. For example, community pharmacies need to provide information on the proper dosage and administration of medications, potential side effects, and any interactions with other medications across all channels, such as the pharmacy's website, mobile application, or in-person consultations with a pharmacist. By providing this detailed information, community pharmacies can improve their customers' understanding of their medications and help them make informed decisions. This, in turn, can lead to increased adoption of electronic prescriptions.

Flexibility

In a study one, two factors, F1 and F2, were identified to understand the customers' perception of flexibility in the use of electronic prescriptions. F1 highlighted the importance of flexible and integrated online and offline services to enhance customer experience, while F2 emphasized the need for voucher and marketing campaigns to be offered holistically in both online and offline channels to prevent customers from being disadvantaged when using electronic prescriptions (Table 56).

Table 56: Flexibility construct - key findings study one

F1	Flexible and integrated online and offline services enhance customer experience and so lead to an increasing adoption of electronic prescriptions.
F2	Voucher and marketing campaigns should be offered holistically in online and offline channels, so that the customer is not disadvantaged when using the electronic prescription.

The item CONINT2 was part of the Integration construct and used to measure the level of integration between online and offline channels regarding marketing and sales offers. Hence, CONINT2 focused on the ability of customers to use marketing and sales offers in both online and offline channels without disadvantage. As F2 is similar to CONINT2 and already addressed, the author did not further use F2 in study two.

Hence the author only converted F1 into CONF1 (Table 57), to measure the degree of flexibility between online and offline processes. The ability to seamlessly integrate online and offline processes can improve the customer experience and so increase the likelihood of adoption. For example, if a customer begins the prescription process online but later decides to pick up their medication in person, a flexible system will allow them to easily transition between the two options without any disruptions or complications.

Table 57: Flexibility construct - measurement items

Construct	**Item**	**Description**
Flexibility	CONF1	As many processes as possible are integrated between online and offline

The Table 58 shows that the median score for the item CONF1 is 3.71, which indicates that the participants' perception of the importance of integrated processes is slightly above average.

Table 58: Flexibility construct - items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
CONF1	500	1	5	3.71	0.885

For community pharmacies, this information indicates that there is a general expectation from the customers to have a seamless integration between online and offline services, especially when it comes to electronic prescriptions.

Table 59: Flexibility construct - item overview in percentages

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
CONF1	2.2%	5.6%	27.6%	48.0%	16.6%

This finding is also supported by Table 59 that shows, while combining the response cluster *agree* and *strongly agree*, that 64.6% of the participants say that they are more likely to adopt electronic prescriptions when they have certain level of flexibility. On the other hand, the combination of *strongly disagree*" and "*disagree* response cluster leads to the result that only 7.8% of the respondents see a limited value in integrated services. This spread indicates that integration of services plays a significant role for the most of survey participants.

Within the A-high group a higher percentage of respondents agreed or strongly agreed (74,6%) that as many processes as possible should be integrated between online and offline compared to the group with low adoption (A-low) where only 47.5% answered the same. Furthermore, the data shows that 7.9% of the A-low group strongly disagreed with the statement, while 0% of the A-high group strongly disagreed. This suggests that individuals who have a high level of adoption to electronic prescriptions value the integration of online and

offline processes to certain extent. On the other hand, the group with low adoption has a higher percentage of respondents who were undecided (34.7%) about the level of integration between online and offline processes. This suggests that individuals who have a low motivation to adopt electronic prescriptions may be uncertain about the value of integrating online and offline processes. This is probably the case because they have limited knowledge and experience from other industries about the benefits of flexibility.

Table 60: Flexibility construct - percentages comparing the A-high group with A-low

	Strongly disagree		**Disagree**		**Undecided**		**Agree**		**Strongly agree**	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high
CONF1: As many processes as possible are integrated between online and offline	7.9%	0%	9.9%	3.9%	34.7%	21.6%	38.6%	53.4%	8.9%	21.2%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5)

The findings above indicate that community pharmacies should take a holistic approach to offer a high flexibility and so encourage the use of electronic prescriptions. Some possible actions are already mentioned earlier stating that community pharmacies could consider (a) offering marketing and sales campaigns that are available both online and offline, (b) making relevant medication information accessible through multiple channels, (c) offering flexible options for ordering and delivery, or (d) ensuring easy access to all relevant information in one central hub.

Personalization

Study one revealed that consumers have ambivalent views on personalization when it comes to the usage of electronic prescriptions. Some participants see the benefit in receiving personalized information and advice based on the information derived from their electronic prescriptions, while others are skeptical and reserved towards receiving personalized marketing offers and communication. The participants who see the benefit are motivated by the improved quality of advice and additional information that can help them prevent negative interactions and feel better and more secure. On the other hand, those who are skeptical do not see the value in receiving personalized offers and marketing communication. Table 61 summarizes the results of study one.

Table 61: Personalization construct - key findings study one

PS1	The receipt of personalized marketing offers and commercials (PS1) may be a potential factor that impacts the adoption of electronic prescriptions.
PS2	Providing personalized information to customers about the positive and negative effects of combining additional products with their prescribed medications can increase the value and adoption of electronic prescriptions.

PS1 refers to receiving personalized marketing offers and commercials and it was identified as a potential factor that might negatively influences the adoption of electronic prescriptions. Some participants expressed skepticism and rejection towards receiving personalized communication or offers based on their usage of electronic prescriptions. For example, one participant clearly stated that there are already too many e-mails including special

offers and therefore there is little desire for more personalized offers. The item was converted into CONPS1 for study two.

On the other hand, PS2 relates to personalized information that helps customers to be aware of the positive and negative change effects of additional products in combination with the prescribed medicine. PS2 was renamed for study two into CONPS1. According to study one, some participants see a benefit in receiving additional advice based on the information that can be derived from the electronic prescription data. These participants explained that they expect an overall improved quality of advice as well as receiving additional useful information that would help them to prevent negative change effects.

Table 62 lists the three items applied in this construct. Out of the three items, CXTRI1 was addressed in study two as one item in the rating question battery (rating scale from 1 to 7). Therefore, it is presented in a separate Table in the following text.

Table 62: Personalization construct - measurements items

Construct	**Item**	**Description**
Personalization	CXTRI1	Personalized discounts during the usage of electronic prescriptions.
	CONPS1	I do not want to receive personalized discounts
	CONPS2	I am informed about possible interactions of the medication

From Table 63 it can be seen that the median of CXTRI1 is 4.33, with a standard deviation of 2.087, while the median of CONPS1 is 3.48 with a standard deviation of 1.114. These values suggest that there might be a contradiction as both median values are relatively seen in a similar range. CXTRI1 was defined as "*Personalized discounts during the usage of electronic prescriptions"* and CONPS1 as *"I do not want to receive personalized discounts."*

Table 63: Personalization construct - items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
CXTRI1	500	1	7	4.33	2.087
CONPS1	500	1	5	3.48	1.114
CONPS2	500	1	5	3.95	0.930

To gain a clearer understanding of that contradictory answers, a closer examination of the data is necessary. In the data presented in Table 64, that highlights the distribution of responses for each category of CXTRI1, the highest percentage of participants (22.2%) selected "1" (not very important), while the lowest percentage (12.2%) selected "7" (very important). This leads to the conclusion that although the median value of 4.33 suggests some level of importance, a majority (49.8%) rated CXTRI1 on a lower scale (1-3), while only 38% rated it on a higher scale (4-7). Hence, the majority of participants rated the importance of personalized discounts low which now corresponds the answers to CONPS1 (I do not want to receive personalized discounts) in Table 65.

Table 64: Personalization construct - percentages per response cluster

Item	1	2	3	4	5	6	7
CXTRI1	22.2%	14.6%	12.6%	12.6%	12.8%	13.0%	12.2%

(1-not very important – 7 very important)

Based on these results, it is recommended that community pharmacies should avoid using personalization marketing approaches. Instead, community pharmacies can focus on other

marketing strategies that highlight the benefits of electronic prescriptions, such as convenience, accuracy, and improved medication safety.

Table 65: Personalization construct - item overview in percentage

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
CONPS1	5.2%	11.8%	34.4%	26.6%	22.0%
CONPS2	2.6%	5.4%	14.0%	50.4%	27.6%

Regarding CONPS2 it can be concluded that that the median score for CONPS2 is 3.95, which is relatively high. That shows that the participants value being informed about possible interactions of the medication. Additionally, Table 65 shows that a majority of participants (50.4%) agree or strongly agree (27.6%) with being informed about medication interactions, while a relatively low percentage (7.2%) disagree or strongly disagree. Given these findings, it is recommended that community pharmacies put a strong emphasis on providing personalized information to customers regarding the potential interactions of their medications. This will not only enhance the level of trust between the patient and the pharmacy but will also ensure that the patients are aware of the possible side effects and interactions that can occur with their medications.

Furthermore, from the data in Table 66, it can be concluded that there are some relevant differences between the A-low and A-high group while looking at the respective response clusters of CONPS1 and CONPS2. For CONPS1, the percentage of *strongly agree* and *agree* responses is lower in the A-high group (45.2%) compared to the A-low group (59,4%), while the percentage of *strongly disagree* and *disagree* responses is higher in the A-high group. This interesting insight leads to the conclusion that A-low group is less willing to receive personalized discounts, while the "A-high" group is more interested in these topics. Hence, a

further study could illuminate the extent to which personalized discounts can motivate people with limited willingness to adopt electronic prescriptions. Furthermore, community pharmacies, should not start to promote the electronic prescription with discounts in the beginning as this might reduce the adoption in the A-low group.

Table 66: Personalization construct - percentages comparing the A-high group with A-low

	Strongly disagree		**Disagree**		**Undecided**		**Agree**		**Strongly agree**	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high
CONPS1: I do not want to receive personalized discounts	5.0%	6.0%	5.9%	14.8%	29.7%	33.9%	31.7%	24.0%	27.7%	21.2%
CONPS2: I am informed about possible interactions of the medication	6.9%	1.4%	9.9%	3.9%	16.8%	10.2%	45.5%	52.7%	20.8%	31.8%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5)

Perceived risk

Similar to the construct of personalization also in the construct of perceived risk study one showed that participants have mixed views regarding the risks related to the adoption of electronic prescriptions. Some participants do not see any risks in using it and assume a high level of security, while others see specific risks in terms of data security and data transmission. Some participants in study one also expressed a desire for greater protection of their personal data. Table 67 highlights the findings of study one.

Table 67: Perceived risk construct - key findings study one

PR1	I do not see any risk in sharing my electronic prescription data electronically
PR2	The transmission of my prescription data needs to be done with high security standards

In study two, PR1 was renamed as PRPR1 to maintain consistency with the other items. PRPR1 illuminates the role of the factor risk in sharing electronic prescription data. Study one identified that some participants that already shared personal information with other online services see no difference in sharing their prescription data with community pharmacies. Therefore, they might be more likely to use electronic prescriptions. On the other hand, there are also participants that expressed concerns about sharing their information.

PR2 measures the perceived risk related to prescription data. The results of study one indicated that a portion of the participants believe that the transmission of prescription data should be undertaken with high security standards to ensure the safety of their data.

Both items were converted into study two. Table 68 highlights the items PRPR1 and PRPR2 that were addressed in the survey with a Likert-based question (1-5). The question was: *How much do you agree with the following two statements regarding data transmission? The digital transmission of e-prescription data.*

Table 68: Perceived risk construct - measurements items

Construct	**Item**	**Description**
Perceived risk	PRPR1	The digital transmission of electronic prescription data is not a problem for me
	PRPR2	The digital transmission of electronic prescription data should meet the highest safety standards

The findings from Table 69 and 70 show that most participants in the study did not see a big issue in sending the prescription data to the respective community pharmacy. Especially Table 70 shows that 62.6% agreed or strongly agreed with this statement.

Table 69: Perceived risk construct - items, median and standard deviation

Item	N	Minimum	Maximum	Median	Standard Deviation
PRPR1	500	1	5	3.69	1.045
PRPR2	500	1	5	4.32	0.853

Also, the results for PRPR2 indicate that a significant portion of the participants believe that electronic transmission of prescription data is safe and secure, and accordingly that high security standards should be maintained. For community pharmacies, these results suggest that they should prioritize ensuring the security and privacy of electronic prescription data to gain the trust and confidence of their customers. Additionally, they can use these findings to inform their marketing and educational efforts by emphasizing the security measures they have in place for electronic prescription data.

Table 70: Perceived risk construct - item overview in percentages

Item	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
PRPR1	4.6%	7.4%	25.0%	40.4%	22.6%
PRPR2	1.4%	2.8%	8.6%	36.8%	50.4%

While looking at the two groups, A-high and A-low Table 71 indicates that in the low adoption group, a higher percentage (37.6%) of participants strongly disagree or disagree that the digital transmission of electronic prescription data is not a problem (PRPR1) compared to

the high adoption group (1.5%). On the other hand, a higher percentage of participants in the high adoption group agree or strongly agree that the digital transmission of electronic prescription data is not a problem (PRPR1) and that it should meet the highest safety standards (PRPR2) compared to the low adoption group.

This finding suggests that participants in the high adoption group are more comfortable with the idea of digital transmission of electronic prescription data and believe that it should be done securely. On the other hand, those in the low adoption group have more concerns about the security of the digital transmission process.

Table 71: Perceived risk construct - percentages comparing the A-high group with A-low

	Strongly disagree		**Disagree**		**Undecided**		**Agree**		**Strongly agree**	
	A low	A high	A low	A high	A low	A high	A Low	A high	A Low	A high
PRPR1	17.8%	1.1%	19.8%	2.5%	25.7%	13.8%	24.8%	50.5%	11.9%	32.2%
PRPR2	5.9%	0.4%	8.9%	1.1%	5.9%	6.0%	29.7%	38.9%	49.5%	53.7%

Percentages comparing group (A-low) low adoption (AB1=1 and 2) with group (A-high) high adoption (AB1=4 and 5)

All factors – Regression analysis

The following section explains and highlights the result of the stepwise multiple regression analysis which were applied to identify constructs and factors that have a significant predictive value for the dependent variable – AB1 *'How likely is it that you would use e-prescribing?'*. Table 72 provides an overview about the constructs, factors as well as the accompanying means and standard deviations (SD).

Table 72: Regression analysis - constructs and measurements items

Construct	Item	Description	Mean	SD
Relative Advantage	RARA1	I can save time using electronic prescriptions	3.68	1.101
	RARA2a	I can order online and have the medication delivered to my home	3.78	1.092
	RARA3	I am no longer bound to the opening hours	3.69	1.099
	RARA4	I can order online and pick up the medication at the pharmacy	3.74	1.051
	RARA5	I can check online whether the medication is available	3.85	1.028
	RARA6	I can receive personalized offers	3.06	1.223
	RARA7	I can simply check the delivery status online	3.68	1.039
Compatibility	PCPC1	The new process corresponds exactly to my ideas of recipe use	3.62	1.025
	PCPC2	There are significant advantages compared to the classic paper prescription process	3.71	1.013
	PCPC3	It is very similar to my usual process of purchasing prescription drugs	3.48	1.024
Complexity	CXCX1	A high degree of automation	3.4320	1.74800
	CXCX2	A high degree of digitization	3.4820	1.88595
	CXCX3	Simple and intuitive usage	5.2880	1.86763
	CXCX4	Availability on mobile devices	3.9300	1.95672
	CXCX5	Uniform usage, online and mobile	3.8680	1.85620
	CXCX6	All necessary information should be centrally available in one application	4.3300	1.95775
	CXTRI1	I would like to receive special discounts and offers when I use it	3.6700	2.08658

Trialability	TRITRI2	The provider is trustworthy	4.09	.919
	TRITRI3	I would receive a comprehensive explanation from my local pharmacy beforehand	3.59	.998
Connectivity	CONCON1	All possible communication channels (web shop, mobile app) are connected with each other	3.64	.963
	CONCON2	General advice can also be obtained via a digital channel (chat, video call)	3.67	.974
	CONCON3	Communication (questions/consultation) is integrated into all digital channels	4.03	.843
Integration	CONINT1	I can view all relevant information online (interactions, etc.)	4.04	.892
	CONINT2	Marketing and sales offers can be used both, offline and online	3.66	1.001
	CONINT3	Payments can be made offline (pick-up) as well as online before pick-up	3.91	.960
Consistency	CSR1	I want to receive all relevant information regarding the medication	4.24	1.944
Flexibility	CONF1	As many processes as possible are integrated between online and offline	3.71	.885
Personalization	CONPS1	I do not want to receive personalized discounts	3.48	1.114
	CONPS2	I am informed about possible interactions of the medication	3.95	.930
Perceived risk	PRPR1	The digital transmission of e-prescription data is not a problem for me	3.69	1.045
	PRPR2	The digital transmission of e-prescription data should meet the highest safety standards	4.32	.853

The further analysis of the data was performed by eliminating various factors throughout nine different models while measuring the R-squared and adjusted R-squared values for each model. The Table 73 shows the F-value and significance level for each model, indicating which combination of factors have a significant effect on the dependent variable. Model 9, with an adjusted R-squared value of 0.370, showed the highest significance level (.000i), suggesting that these factors, included in this model, have the strongest predictive value for the dependent variable.

Table 73: Stepwise multiple regression - model overview

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	F Change	df1	df2	Sig. F Change
1	.471	.222	.220	1.086	.222	141.905	1	498	.000
2	.540	.291	.289	1.037	.070	48.908	1	497	.000
3	.568	.322	.318	1.016	.031	22.405	1	496	.000
4	.583	.340	.334	1.004	.017	13.040	1	495	.000
5	.590	.348	.342	.998	.009	6.735	1	494	.010
6	.596	.355	.347	.994	.006	4.790	1	493	.029
7	.606	.368	.359	.985	.013	10.166	1	492	.002
8	.613	.376	.366	.980	.008	6.381	1	491	.012
9	.618	.382	.370	.976	.006	4.636	1	490	.032

- *a Predictors: (Constant), PRPR1: The digital transmission of e-prescription data is not a problem for me*
- *b Predictors: (Constant), PRPR1, RARA4: I can check online whether the medication is available*
- *c Predictors: (Constant), PRPR1, RARA4, PCPC2: There are significant advantages compared to the classic paper prescription process*
- *d Predictors: (Constant), PRPR1, RARA4, PCPC2, RARA2a: I can order online and have the medication delivered to my home*
- *e Predictors: (Constant), PRPR1, RARA4, PCPC2, RARA2a, CONPS1: I do not want to receive personalized discounts*
- *f Predictors: (Constant), PRPR1, RARA4, PCPC2, RARA2a, CONPS1, CONINT1: I can view all relevant information online (interactions, etc.)*
- *g Predictors: (Constant), PRPR1, RARA4, PCPC2, RARA2a, CONPS, CONINT1, CONCON3: Communication (questions/consultation) is integrated into all digital channel*

- *h Predictors: (Constant), PRPR1, RARA4, PCPC2, RARA2a, CONPS1, CONINT1, CONCON3, CONINT2: Marketing and sales offers can be used both, offline and online*
- *i Predictors: (Constant), PRPR1, RARA4, PCPC2, RARA2a, CONPS1, CONINT1, CONCON3, CONINT2, CONF1: As many processes as possible are integrated between online and offline*

Furthermore, Table 73 indicates that model 9 makes more accurate predictions, as the error of the estimate also decreases. The F Change and Sig. F Change columns show that adding each predictor to the model significantly improves the fit, as the p-values are all less than 0.05. Based on these findings the author continued with the stepwise multiple regression analysis and Table 74 presents the coefficients of each factor, describing the relationship between each predictor variable (independent variable) and the dependent variable (adoption of electronic prescriptions) being predicted.

Table 74: Stepwise multiple regression - coefficients

	Unstandardized Coefficients		**Standardized Coefficients**		
Items	**B**	**Std. Erros**	**Beta**	**t**	**Sig**
PRPR1	.289	.051	.245	5.675	.000
RARA4	.204	.052	.175	3.943	.000
PCPC2	.206	.051	.170	4.008	.000
RARA2a	.171	.048	.152	3.550	.000
CONPS1	-.122	.040	-.111	-3.035	.003
CONINT1	.220	.065	.160	3.363	.001
CONCON3	-.186	.065	-.127	-2.845	.005
CONINT2	-.160	.052	-.131	-3.064	.002
CONF1	.131	.061	.095	2.153	.032

PRPR1 (Perceived Risk) measures the perception of risk associated with the digital transmission of electronic prescription data. The coefficient (B) is 0.289 and the significance value (Sig) is 0.000, which indicates a strong positive relationship between this item and the dependent variable (adoption of electronic prescriptions – AB1). Hence, participants that

confirmed that *'the digital transmission of electronic prescription data is not a problem for me'* are more likely to adopt electronic prescriptions. As this item has the highest beta, community pharmacies should be aware of this factor and aim for a solid and trustful positioning. This can be achieved through various actions, some of them have already been explained earlier. First, community pharmacies can provide information and educate patients about the security measures in place to protect electronic prescription data while using their digital sales channels. Second, they can address the concerns of patients who are not tech-savvy and provide support, especially to patients who may not be familiar with the use of digital technology. Third, as most of the community pharmacies are organized in cooperatives, they can define together industry standards, partner with technology providers that have a strong track record in ensuring the security of sensitive data and execute a national communication campaign. Moreover, in the view to the pure online pharmacy competition, the trustful positioning that community pharmacies currently have can be a strong asset for the extension towards an omnichannel business.

The **Relative Advantage** construct is also positively associated with electronic prescription adoption, as indicated by the significant standardized coefficients for the items RARA2a and RARA4 (all with $p < .05$). **RARA2a** measures the perceived advantage of being able to order medication online and have it delivered to one's home. The coefficient of (B) 0.171 also indicates a strong positive relationship between this item and the dependent variable. Participants who rate the possibility to order online including home delivery are more likely to adopt electronic prescriptions. Regarding **RARA4** (I can order online and pick up the medication at the pharmacy) it can be seen that it also has a significant positive predictive value as the coefficient (B) is 0.204. Therefore, community pharmacies should focus on promoting the advantages of the new technology, such like the increased convenience and efficiency of

ordering medications online and having them delivered to the customer's home. With the focus on the earlier mentioned PRPR1, community pharmacies could also provide detailed information about the delivery process and any associated costs to minimize any perceived risk, as this is also a very important factor for adoption. As home delivery seems to be attractive for customers of community pharmacies, they could initiate various activities to increase the overall acceptance such like making online ordering and delivery options easily accessible and user-friendly, provide personalized delivery options or allow customers to track their deliveries online (RARA7).

PCPC2 was one factor in the Compatibility construct. This item refers to the fact that customers see significant advantages compared to the classic paper prescription process. The coefficient (B) is 0.206 and the significance value (Sig) is 0.000, indicating a strong positive relationship between this item and the dependent variable. Therefore, community pharmacies should focus on promoting the significant advantages that electronic prescriptions have over the traditional paper prescription process to increase its adoption. They can do this by highlighting the convenience, speed, and accuracy of electronic prescriptions compared to the traditional process. Additionally, community pharmacies can explain customers the new process and so help them to feel more comfortable with the usage of the electronic prescription process. This was also rated relatively important with a moderate mean value of 3.59 (TRITRI3).

In contrary, **CONPS1** demonstrated a relatively strong negative predictive value. This item measures users' preferences for personalized discounts, and participants were asked to evaluate the statement 'I do not want to receive personalized discounts.' With a coefficient (B) of -0.122 and a significance value (Sig) of 0.003, this indicates a significant negative relationship between this item and the dependent variable. In other words, the more customers

who do not want to receive personalized discounts, the lower the adoption of electronic prescriptions.

Two factors in the Integration construct showed significant predictive values, **CONINT1** and **CONTINT2.** While CONINT1, *I can view all relevant information online (interactions, etc.),* indicated a strong positive relationship (coefficient is 0.220), showed CONINT2, *Marketing and sales offers can be used both, offline and online,* a negative predictive value with a coefficient of -0.160 and the significance value (Sig) is 0.002.

Regarding CONINT1, community pharmacies should improve the accessibility and availability of relevant information such as drug interactions (CONPS2) and other relevant health information through their online channels. This will increase customers' confidence and trust in electronic prescriptions, which ultimately positively influences the adoption of electronic prescription.

Based on the results of the items related to personalized offers and marketing, it appears that CONPS1 and CONINT2 have different impacts on the adoption of electronic prescriptions. First, community pharmacy may need to create a segmented marketing approach that allows a certain level of flexibility to offer personalized discounts only to customers who are receptive and really want personalized discount (online as well as offline). As CONPS1 indicates a strong negative predictive value, community pharmacies should be aware a of the potential negative effect that personalized may have on certain customer segments. Second, the results of CONINT2 highlight that while marketing and sales offers can be effective in promoting the advantages of electronic prescriptions, there exit customer segments who do not want to receive any marketing and sales offers, neither online nor offline. Hence, also in this context community pharmacies should strike for a balance between marketing and informative content. This means

providing customers with valuable information and support to help them to understand the benefits of electronic prescriptions, in addition to general marketing efforts.

In the construct Connectivity, the item **CONCON3** measured the importance of the integration of communication channels into all digital channels. The negative coefficient of -0.186 reveals that there is an inverse relationship between this item and the adoption of electronic prescriptions. This suggests that participants who placed high importance on the ease of communicating with their community pharmacy through various digital channels were less likely to embrace electronic prescriptions. The reasons for that could include an overall lack of trust in digital communication channels or using digital communication tools. As some participants may struggle to access or use digital communication tools, they also might be hesitant to adopt electronic prescriptions. On the other hand, these customer segments might prefer face-to-face interaction because they perceive this form of communication as more secure. Further research is needed to fully understand the root causes behind this relationship.

CONF1 was defined in the survey as *'as many processes as possible are integrated between online and offlin*e' in the flexibility construct. CONF1 had a positive relationship with the dependent variable and the coefficient is 0.131. This leads to the conclusion that participants who rate the importance of integrating processes between online and offline relatively high are more likely to adopt electronic prescriptions. Based on this finding, it is recommended for community pharmacies to ensure that as many processes as possible are integrated between online and offline to increase the potential adoption of electronic prescriptions. This could include streamlining the process of switching from online to offline or vice versa or ensuring that all necessary information is available and accessible on both channels.

Overall, the results above show that it is important for community pharmacies to consider the specific needs and preferences of their customers when deciding which services to integrate between online and offline.

Chapter 6: Discussion

The healthcare industry and so community pharmacies has continuously undergone significant transformations due to technological advancements such as the introduction of EHR. Nowadays, an innovation that is just about to change the pharmacy landscape in Germany is the introduction of electronic prescriptions. Other countries such as Estonia showed that electronic prescriptions can have a major impact on customer behavior and their way to purchase medication (Kõnd & Lilleväli, 2019). However, it is essential to note that just like Amazon's impact on the book retail landscape, electronic prescriptions can also have significant impact on how customers purchase medicine (Brynjolfsson, 2013). The fact that using electronic prescriptions compared to paper-based prescription for ordering medicine online is far more convenient, indicates the future relevance for community pharmacies. Also based the results of this study it can be assumed that community pharmacies need to increase their know-how in e-commerce, omnichannel services and digital communication to maintain competitiveness compared to pure online pharmacies.

In this context, the given study aimed to investigate the factors impacting the adoption of electronic prescriptions at community pharmacies in Germany. The study comprised two parts: a qualitative study to identify factors influencing the adoption of electronic prescriptions and generate recommendations for community pharmacies, and a quantitative study to project the extent to which customers will adopt electronic prescriptions.

The findings and conclusions of this study provide valuable insights for community pharmacies and other stakeholders, such as healthcare software provides in Germany. Of course, the results of this study also contribute to academic literature, especially on the adoption

of healthcare technology in the context of omnichannel management as there are still many undiscovered phenomena's.

To start, the discussion emphasizes the integration of the results with existing literature, connecting the implications of this research with the current body of knowledge. Following this, the chapter delves into a detailed analysis of factors affecting the adoption of electronic prescriptions, shedding light on the elements that determine and influence customers' adoption of electronic prescriptions. This insight informs the next section, which centers around formulating practical recommendations for community pharmacies, informed by both the qualitative and quantitative findings of this research. Finally, the chapter presents projections for the adoption of electronic prescriptions. Each section serves as a pillar, integrating the study's findings into a comprehensive discussion that aids both academic and practical understanding.

Integration with existing literature

As the present study sought to explore the adoption of electronic prescriptions in community pharmacies, it is essential to also contextualize the findings within the existing literature. In this section, the author compares the findings of the given study with relevant statements from the literature review chapter and focuses on several key themes, such as the importance of data integration, the evolution of multichannel towards omnichannel retailing, or the significance of channel shift in customer behaviour. Table 75 shows the connection between the literature review and the findings of the current study. The findings validate the literature's identification of the evolution from multichannel to omnichannel retailing and show the

importance of seamless integration across online and offline worlds as well as the key role of mobile channels.

Table 75: Literature review comparison with findings of this study

Literature Review	**Finding**
Gall et al. (2016) noted that the electronic prescriptions as a stand-alone health application only provides limited benefits for patients and that a combination of various applications and stakeholders is necessary to develop a reliable and comprehensive patient's medication list.	The item CXCX6 - *all necessary information should be centrally available in one application* – validates that also in the context of this study customers desire one central application. Furthermore, the items related to the relative advantage construct (RARA1-RARA7) and compatibility construct (PCPC1-PCPC3) support the desire for centralized benefits
Verhoef et al. (2015) explains the evolution of multichannel retailing as a result of the blurring of boundaries between the online and offline world.	Items such like (CONCON1-CONCON3) and (CONINT1-CONINT3) confirm the desire for a high level of connectivity and integration
Herhausen et al. (2015), Hosseini et al. (2018), Saghiri et al. (2017), Verhoef et al. (2015) and Cai and Lo (2020) highlight the growing importance of mobile channels	CXCX4 - *availability on mobile device and* CXCX5 - *uniform usage, online and mobile*, reflect the importance of making channels available on mobile devices,
Brynjolfsson et al. (2013) points out that different channels and touchpoints are used simultaneously and interchangeably to create a coherent customer experience across various customer touchpoints. Multichannel retailing work completely independently from each other	Items related to connectivity (CONCON1-CONCON3), integration (CONINT1-CONINT3) CSR1 - *I want to receive all relevant information regarding the medication* – and CONPS2 - *I am informed about possible interactions of the medication* – show the importance of integrating channels and providing a seamless experience for customers, which is more in line with the omnichannel approach than the multichannel approach.
Neslin et al. (2006) suggest that data integration is a core perquisite for successful multichannel customer management.	CXCX6, CONINT1, and CSR1 items also support the fact that data integration is a core prerequisite for successful channel management.
Zhang et al. (2010) prove that inconsistencies and asymmetries within	PCPC1, CXCX3, CONCON1, CONCON3, CONINT1, CSR1, and CONPS2 items show that

these touchpoints will hinder the customer from experiencing barrierless channels. This will result in lost sales for retailers that are not able to provide customer a seamless shopping experience.	inconsistencies and asymmetries within touchpoints hinder a barrierless channel experience, resulting in lost sales for community pharmacies that cannot provide a seamless shopping experience.
The general importance of technology in modern retailing is emphasized by several authors, including Verhoef et al. (2015), Brynjolfsson et al. (2013), Neslin et al. (2006), Zhang et al. (2010), Gall et al. (2016) and Shi et al. (2020), as it enables new forms of shopping behaviour, integration of channels, data management, and improved customer experiences.	The main constructs that support the superior role of technology in the case of this study are: Relative Advantage, Complexity, Connectivity, Integration, Consistency, and Perceived risk.
Verhoef et al. (2017), highlighted the importance of data that it is a necessary prerequisite for marketing strategies of omnichannel retailers	The items CONINT2 - *Marketing and sales offers can be used both, offline and online* and CONPS1 *I do not want to receive personalized discounts (referring to personalized discount offers)* show that a segmented marketing approach based on data is important to attract customer
Brynjolfsson et al. (2009) stated that brick-and-mortar retailers can compete with online retailers on mainstream products, but differentiation strategies are crucial for niche products, particularly through online channels	Community pharmacies typically have a limited product assortment that is very similar across different pharmacies. As a result, there is not any specific items that correlate with this statement, as the constructs and measurement items are focused on specific features of electronic prescriptions and omnichannel retailing.
Shen et al. (2018) found that the more a retailer interacts with customers through various channels, the higher is the overall level of satisfaction and loyalty, suggesting that the shopping experience can influence channel shift.	There are no specific items in the given context that directly support the importance of channel shift. However, the items in the construct of "relative advantage" and "connectivity," indirectly relate to this idea.

As in the course of this study the author applied the innovation diffusion approach developed by Rogers (2003) a detail review of application is also necessary. Table 76 presents

a comparison between Rogers' (2003) Innovation Diffusion Theory and this study's findings, specifically emphasizing how the perceived relative advantage of electronic prescriptions leads to their faster adoption

Table 76: Innovation Diffusion Theory and findings of this study

Literature Review	Finding
Relative advantage refers to "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers 2003, p. 15). The definition reflects the advantage of the innovation. This can be – for example – a better design, better usability, or a higher convenience. Of course, the higher the subjectively perceived relative advantage of an innovation, the faster its adoption proceeds.	When combing all items, the mean for the construct (RA) is 3.64. This indicates that the perceived benefits of using electronic prescriptions are higher than the benefits of using traditional paper-based prescriptions. Furthermore, RARA2a and RARA4 showed positive predictive values which supports the statement that the higher the perceived relative advantage of an innovation, the faster its adoption will be.
Compatibility of an innovation that addresses existing needs presupposes a fundamental familiarity with the overall context in which the innovation is embedded. According to (Rogers 2003, p.15), combability refers to "the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters" The greater the compatibility of an innovation, the greater the speed of adoption.	The mean scores for PCPC1 and PCPC3 (3.62, 3.48) reveal that the participants perceived the electronic prescription process to be consistent with their past experiences or needs (future needs). Additionally, the standardized coefficient for PCPC2 - *There are significant advantages compared to the classic paper prescription process* - in the regression analysis shows in combination to PCPC2 and PCPC3 that perceived compatibility is positively associated with the intention to adopt the electronic prescription.
Complexity describes "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers 2003, p. 15). If a potential user perceives a high level of complexity that comes along with the innovation, the less likely it will be adopted. Complexity manifests itself in the learning effort required to use an innovation.	While none of the factors in this construct showed a significant predictive value for the adoption of electronic prescriptions, the findings still provide valuable insights into the overall product and process requirements for the successful implementation of electronic prescriptions. For example, intuitive usage was a relevant factor identified in study two.

The overall **trialability** refers to the possibility of trying out. This can reduce the perceived risk for adopters associated with an innovation. According to (Rogers 2003, p.16), trialability refers to "the degree to which an innovation may be experimented" (Rogers 2003, p.16). The greater the trialability, the greater the speed of adoption**.**	The possibility of trying out electronic prescriptions can reduce the perceived risk for adopters, which was reflected in the participants' emphasis on local advice and explanation from a pharmacist (TRITRI2). Participants who had a higher level of agreement regarding this factor also had a higher level of adoption of electronic prescriptions, indicating that trialability could play role in their decision to adopt.
The **observability** refers to "the degree to which the results of an innovation are visible to others" (Rogers 2003, p.16). To the extent that the results of an innovation and its benefits are observable, the likelihood of adoption of the innovation increases.	This construct was excluded after study one.

As described in the literature review and methodology chapter, the author extended in study one and two Rogers' constructs by a set of constructs that were identified from Shi et. al. (2020). The authors identified five relevant dimensions of omnichannel experience from a customer's point of view, including *connectivity, integration, consistency, flexibility*, and *personalization*. Apart from these five dimensions the author also added the dimension 'perceived risk.' With the introduction of electronic prescriptions in Germany, community pharmacies can offer various omnichannel services, and perceived risk may play a significant role in the larger context of electronic health products as the customer need to operate with sensitive personal data. Table 77 illustrates a comparison of these six constructs with the findings of this study, focusing on how the importance of connectivity across different communication and sales channels aligns with the results of Shi et al. (2020) in the context of electronic prescriptions.

Table 77: Literature review comparison with findings of this study

Literature Review	Finding
Shi et al. (2020) define **connectivity** as the extent to which cross-channel service content and information are linked and interconnected. In other words, it is the degree to which different channels are integrated and can communicate with each other. The authors found that the more connected the channels were and the more seamlessly they integrated with each other, the higher the perceived compatibility of omnichannel shopping.	The findings align with the results of Shi et al. (2020) regarding the identified overall importance of connectivity across different communication and sales channels. The majority of participants agreed that different communication and sales channels should be connected with each other for sending electronic prescriptions and obtaining general advice (CONCON1, CONCON2). Nevertheless, the negative predictive value of CONCON3 (carrying out digital communication and consultation) indicate that there exist a group that are neither interested in using electronic prescriptions nor to address questions via a digital channel.
Integration refers the extent to which customers perceive all information systems and management operations to be unified and integrated well across channels in omnichannel shopping (Shi et al. 2020). The authors found out that integration positively corresponds with overall omnichannel experiences and so adoption.	The items CONINT1 and CONINT3 confirmed that seamless integration between various communication channels, including payment options, can contribute to a better experience and increase adoption rates. Marketing and Sales offers (CONNT2), on the other hand, showed a negative predictive value. Hence an integration of Marketing and Sales offers is perceived in the context of electronic prescriptions as a factor that does not support adoption.
According to Shi et al. (2020) **Consistency** in omnichannel experience is related to both, content, and process of interactions across channels. Shi et al. found that consistency, along with personalization, reduces customers' perceived risk in omnichannel shopping.	The analysis of this construct showed that there exist a wide range of opinions among customers regarding the desired level and depth of information. In conclusion, it reveals the importance of providing tailored information and communication options to cater to customers' individual preferences.
Shi et al. (2020) define **flexibility** in omnichannel experience as the extent to which customers are provided with flexible options when migrating tasks from one channel to another.	In both studies (one and two), the participants expressed a need for a tailored approach to meet their needs and preferences in terms of flexibility, with a strong emphasis on seamless and consistent customer experience across different channels.
In Shi et al.'s (2020) study, **personalization** refers to the extent to which customers perceive individualized	The results in the Personalization construct strongly vary: while some customers may see it as a benefit, others may feel it is invasive.

attention from a certain retailer in the omnichannel context. Their findings suggest that providing personalized attention can lower customers' perceived risk in adopting innovative technologies.	However, the negative predictive value for the adoption of electronic prescriptions found in the second study regarding personalization is not reflected in Shi et all's findings.
Shi et al. (2020) found that if omnichannel retailer provide consistent and personalized attention, they are less likely to **perceive a high level of risk** associated with adopting innovative technologies. This finding highlights the importance of providing a seamless and personalized omnichannel experience in reducing customers' perceived risk and increasing their intention to adopt new technologies.	PRPR1 and PRPR also indicate that customers have different levels of sensitivity when it comes to data security and privacy. Especially the strong positive predictive value from PRPR1 (that customers have different levels of sensitivity when it comes to data security and privacy) shows that participants generally had a positive perception of the security of electronic transmission of prescription data. However, as mentioned in the key findings, there were still differences in perceptions between the high and low adoption groups, with those in the low adoption group expressing more concerns about security. If consistent and personalized attention are the root cause for the positive predictive value needs to be investigated in future studies.

In summary, it can be concluded that this study made valuable contributions to the literature by providing insights into the factors that influence the adoption of electronic prescriptions at community pharmacies in Germany. By combining the derived omnichannel dimensions with the Rogers DOI characteristics, the study presented a comprehensive framework that can be used to guide the development and implementation of an electronic prescription omnichannel ecosystem. As stated earlier, academic research in the field of community pharmacies and digitalization is still lacking in some crucial areas, particularly in regard to omnichannel integration. Simone and Edoardo (2017) suggest that a sectoral focus on the integration of in-store and online operations will be important as retailers continue to invest in omnichannel technology. This study sheds light on this unexplored territory and helped to illuminate factors and its effects regarding electronic prescriptions and omnichannel service.

Factors affecting the adoption of electronic prescriptions

The first research aim was to identify what factors that influence customers' usage of electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany. Hence, it aims to identify relevant factors that have either a positive or negative predictive value for the adoption of electronic prescriptions. The following sections discusses these findings per construct:

Relative advantage:

Relative advantage refers to the extent to which an innovation is perceived as better or more useful than existing alternatives. According to Rogers (2003), a higher perceived relative advantage is positively associated with a higher rate of adoption. Greater perceived relative advantage is associated with a higher rate of adoption, a relationship confirmed in various fields, including healthcare (Venkatesh et al., 2003; DeLone & McLean, 2003).

In this context, study one explored that the most frequently cited advantage in this construct was time savings, followed by fast delivery and the ability to order online and pick up at the pharmacy (click-and-collect). Other factors mentioned in the interviews were personalized offers, transparency about the status of the prescription and information about the current stock/ availability. This underscores findings from previous literature which found out that the intention to use an omnichannel services is primarily influenced by its perceived usefulness, ease of use, and its compatibility with the consumer's lifestyle and values (Silva et al., 2018). Interestingly, the study from Silva et al. (2018) also showed that the ease of use is a strong predictor of adoption among high-frequency users of the omnichannel services, while

perceived usefulness is a more significant factor for low-frequency users. This implies that community pharmacies should focus on enhancing the problem-solving potential of their omnichannel services for low-frequency users, and on usability for frequent users, to encourage adoption.

The findings of study two also support to these implications. The positive responses to items RARA2a and RARA4, both related to home delivery of medications ordered online, indicate a preference for the convenience brought by omnichannel services. The significant positive predictive value for the adoption of electronic prescriptions further emphasizes the value that users perceive in such flexible order and delivery services.

When combing all items, the mean for the construct is 3.64. The highly rated factors such as the ability to check medication availability online, order online for home delivery, and order online for pharmacy pick-up indicate that users appreciate the convenience, accessibility, and efficiency. These results validate previous studies emphasizing the significance of perceived usefulness and convenience in omnichannel adoption. For instance, Verhoef et al. (2015) demonstrated that the key advantage of omnichannel retailing lies in its ability to allow customers to seamlessly interact with retailers through different channels based on their convenience. Specifically, the ability to check the availability of medication online (RARA5) aligns with findings from Gao and Su (2017), who observed that real-time inventory visibility was a key driver in consumers' omnichannel shopping behavior. Additionally, the ability to order online for home delivery or pharmacy pick-up confirms the conclusions drawn by Piotrowicz and Cuthbertson (2014), who found that providing multiple and flexible fulfillment and information options contributed to a better omnichannel experience.

These findings also point to a potential area of further exploration, which is the prioritization of different factors. While all three aforementioned factors scored highly,

participants rated the ability to check medication availability online the highest. This could suggest that the immediate value perceived in being able to confirm product availability might be a primary driver in electronic prescription adoption, even above the value offered by flexible delivery options.

Key findings are:

- **Providing up-to-date information on medication availability:** Customers view the ability to check online whether medication is available as the most advantageous item in the Relative Advantage construct.
- **Convenience is important:** Customers do see time-saving benefits and value the ability to order medication online and have it delivered home or picked up at the pharmacy (RARA2a, RARA4).

Compatibility:

The compatibility construct primarily explored the alignment of the new electronic prescription process with existing customer expectations and practices. According to DOI by Rogers (2003), an innovation's compatibility with the potential adopters' existing values, needs, and experiences, significantly increases its acceptance, a conclusion that is also verified by the present study's findings.

Furthermore, the study also supports Agarwal and Prasad's (1999) findings on individual differences in technology acceptance. They found out that people's unique characteristics, their experiences, and their attitudes towards technology can influence how and when they adopt a new technology. In the context of the present study, the individual

differences among the participants became evident in their varied expectations and perceptions of the new electronic prescription process. Some participants had the view that the new process should be simpler and faster than the paper-based process. This reflects the need for more efficiency. On the other hand, some individuals also expressed that the new process should be significantly different from the current process to truly leverage the potential benefits. This clearly demonstrates a desire for innovation and improvement. Hence, there exist quite diverse expectations according to individual characteristics.

The privately insured participants expressed concerns about submitting their digital prescriptions to their health insurance companies. These participants may have been used to submitting paper-based prescriptions to their insurance companies and were unsure about how the digital prescriptions would be processed. The perceived need for a physical document may also reflect a lack of familiarity with the electronic submission process or a lack of trust in the overall system. This echoes the findings from a study by Agaku et al. (2014), which found that about two-thirds of US adults were concerned about a breach in the security of their personal health information during transfer between healthcare professionals by fax or electronically. In addition, 12.3% of US adults reported that they had withheld information from a healthcare professional due to these concerns. These concerns, that exit in both countries the US and Germany, show the need for community pharmacies to clearly explain the digital process of using electronic prescriptions and so to eliminate any worries or concerns. It also highlights a tension between digital convenience and trust in system security.

The fact that compatibility in general can positively impact the adoption of electronic prescriptions was also reinforced by the results of the second survey. Accordingly, the median scores for items PCPC1 (The new process corresponds exactly to my ideas about prescription use), PCPC2 (There are significant advantages compared to the classic paper prescription

process), and PCPC3 (It is very similar to my usual process of purchasing prescription drugs) were moderately high with 3.62, 3.71, and 3.48. The average mean of all three items is 3.60.

An interesting finding in the Compatibility construct pertains to PCPC2 as this item exhibited a strong predictive value for the adoption with electronic prescription adoption. This highlights the role that perceived advantages play in user adoption, supporting the findings of Davis's (1989) Technology Acceptance Model (TAM), which posits that perceived usefulness (the degree to which a user believes that using a particular system would enhance his or her job performance) significantly influences the user acceptance of technology. This demonstrates the fundamental role of community pharmacies in effectively articulating the specific benefits of electronic prescriptions compared to the paper-based process.

Furthermore, the results also align with Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT). Venkatesh et al. (2003) argue that effort expectancy is a core determinant of technology adoption, particularly during the early stages of adoption. While effort expectancy was not explicitly described in the items PCPC1, PCPC2 and PCPC3, the strong positive predictive value of PCPC2 with adoption indicates that the participants desire a high degree of effort improvement. Hence, it is insufficient for community pharmacies to strongly highlight the benefits of electronic prescriptions. They must also make an effort to explain the simplicity of the new process, and more importantly, reassure customers of the robust security measures in place.

Key findings are:

- **Better than paper-based process:** customers are more likely to adopt electronic prescriptions when they recognize the relevant benefits of the new process. This shows that

community pharmacies need to effectively communicate the advantages of electronic prescriptions to customers to increase their adoption.

Complexity:

The Complexity construct includes some relevant factors which can be seen in the high median value of 4.0. Study one revealed that ease of use, intuitive user interface, interoperability on multiple devices, and the avoidance of media changes are important factors for the adoption of electronic prescriptions. Like in the construct of Relative Advantage, these findings also align with prior research, underscoring the overall importance of user-friendly design in facilitating the acceptance of new technologies (Venkatesh et al., 2003). Correspondingly, participants of study one also expressed the need for a high level of automation as well as the availability of both mobile and desktop applications, which offers a certain level of interoperability. Besides that the participants additionally mentioned that they prefer a central application for all relevant processes related to their electronic prescription tasks.

The second study's findings further reinforced the importance of the factors highlighted above. Notably, the study devoted particular emphasis to simple and intuitive usage (CXCX3) with a median score of 5.28, echoing previous research that has established ease of use as a critical determinant of technology acceptance (Davis, 1989). This high score might suggest that participants particularly value usability and the necessity for user-friendly interfaces.

On the contrary, the factors of a high degree of automation (CXCX1) and digitization (CXCX2) were rated lower in importance. This is seen as counterintuitive because many theories and studies, including the work by Brynjolfsson and McAfee (2014), suggest that

increased automation and digitization are key factors that drive the adoption of new technologies. A possible explanation for the lower importance attributed to automation and digitization could be the inherent need for control. In scenarios involving sensitive health data, individuals might feel that a high degree of automation compromises their control over the process. Similarly, the lower importance given to digitization could also be indicative of a sense of disconnection users might feel towards entirely digital processes. Especially if they are used to traditional, paper-based methods, an entirely digital system might feel unfamiliar. This discrepancy is further illuminated by the 'privacy paradox', as discussed by Gerber et al. (2018). Their findings point out that while users express concern for privacy, their behavior with digital tools often does not reflect this, possibly due to unfamiliarity or discomfort with the digital realm.

Furthermore, the factors of availability on mobile devices (CXCX4) and uniform usage across online and mobile platforms (CXCX5) demonstrated median scores of 3.93 and 3.86 (scale 1-7). This reflects a certain degree of variability in participant responses, a tendency that partially contrasts with prior research, such as the study by Kumar et al. (2013), which identified a strong consumer preference for mobile health applications. This divergence could suggest that, while mobile access is generally valued, it may not be a crucial determinant for all users within the context of electronic prescription adoption. This aligns with the findings of Ziefle and Wilkowska (2010) and Schnall et al. (2016), both assert that user preferences regarding platform availability are shaped by a variety of factors including demographics, the intended use of the app, and individual comfort with the technology. This means that the importance of mobile availability and uniform usage across platforms can vary among individuals and may not be the most critical determinant for all users when it comes to adopting electronic prescriptions.

Despite the fact that 3.76 shows a moderately high value, a detailed look at CXTRI7 reveals that 49.40% rated that item as not very important (1,2,3) compared to 25.8% that rated it rather high in importance (5,6,7). This spread is also reflected in a relatively high standard deviation of 2.08. Hence, while some participants may view receiving special discounts and offers as an important factor in terms of electronic prescriptions, others may not. This outcome aligns with previous research that suggest that consumers' response to personalized offers can be multifaceted, depending upon their perceived value, and privacy concerns (Zhang et al., 2016). They argue that the expectation of value by consumers significantly influences their response to incentives, like discounts and offers. Hence, while some users might highly anticipate the value in such offers and therefore consider them important, others may have lower anticipation of value, leading to less importance attributed to discounts. Therefore, community pharmacies need to lay the necessary groundwork being able to execute a segmented marketing and sales approach. Like this they can match their marketing approach to individual or segmented needs of their customers.

Finally, the factor of central availability of all necessary information (CXCX6) had a median score of 4.33, indicating that participants considered this to be a relatively important factor for electronic prescriptions. This supports the earlier-highlighted findings regarding RARA5 (I can check online whether the medication is available). While the identified factors in this construct did not show statistically significant correlations with the adoption of electronic prescriptions, the construct remains insightful, shedding light on the broader product and process prerequisites.

Key findings are:

- **Simple and intuitive usage:** When implementing tools like web shops or mobile shops simplicity plays a very important role. The upload or sending of electronic prescriptions should be designed as user-friendly as possible so that it is easy for customers to understand and use (CXCX3). This may also be important for customer segments with higher age and less knowledge about using digital tools.
- **Availability on mobile devices:** It is important for community pharmacies to create a uniform experience for customers regardless of the channel they choose to use. Whether customers prefer to use online or mobile channels, they should receive the same level of information, services, and convenience. Community pharmacies that can offer a seamless and consistent experience across all channels will be better equipped to meet the needs of their customers (CXCX4, CXCX5).
- **One central application**: Community pharmacies should aim to create a centralized information hub for their customers, providing a streamlined and convenient solution for accessing all necessary information in one place. By centralizing information and resources, community pharmacies can ensure that their customers have quick and easy access to the information they need (CXCX6).
- **Special discounts and offers**: As already explained earlier (CXTRI1), the customers' opinion about receiving special discounts in line with using electronic prescriptions varies from appreciation towards strict rejection. Therefore, community pharmacies need (a) be able to create knowledge about customers' marketing preferences and collect data, (b) develop the technology basis to run segmented and tailor-made marketing approaches.

Triability:

In study one the participants highlighted three main factors in the construct of Triability that might influence the adoption of electronic prescriptions: discounts, trust in the mobile application or online shop, and local advice and explanation provided from a local pharmacist. The role of discounts was already addressed and discussed earlier with the item CXTRI1.

Trust in the mobile application or online shop was considered by some participants in study one as a prerequisite for trying electronic prescriptions, as participants deemed health data to be quite sensitive. This finding aligns with the work of McKnight et al. (2002), who have illustrated the central role of trust in encouraging online transactions, particularly when they involve sensitive information such as health data. In their study, they found that trust significantly improves consumers' perceptions of risk and insecurity. This enables them to comfortably share personal information and proceed with online purchases. Consequently, in a context of community pharmacies where the handling and processing of sensitive health data are involved, the role of trust becomes even more important.

Finally, local advice and explanation from a pharmacist was seen as a positive influence on trialability, with participants saying they would be more likely to try electronic prescriptions if they obtain a specific explanation from their pharmacist. This underscores the importance of interpersonal influence and communication in fostering innovation adoption. This finding is consistent with the study by Rogers (2003), who also stressed the role of trusted advisors or experts in promoting the acceptance of novel technologies. Additionally, it aligns with Fichman's (1992) statement that environmental and interpersonal aspects can significantly influence the rate of innovation adoption, especially in health-related areas where expert advice is highly valued. In his analysis, Fichman highlighted the impact of information channel types

and sources at different adoption decision stages. This means that users may be differentially influenced by different sources of information and advice depending on their stage of adoption. For example, during the awareness stage, a pharmacist could introduce the concept of electronic prescriptions to customers that visit the local pharmacy. Later, during a subsequent visit, the same customer might show further interest in trialing electronic prescriptions. The pharmacist then could assist in the initial setup, guiding the customer through steps like entering prescription details and setting up reminders. Goldsmith and Horowitz (2006) also affirmed this observation, stating that advice from knowledgeable professionals plays a crucial role in individuals' decisions to adopt new services or products. This is particularly relevant in fields where consumers might lack expertise, necessitating expert guidance.

The second study confirmed that the majority of participants agreed that a trustworthy provider as well as comprehensive explanation from the local pharmacist would increase their motivation to adopt electronic prescriptions. Furthermore, participants in the high adoption group had a higher level of agreement regarding these factors compared to the low adoption group. This shows that trust and explanation are important factors, also for customers that are generally willing to adopt electronic prescriptions. The average mean of this construct is 3.84.

Key findings are:

- **Trust is important:** Many community pharmacies have exiting loyal customers. Hence, community pharmacies can leverage their existing reputation to also increase online and mobile sales, and so increase the adoption of electronic prescriptions. For example, they could encourage loyal customers to share their experiences with others so that they can build social proof and so increase trust to use electronic prescriptions. This could be achieved offline via written hand-outs or digital via short video testimonials.

- **Support customer:** Customers clearly indicated that they would like to receive guidance in using electronic prescriptions. In consequence, community pharmacies should focus on providing a comprehensive explanation and local advice through the pharmacist. This can be achieved by ensuring that the pharmacist (and team) is knowledgeable to answer any questions or concerns. Additionally, the pharmacy can provide educational materials or online training sessions for customers on the benefits and use of electronic prescriptions.

Connectivity:

Connectivity among different communication channels was rated by 70% of the participants in study one as being very important. They mainly interpretated connectivity as the ability to transmit electronic prescriptions from the doctor to the community pharmacy via a mobile or desktop application. Additionally, some participants also mentioned that they would like to be able to receive general advice via different channels and see real-time inventory (also addressed with RARA5). Surprisingly, 20% of the participants preferred to use WhatsApp as their primary communication platform, implying that the availability and convenience of communication channels could directly influence their willingness to adopt electronic prescriptions. This echoes the findings of Ou et al. (2014), who identified that user comfort and familiarity with particular communication platforms can play a vital role in technology adoption. Furthermore, they found out that the importance of website design in facilitating quick establishment of relationships can have strong implication on e-commerce transactions.

In this context, earlier findings from Ou and Davison's (2011) study on the use of instant messaging at work also provide valuable insights with relevance for community pharmacists.

They discovered that while instant messaging can lead to work interruptions, these interruptions were not significantly negative to work outcomes. These findings resonate with the participants' preference for WhatsApp, which functions similarly to instant messaging platforms, in their daily communication. Hence, it is recommended that community pharmacy need to consider what kind of communication channels are relevant for certain customer segments.

Also, in study two the majority of participants (45.8%) agreed that different communication channels should be connected for easy and efficient communication, especially for medical information which requires high security standards. This reflects the interplay between the constructs of trust and connectivity, emphasizing the need for secure, integrated communication platforms in contexts involving sensitive health data. This aligns with the observations of Martínez-Pérez et al. (2015) who emphasized the critical role of privacy and security in mobile health applications. Based on their finding the authors recommended that app designers should apply higher security measures that are beyond the minimum legal requirements, given the sensitive nature of personal health information.

Furthermore, study two showed that participants value the availability of general advice across different communication channels with a median of 3.67 which fits to the above-mentioned finding under the construct of triability. In the context of electronic prescriptions, having general advice available across various communication channels can also be seen as a form of 'trialability'. As it allows individuals to familiarize themselves with the system, its functions, and potential benefits without having to commit fully to its use. This trialability can mitigate perceived risks and enhance user confidence in the technology and so potentially increasing its adoption rate (Venkatesh et al., 2003). Furthermore, the importance participants attach to general advice availability reflects the evolution of healthcare consumers who are becoming more informed and proactive in managing their health (Hibbard and Greene, 2013).

Regarding the item *'that communication (questions/ consultation) integrated in all digital channels'* the study explored some contradictory findings. First, more than 80% of the participants in study two rated this with *agree* or *strongly agree*, which shows they see this factor as being relevant in order use electronic prescriptions. Nevertheless, the regression analysis showed a negative predictive value for this item. Based on these numbers the author can only postulate what are the reasons behind this. Several potential explanations might account for this paradox. First, participants might have concerns about the trustworthiness of digital channels, particularly regarding the confidentiality and privacy of their sensitive health information (Beldad et al., 2010; Kisekka & Giboney, 2018). Second, technical difficulties or lack of familiarity with digital tools could be a barrier to embracing a fully digital health communication platform (Van Deursen et al., 2011). Third, despite the increasing popularity of digital communication, many individuals might retain a preference for face-to-face interactions, particularly in healthcare contexts where personal comfort and the human touch are valued. Finally, general fears about digital privacy and security, magnified by high-profile data breaches and growing public awareness of digital rights, could be contributing to the observed negative correlation (Kokolakis, 2017). To better understand the root causes of this relationship, further research is recommended.

Key findings are:

- **Connect channels:** Connecting all possible communication channels, such as a web shop and mobile app, can help increase the adoption of electronic prescriptions. This is because it enables seamless communication and exchange of information between customer and the pharmacy. Like customer can have easy access either to their prescription data or to clarify questions. When all communication channels are connected, customers are more likely to

feel comfortable and confident using electronic prescriptions, which can lead to increased adoption and long-time usage. Additionally, it can be assumed that connected channels can also improve the efficiency and accuracy of the prescription process and reduce errors.

- **Seamless advice:** Of course, this study revealed that customers are looking for general advice and the opportunity to address questions in different channels when using electronic prescriptions. Hence, community pharmacies should provide access to advice through multiple channels such as chat, video call, or other digital channels makes it easier for customers to obtain the information that they need. Furthermore, it can help to build trust, that is as highlighted earlier as an important factor for the majority of customers.

Integration:

According to study one, the core of this construct was defined by many participants as the seamless connection between different elements of the electronic prescription system, covering components such as sales channels, marketing channels and internal back-end systems like the enterprise resources software that contains real-time stock information. The results of the first study showed that a significant number of participants (60%) believe that seamless integration between various communication channels could play a positive role in their use of electronic prescriptions. This underlines the broader trend towards digital adoption in healthcare, as found in a study by Kruse et al. (2018). In this research, improved medical outcomes were observed in 81% of the studies following the adoption of health information technology, which among others also included electronic ordering. These findings suggest that a well-integrated, multichannel electronic prescription system could also enhance medical

outcomes, increasing the efficiency and quality of patient care. Customers might recognize the growing advantage of digital health technologies and therefore request in general a stronger integration of various digital tools and information.

The study also identified the integration of payment options as a key factor that could contribute to the widespread adoption of electronic prescriptions. In other words, the participants stated that they would prefer to pay for their orders regardless of the channel through which they placed their orders. Such findings parallel those in the field of electronic commerce, where seamless, multichannel payment options have been found to significantly enhance the user experience and promote customer loyalty. For example, Huang and Benyoucef (2013) identified two categories of social commerce: one based on e-commerce websites that use Web 2.0 tools to enable social interaction (like Amazon), and the other built on Web 2.0 platforms that incorporate e-commerce features (like Facebook). Huang and Benyoucef utilized a heuristic evaluation to analyze the extent to which various social and commerce features are implemented on these platforms. They found out that both Amazon and Facebook present clear and straightforward information, encourage user engagement, and support users in sharing their content and experiences. However, they also observed some missing features on both platforms. For instance, Facebook lacked key e-commerce features such as online payment and shopping cart functions, incomplete product information, and lack of online help functions. The study shows (a) that integrated payment options (via desktop or mobile app in the example of Facebook) play an important role and (b) suggests that a balance between social and commerce features can enhance the overall user experience and foster user engagement.

Analogously, community pharmacies could also greatly benefit from integrating both, integrated payment option as well as integrated communication channels to develop a strong competitive online position. By considering these findings, community pharmacies can

construct electronic prescription processes and systems that not only offer seamless multichannel payment options but also facilitate social interaction. This would match the interactive customer experiences offered on Amazon and Facebook and potentially result in increasing adoption of electronic prescriptions.

Study two converted these findings into the following three items (a) the ability to view all relevant information online, (b) the availability of marketing and sales offers both offline and online, and (c) and the ability to pay both offline and online. The analysis of the results showed that most of the participants agreed with all three constructs and the average mean of this construct is 3.87. A significant predictive value was observed between the items "I can view all relevant information online" and "Marketing and sales offers can be used both offline and online," although in different directions.

The findings from study two underscore the preference for a centralized application that integrates various processes, most notably the upload of electronic prescriptions, ordering processes, and communication. Swan (2009) proposed that the integration of social features into healthcare systems is fundamental, thereby emphasizing the necessity for patients to manage all relevant procedures within a single platform. This not only aligns with the aforementioned desire for social interaction as expressed by Huang and Benyoucef (2013), but it also highlights the significance of accessing crucial information through a centralized hub.

However, it is also important to remember that the convenience to see all relevant information in one online tool must be balanced with the critical need for trust and privacy in electronic health platforms. A study by Zulman et al. (2011) emphasized that trust plays a crucial role in online health services. Their research showed that older adults who trusted the internet as a health resource were more likely to use it for a wide range of health-related purposes, including searching for information, purchasing medications, and even discussing

health matters with their healthcare providers. This underscores the fact that building trust, through the development and promotion of easy to understand and credible online portals, is crucial for community pharmacies to improve the accessibility and utility for all users. Therefore, any attempt to visibly commercialize electronic prescriptions needs to be handled carefully to prevent erosion of this trust.

Continuing this thread of discussion, marketing offers showed a significant negative predictive value regarding the usage of electronic prescriptions. While users generally appreciate the convenience offered by online services, they may interpret prominent marketing as an unwelcome interruption that disrupts their primary purpose which is procuring prescriptions and accessing pertinent health information.

This adverse reaction to marketing offers within the electronic prescription could be attributed to several factors. First, if marketing messages or offers are perceived as irrelevant or misaligned with the users' needs or preferences, they could be considered unrelated or bothersome and thus degrade the overall user experience. Second, users may view the presence of marketing within a trust- and privacy-sensitive space as an commercialization, which could raise concerns and evoke resistance. Finally, the anticipation of a seamless, frictionless experience may lead users to reject marketing efforts that disrupt this smooth transactional process (Zulman et al., 2011).

Key findings are:

- **One central application**: As already identified earlier (similar to the Complexity construct), customers want to be able to view all relevant information online at a central point, so community pharmacies should focus on making sure that their online platform,

web shop or mobile application provides all relevant information at a glance. This could include online access to interactions, medical records, and other important information. As this factor has a positive predictive value for the adoption of electronic prescriptions, future studies could explore what kind of information customers desire in terms of both breadth and depth. Furthermore, the integration of payment across different channels is especially important for the group that is more likely to adopt (A-high) electronic prescriptions. Community pharmacy can communicate this to be more attractive for early adopters.

- **Special discounts and offers:** The findings around the role of marketing and sales offers (similar to the Complexity construct) contain some controversy. Customers claim to use electronic prescriptions more often when they receive some special offers (study one), although study two also revealed a negative predictive value for the adoption of electronic prescriptions. This means that customers who rate this factor relatively high are ultimately less likely to use electronic prescriptions. Given this negative predictive value, community pharmacies need to have a good understanding about the individual preferences regarding special discounts and offers (as explained above under Relative advantage construct and complexity). Moreover, regarding special discounts and offers it is recommended that community pharmacies allow customers to choose, if they want to receive specific promotions via a specific channel. For example, this could be achieved in combination with the required GDPR approval process. Like this they could offer selected promotion approaches that stimulates the acceptance of electronic prescriptions in different target groups. Hence, it is needed to carefully develop an omnichannel marketing approach. Practitioners could alslo consider conducting surveys or focus groups with customers to better understand their preferences and motivations for using electronic prescriptions.

Consistency:

In the context of electronic prescriptions, the construct of consistency showed divergent perceptions, as evident from study one and tow. Participant opinions showed a wide disparity especially when it came to the perceived utility of additional advice in combination with electronic prescriptions. Some participants did not see any particular advantage in receiving additional advice via a digital channel of a community pharmacy. Conversely, others expected the community pharmacy to deliver advice at par with the level offered during a visit to a physical pharmacy. This heterogeneity in customer expectations reflects the desired level of information consistency in electronic prescription services. This can be compared with findings from Gao and Su's (2017) research into omnichannel retailing. They noted a transition towards omnichannel shopping experiences, where consumers seek a seamless integration of services across both online and offline channels. Furthermore, in the omnichannel environment, the level of information available to consumers across various channels is a key component in shaping customer experiences. Consistency in this information can significantly impact customers' perception of the services, whether it is in a classical retail setting or at community pharmacies. Like in omnichannel retailing strategies outlined by Gao and Su (2017), in electronic prescription services, maintaining this level of information consistency is not a straightforward task. It requires careful planning, the adoption of relevant technologies, and potential restructuring of services. While more information generally reduces customer uncertainty, there are instances where it can lead to complications, such as increased returns in retail or misinterpretation. Hence, providing the right level of consistent information across channels while managing potential challenges is crucial to ensure a satisfactory customer experience.

Study one further unveiled mixed opinions on the depth and breadth of information required in the electronic prescription process. One participant emphasized the necessity for a bilateral dialog with the pharmacist to answer specific medication-related questions, which highlights the significance of interactive communication in the context of electronic prescription services.

Study two confirmed these varying preferences in the desired information level. Although the median value for this construct was 4.24 on a scale of 1-7, the distribution of responses spread evenly across different clusters, which shows that there exists a diverse range of preferences among participants. This echoes with previous research, such as Bhattacherjee (2001), who stressed the importance of acknowledging user preferences when designing information systems. Building upon the framework of Bhattacherjee's expectation-confirmation model, it becomes clear that the variations in user preferences significantly influence the usage of information systems. These preferences are an integral part of individual satisfaction and perceived usefulness, both of which are crucial for the continued engagement with a system. Study two confirms these insights, illuminating the wide range of preferences regarding the desired level of information. This heterogeneity highlights the challenge faced by community pharmacies in meeting a variety of user needs.

Furthermore, the results align with Parasuraman et al.'s (2005) statement about the necessity for personalization in digital services to accommodate a broad spectrum of customer needs and preferences. Their scales for assessing electronic service quality echo the importance of understanding and accommodating user preferences, just as Bhattacherjee's model indicates. Parasuraman et al.(2005) highlight the need for efficient and fulfilling service provision, with particular emphasis on system availability and privacy concerns. Their findings, alongside those from the present study, suggest that successfully meeting users' diverse preferences and

needs requires not only an efficient interface but also a robust behind-the-scenes infrastructure. Additionally, their research points to the significance of recovery service dimensions in managing non-routine encounters.

In conclusion, the construct of consistency should be a priority as electronic prescription services continue to evolve. Offering different levels of information and advice that can be personalized to each user's needs may be a key driver of user satisfaction and continued system usage.

Key findings are:

- **Modular information approach**: In addition to the above-mentioned findings (one central application, seamless advice), it can be recommended that community pharmacies should provide a tailored approach to each customer's needs and preferences by offering different levels of information and communication options, such as in-person consultation, phone call, e-mail, or chat. This can help to increase customers' confidence in using electronic prescriptions.

Flexibility:

As understood in the context of electronic prescriptions, flexibility captures a range of customer desires for integrated omnichannel services. Omnichannel strategies have gained recognition as crucial mechanisms for enhancing customer experience in diverse retail sectors (Beck & Rygl, 2015). The capacity to interact with a brand or service across different channels

and enjoy a seamless experience is an essential ingredient in fostering positive customer relationships and enhancing loyalty.

The first study found out that the participants had quite diverse definitions of flexibility in the context of the adoption of electronic prescriptions at local pharmacies. Seven out of ten interviewees asked for clarification on the term “flexible omnichannel service.” Once a common understanding was established, almost all interviewees expressed interest in omnichannel services such as click-and-collect, reserve-and-click, and buy online and return in-store. These services were especially rated high in value due to the fact that some participants often experienced unavailability of prescription drugs when they visited a community pharmacy. Additionally, two interviewees mentioned the desire for voucher redemption both online and offline. The discussion showed that each interviewee had a unique understanding and need for certain level flexibility, and that a strong integration of online and offline services would increase the use of electronic prescriptions. The notion of integrating online and offline services to create a flexible, customer-centric approach is underscored in the literature, with Verhoef et al. (2015) suggesting that a well-executed omnichannel strategy can significantly boost customer satisfaction and engender loyalty. The positive predictive value identified in the second study between integrated services and the tendency to adopt electronic prescriptions supports this view. However, the quest for omnichannel integration is not without challenges. As noted by Cao & Li (2015), executing an effective omnichannel strategy requires substantial financial, technological, and human resources. Hence, community pharmacies need to integrate diverse systems and databases, train staff to work across multiple channels, and manage potential disruptions that could impact service delivery. Furthermore, there is a risk of customer information overload with multiple channels, leading to customer confusion (Sousa and Voss, 2006).

Also, the desire for voucher redemption both online and offline raised by some participants also points towards customers' increasing expectation for service flexibility. This highlights the critical role of maintaining consistency across channels, as indicated by Herhausen et al. (2015), to meet customer expectations and foster engagement.

The second study came to a similar result as the majority of the respondents (65.6%) hold a positive view on the integration and flexibility of various omnichannel services, while only 7.8% have a negative view. The group with high adoption to electronic prescriptions valued the integration of online and offline processes more than the group with low adoption. The average median score of this dimension was moderately high with 3.7. The item "As many processes as possible are integrated between online and offline" showed a positive predictive value, so that it can be assumed that integrated services are important for community pharmacies when it comes to the adoption of electronic prescriptions.

Key findings are:

- **Adopters require a higher flexibility of services:** Especially persons that willing to adopt electronic prescriptions request smooth and consistent customer experience across different channels. They want to decide which channel the use at a certain time and place. As stated earlier this also reflected in the fact that an intuitive and convenient usage is rated among the most important factors. Hence, the author recommends that community pharmacies offer flexible options for ordering and delivery, such as click-and-collect, reserve-and-click, and buy online and return in-store (RARA2a and RARA4).

Personalization:

In the construct of Personalization some participants were clearly opposed to receiving personalized marketing based on their electronic prescription information, while others saw it as a benefit. The dichotomy once again reflects the broader tension between privacy concerns and the perceived benefits of personalization in the context of digital health services.

The group who perceived benefits appreciated the supplementary advice and information generated from their electronic prescription data. They found the provision of details about complementary or potentially conflicting products especially valuable. Hence, this group's main motivation was to prevent negative side effects. The correlation of personalized health communication with enhanced understanding and adherence to treatment plans, as outlined by Kreps and Neuhauser (2010), mirrors this finding. Nevertheless, it is also crucial to distinguish participants' desire for personalized information as specific to health-related advice and separate from their attitudes towards personalized marketing. This nuanced perspective is a critical consideration for community pharmarcies, which often balance healthcare provision and commercial interests. This viewpoint echoes Agaku et al. (2014) study, where they found that while patients appreciated tailored health information, they expressed concerns about the possible misuse of their health information for marketing purposes. Hence, for successful implementation and increased adoption of electronic prescriptions, community pharmacies need to establish clear boundaries and ensure customer trust by guaranteeing that health information is used responsibly and primarily for the enhancement of health outcomes, not for commercial exploitation.

Study two confirmed again these insights from the first study and explored that even if the attitude towards personalized marketing based on electronic prescription information was

divided among the participants, most participants of the second study confirmed that they do not want to receive personalized marketing or sales offers. Furthermore, this item also showed a negative predictive value for the adoption of electronic prescriptions. This means that customer that strongly agree that they do not want to receive personalized offers are less likely to adopt. In other words, that leads to the conclusion that there exist a group with little interest to adopt electronic prescriptions that is very sensitive regarding all kind of personalized marketing or sales offers.

Moreover, a significant number of participants of study two also echoed the importance of receiving information about potential interactions between prescribed medications and other substances. These findings (CONCON2 and CONCON3) underscore the need to strike a balance between leveraging electronic prescription data for personalized health advice and ensuring that such use does not transition into unwanted marketing intrusion. This highlights the need for tailored health information that promotes patient safety and medication effectiveness, without crossing into unwarranted marketing territory.

Building on these findings and the work of Acquisti et al. (2015), the research underscores the importance of an informed approach to personalization in electronic prescriptions, especially for community pharmacies intending to enhance the adoption of such services. Given the context-dependent and variable nature of privacy concerns illuminated by Acquisti et al. (2015), it is crucial for these pharmacies to respect and address these concerns when implementing personalized services. Establishing clear policies concerning the use of patient data can help assuage privacy anxieties, thereby promoting a broader acceptance of electronic prescriptions.

Key findings are:

- **Segmented marketing approach:** It is important to note that it is essential to find the right balance between personalized and neutral marketing and sales offers. Too much personalization may be seen as invasive, while too little may not be effective in capturing customer attention. The community pharmacy owner need to analyze and consider their target audience carefully and determine what level of personalization will be most appealing to them.

Perceived risk:

Study one showed that for some participants efficiency outranged perceived risk. However, others were very sensitive regarding their personal information to be shared without their consent. Participants in study one who were particularly sensitive regarding the interception or unauthorized sharing of their personal information echoes the concerns raised by Aval et al. (2022). In their study both groups' patients and physicians raised worries about the privacy and security of medical data. In this context, participants of study one emphasized the importance of data security and the preference for end-to-end encryption during the transmission of sensitive information, which also aligns with the security measures proposed by Aval et al. (2022) in their recommendation. These measures include advanced login and password mechanisms or authentication tools, strict control of data confidentiality using private networks or data encryption techniques, and the use of digital signature mechanisms for data integrity. Furthermore, Aval et al.'s (2022) research shows that while various countries have implemented electronic prescribing systems, many still lack minimum requirements and standards, thus contributing to the perceived risk. Consequently, future studies that delve more

specifically into the role of perceived risk in the adoption of electronic prescriptions across diverse countries would illuminate potential differences.

Study two identified a more homogenous image that there is a general positive perception among participants regarding the electronic transmission of prescription data. The respective item showed a strong predictive value for the adoption across many participants. However, there are differences in the perceptions between the high and low adoption groups. Participants in the high adoption group are more likely to believe that digital transmission of prescription data is safe and secure and that high security standards should be maintained. On the other hand, those in the low adoption group showed more concerns about the security of the digital transmission process. The average mean for this construct is 4 and underlines its general importance. The contrast in risk perception among high and low adopters can also be explained within the context of the Technology Acceptance Model proposed by Davis (1989). According to this model, perceived usefulness and perceived ease of use are key determinants of technology acceptance. Applying this framework to present study, high adopters might view electronic prescriptions as more useful and easier to use, thereby mitigating their perception of risk.

Moreover, Slovic (2000) points out that people often make risk assessments based on emotional and intuitive processes rather than purely analytical ones. This effect may further explain why high adopters are more comfortable with electronic prescriptions as they might have had positive prior experiences with similar technologies which leads to an overall more positive perception. On the contrary, low adopters may have heightened concerns due to a lack of familiarity or trust in the technology, aligning with what Luhmann (2000) referred to as a "trust-risk paradox." Essentially, the less trust individuals have in a system, the greater the

perceived risk. The interplay between these psychological factors and the adoption of electronic prescriptions is complex and could also be focus for future research.

In conclusion, community pharmacists seeking to increase the adoption of electronic prescriptions need to consider several factors. First, there is a strong emphasis on data security and the maintenance of privacy among customers. Implementing robust security measures can diminish perceived risks associated with the electronic transmission of prescription data. Second, community pharmacists should have a good understanding about the nuances in perceptions between high and low adoption groups is crucial. High adopters, likely perceiving electronic prescriptions as more useful and easier to use, often show more trust in the system's safety and security. Contrarily, low adopters tend to show heightened concerns about the digital transmission process.

Key findings are:

- **Data security is crucial:** As data security has the strongest impact on the adoption of electronic prescriptions, practitioners should be aware of this factor. First, community pharmacy needs to invest in a secure infrastructure. This includes having a secure network, firewalls, and antivirus software to protect against cyber threats. Second, pharmacy staff should be trained on the proper handling and storage of electronic prescription data, as well as on how to recognize and respond to potential security incidents. Furthermore, the pharmacy should establish a written policy that outlines the procedures for protecting electronic prescription data, including access controls, password policies, and data backup and recovery. Third, community pharmacies should highlight the significance of protecting personal and health information and what it does to secure it. In this context it is important to avoid using technical terms that may be difficult for customers to understand.

Recommendation for practitioners

Aligned with the study's main objective of acquiring an in-depth understanding of the essential factors influencing the adoption of electronic prescriptions, the second aim is to create actionable recommendations for community pharmacies to overcome resistance and increase the likelihood of adoption of electronic prescriptions. Generally, the results of this study confirmed that customers are looking for various omnichannel services, such as click-and-collect or buy online (e.g. RARA2a) and pick-up at the community pharmacy (e.g. RARA4) and overall customers do see advantages in using electronic prescriptions. Table 78 shows that 56.6% of the survey participants mentioned that they are likely or very likely to adopt electronic prescriptions. On the other hand, only 20.2% answered this question with very unlikely or unlikely. Hence, practitioners need to understand the evident upcoming impact of electronic prescriptions to adopt their business operations at an early stage so that they can ensure that they stay attractive for all relevant customer groups.

Table 78: Results question on adoption (AB1)

Item	Very unlikely	Unlikely	Undecided	Likely	Very likely
AB1	9.4%	10.8%	23.3%	32.6%	24.0%

Given this relevance, it is recommended for practitioners of community pharmacies to have a holistic customer view so that they can effectively influence the decision-making-process of adoption. Therefore, the author describes a set of recommendations structured according to standardized customer journey in four phases: *research and awareness, consideration, decision-making, retention & advocacy*. These phases correspond to findings of

both, Neslin et al. (2006) as well as Rogers (2003) that explored the phases of the innovation decision process, which is explained in the literature review chapter. For example, Neslin et al. (2006) define the elements of a customer journey as n*eed recognition, information search, purchase, and after-sales service.* In a similar vein, Verhoef et al. (2009) define customer experience in a retail context as a holistic, multi-dimensional concept that encompasses a customer's cognitive, emotional, physical, social, and affective responses to a retailer. Furthermore, they argue that customer experience is journey that a takes a customer throughout the entire purchase cycle, and across multiple touch points. This journey is seen as a dynamic process, beginning with the pre-purchase stage, moving through the purchase stage, and ending with the post-purchase stage. Companies such as community pharmacies can control some of these touchpoints in the different phasis of a customer journey while others are influenced by previous experiences or external factors. In this context, Grewal et al. (2022) mentioned that the advantage of using a customer journey approach is the possibility to develop a guide that helps to influence the effects of different touch points on the customer's experience over time. Hence, by having a complete picture of the customer journey, practitioners can identify opportunities to improve the customer experience, understand pain points and barriers, and so address these challenges effectively.

In the first phase of the customer journey, research and awareness, customers might search for community pharmacies that offer the ability to apply electronic prescriptions. During this phase, customers may research online, ask for recommendations from friends or family, or compare different pharmacies according to the information that is available offline and online. Table 79 shows the action cluster and the accompanying recommend actions that practitioners should apply to increase adoption of electronic prescriptions. First, it is important to set the scene and develop a secure and user-friendly back-end tool that is connected with the online

web shop or central health portal. This portal should be accessible via desktop and mobile as these are important channels for customers of community pharmacies. It is important that the back-end tool is connected with the respective ERP system so that real-time stock availability can be presented in portal. When the necessary technological basis is achieved, practitioners should focus on communication and (a) ensure that all relevant information – especially regarding data security – is correct and up to date on their website as well as (b) promote the benefits of electronic prescription services through in-store communication, social media, and advertising.

Table 79: Phase research and awareness – potential action plan

Action cluster	**Recommended Action**
Technology	Develop a secure and reliable electronic prescription management system (back-end). The system should also be user-friendly for pharmacy staff and allow realizing flexible customer-centered processes (**PRPR1**, CXCX3)
Technology	Create an online portal (customer front end) that is accessible via desktop and mobile (CXCX4, CXCX5)
Technology	Connect ERP system with online portal so that real-time stock information can be provided, and customer can see before setting up an account if medication is available (RARA5)
Marketing	Attract customers by having an up-to-date and easy-to-use website / portal that clearly states their services and technology capabilities, including the ability to accept electronic prescriptions (CXCX4)
Marketing	Promote the benefits electronic prescription services through social media, advertising, and little events in the pharmacy (**PCPC2**)
Marketing	Provide information on the measures taken to ensure data security, such as using encrypted databases, regularly updating security software (**PRPR1**, TRITRI2).

(significant predictive value is marked bold)

The “Consideration” phase marks the point in the customer journey where customers’ are evaluating options for acquiring their medication after becoming aware of the availability

of electronic prescription services at a certain community pharmacy. During this phase, it is crucial to promote a sense of trust and ease of use regarding electronic prescriptions. Customers may seek more information about the advantages and disadvantages of electronic prescriptions, making communication a vital component of this phase. Table 80 highlights the main recommended action points in this phase.

Table 80: Phase consideration – potential action plan

Action cluster	**Recommended Action**
Technology	Connect ERP system with online portal so that real-time stock information can be provided (RARA5). Like these customers can see that the medication is available and can be ordered online (**RARA2a**)
Marketing	Offer demonstrations of the electronic prescription process to customers, which can help them understand how it works and address any concerns they may have about data security (TRITRI3, **PRPR1**)
Marketing	Provide clear and comprehensive information about electronic prescriptions, especially about various benefits. Highlight that many processes are seamless integrated and allow a high flexibility (**CONF1**). Flexibility is important for early adopters.
Online portal	As customer might set up a digital account, make sure that digital portal is easy to use and provide clear information. Design portal with the aim that all relevant information regarding personal medication can be seen at a glance (CXCX3, **CONINT1**)
Online portal	Makes sure that the customer gains a good overview to manage the prescription and orders (**CONINT1**)

(significant predictive value is marked bold)

In the next phase, decision-making, the customer has already evaluated the various options and potentially different pharmacies. Based on this, the customer will consider which community pharmacy to choose for their electronic prescription upload/usage. Table 81 presents the main actions recommended in this phase.

Table 81: Phase decision – potential action plan

Action cluster	Recommended Action
Online portal	Enable simple purchasing of prescribed medication – online and mobile (**PCPC2,** CONON1)
Online portal	Provide easy and convenient delivery options, especially home delivery and pick-up at the pharmacy (**RARA2a, RARA4**)
Online portal	Include a secure and user-friendly checkout process (**PRPR1**, PRPR2)
Online portal	Provide online support (seamless advice), such as a chat function or FAQ section, to assist customers with their inquiries and issues (CONCON2, **CONCON3**)
Promotion	If you use discounts address them rather generally and do not offer discounts that linked to the electronic prescription used or planned to be used (**CONPS1**, **CONINT2**)
Advice	Highlight possible interactions of the chosen medication (modular information approach). A design that allows for customization of information, such as allowing the customer to choose the level of detail they would like to receive, can be beneficial in this phase (**CONINT2**).

(Significant predictive value is marked bold)

Throughout the retention and advocacy phase customers rate their individual purchasing experience and evaluate for the future if they to use electronic prescriptions at the respective community pharmacy again. Therefore, in this phase, the goal is to keep the customer satisfied and engaged with the electronic prescription service, and so (a) to encourage them to become a promoter of the service and (b) to become a loyal customer and come back. Table 82 highlights the recommended actions in this phase.

Table 82: Phase retention & advocacy – potential action plan

Action cluster	Recommended Action
Online portal	Provide updates and notifications on the status of orders and deliveries (RARA7)
Marketing	Regularly evaluate and update the online portal to meet changing customer needs and preferences (CXCX3).

Promotion	Offer general discounts or rewards for the next purchasing process. Take care that it is not linked to the previously ordered medicine (**CONPS1**)

(Significant predictive value is marked bold)

Predictive analysis of electronic prescription adoption

Adoption projection or sales forecasting is a complex research field that also holds significant relevance for practitioners of community pharmacies. For, example it directly influences critical business decisions, such as determining the appropriate stock levels of medicines to keep on hand. It is essential for practitioners to have a comprehensive understanding of the opportunities and challenges presented by electronic prescriptions to determine if implementing and maintaining costs are justifiable. Moreover, if the adoption rate is high, community pharmacies need to be well-prepared to handle the increased volume of electronic prescription orders.

Hence, in the context of this study, the projection of adoption forms the third research objective. The results of the adoption projection can enable community pharmacies to make informed decisions, improve overall customer service, and ensure efficient inventory management. Additionally, gaining a thorough understanding of the level of customer adoption of electronic prescriptions for purchasing prescription drugs online is also crucial since it is a relatively new technology that has only been launched in limited test areas. As a result, there is limited knowledge available, and it remains a relatively unknown area for community pharmacies.

To achieve the third research goal, different forecasting methods could be used, such as time series analysis, diffusion models, or regression analysis. Time series analysis focuses on

analyzing historical data and identifying patterns in the data to make predictions about future trends. Since electronic prescriptions are not yet fully implemented in Germany, there is only restricted and very limited historical data available to use for time series analysis. Without historical data, it is not possible to build a time series model, and therefore this method would not be appropriate for estimating the level adoption.

Even though the author used Rogers' DOI to identify relevant factors for the adoption this model is not recommended to be used to forecast adoption. In order to properly forecast adoption using a diffusion approach, further data would be required. For example, here historical data on the rate of adoption would also be needed. This could include information on the number of people who have adopted the innovation over time, and additionally the characteristics of early adopters, the timing of adoption, and the rate of adoption among different population segments. Moreover, data on factors that have influenced the adoption process, such as external influences, may also be needed to make proper predictions. Similar as explained above in the case of the time series approach, there simply does not exist sufficient or accessible historical data on the actual usage of adopters in the different test regions. This makes it difficult to estimate the relevant parameters of the diffusion model accurately and so to forecast the adoption of electronic prescriptions over time. Hence, a diffusion model to forecast the usage of electronic prescriptions is also not recommended.

In the regression analysis that is highlighted in Chapter 5, the author identified factors that are most strongly associated with adoption and therefore can be also statistically used to estimate the degree of influence that each factor has on the likelihood of adoption. The results are shown in Table 83 below. Of course, as the identified factors are derived from study one there might exit further unmeasured factors that also influence the adoption (omitted variable bias). Furthermore, the projection is based on limited sample and a certain moment in time,

when the survey took place, which also represents a limitation. The author elaborates this further in the upcoming section Limitations.

Although limitations exist that must be considered while deriving conclusions from the analysis of the projection, the advantage of using regression analysis to forecast adoption is that it enables the focus to be concentrated only on the factors that are of interest and have been validated throughout study one and two. This ensures that the analysis is based on a solid foundation of research, which increases its reliability and validity.

Consequently, using regression analysis it is possible to estimate the degree of influence that each predictor has on adoption.

Table 83: Coefficients regression analysis

	Unstandardized Coefficients		**Standardized Coefficients**			
Items	**B**	**Std. Erros**	**Beta**	**t**	**Sig**	**Mean**
PRPR1	.289	.051	.245	5.675	.000	3.69
RARA4	.204	.052	.175	3.943	.000	3.74
PCPC2	.206	.051	.170	4.008	.000	3.71
RARA2a	.171	.048	.152	3.550	.000	3.78
CONPS1	-.122	.040	-.111	-3.035	.003	3.48
CONINT1	.220	.065	.160	3.363	.001	4.04
CONCON3	-.186	.065	-.127	-2.845	.005	4.03
CONINT2	-.160	.052	-.131	-3.064	.002	3.66
CONF1	.131	.061	.095	2.153	.032	3.71

The regression equation for predicting the level of adoption of electronic prescriptions is: Level of adoption = 0.289(3.69) + 0.204(3.74) + 0.206(3.71) + 0.171(3.78) – 0.122(3.48) + 0.220(4.04) – 0.186(4.03) – 0.160(3.66) + 0.131(3.71) = 1.859. So, the predicted level of adoption of electronic prescriptions using the mean values of the independent variables is 1.859. While taken into consideration that the scale of the dependent variable ranges was defined from

1 to 5, a predicted value of 1.859 indicates that, on average, an individual is slightly more likely to respond *unlikely* or *uncertain* than *somewhat likely* or *very likely* to the question of how likely they are to use electronic prescriptions. However, this is only an estimate, and the actual response of individuals may depend on other specific characteristics and circumstances that were not identified in study one or out of scope as explained earlier. As already highlighted earlier, Table 84 reflects on the other hand that the actual responses of the participants to the question of how likely they are to use electronic prescriptions differs from the predicted values based on the regression analysis. It can be seen that about 57% of the participants responded *likely* or very likely, while only 20.2% responded *unlikely*. The remaining 23.3% of respondents were undecided. Hence, these responses are more favorable towards adoption than the predicted values from the regression analysis.

Table 84: Results question on adoption (AB1)

Item	Very unlikely	Unlikely	Undecided	Likely	Very likely
AB1	9.4%	10.8%	23.3.0%	32.6%	24.0%

These contradictory findings can be an indicator for the fact that study one did not identify all important factors and so the regression model was missing some items with significant impact. While looking at the overall predictive power of the model, which was defined as moderate, the R-squared value was 0.382 (Table 72). This value shows that 38.2% of the variance in the adoption decision can be explained by the included factors, while the remaining 61.8% of other factors were not included in the model. Therefore, it is possible that the predictive power of the model was limited by the exclusion of certain important factors that also significantly influence the adoption decision. One may suggest including more of the 31

factors identified in study one that were excluded through multiple stepwise regression. However, such an approach is not recommended as it could result in a more complex and less interpretable model, with insufficient significance. The author rather recommends to further investigate the discrepancy between the predicted value from the regression analysis and the actual responses in Table 84. For example, this can be achieved with further qualitative research – such as focus groups or in-depth interviews – to explore the reasons behind the responses and provide a better understanding of the decision-making process.

Chapter 7: Conclusions

This concluding chapter brings the research journey full circle, reflecting on the process undertaken and the resulting outcomes. The chapter commences with an appraisal of how successfully the stated research aims have been accomplished. Following this, there is a discussion of the novel insights that this study brings to the academic conversation surrounding the adoption of electronic prescriptions. Additionally, the practical implications of this study, particularly the introduction of the ADOPT framework, are considered from the perspective of community pharmacy practitioners.

The chapter concludes with an acknowledgment of the study's limitations, thus offering a balanced perspective on the research process and its findings. By encapsulating the essence of the research journey, its achievements, and challenges, this chapter serves as an opening for future investigations into the field of electronic prescription adoption.

Evaluation of research aims achievement

The following section shows an evaluation of how successfully the study's objectives were achieved. Each aim is assessed based on the methods employed and the results obtained, ensuring a comprehensive understanding of the study's accomplishment.

Table 85 presents the first research aim, which revolved around understanding the factors that influence customers' usage of electronic prescriptions to purchase prescription drugs online at German community pharmacies. Through a meticulous process involving a

literature review, the development of a research framework, and in-depth interviews, this aim was substantially achieved.

Table 85: Research aim 1 and achievement

Aim 1: Explore what factors influence customers' usage of electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany.
How this has been achieved: To achieve this aim, a research framework consisting of eleven constructs that influence the adoption of electronic prescriptions was developed based on a comprehensive literature review (Chapter 2). Ten interviews were then conducted with participants from different age groups in Germany to identify relevant factors within each construct that positively or negatively correlate with adoption. The analysis of the interview transcripts, which includes numerous quotations, provided valuable insights, and resulted in a list of 31 factors (Chapter 4) that serve as the basis for the second study – a quantitative survey aimed at developing an adoption projection.

The second aim – presented in Table 86 – was to compile a list of recommendations for German community pharmacies to enhance customer acceptance of electronic prescriptions. This objective was attained via a mixed-method approach: an explorative investigation into factors influencing customer adoption, followed by a comprehensive survey assessing the relevance and predictive value of these factors. The derived recommendations provide valuable guidelines for pharmacies.

Table 86: Research aim 2 and achievement

Aim 2: Create a list of recommendations for community pharmacies in Germany to enable them to increase customers' acceptance of electronic prescriptions.
How this has been achieved: Based on the results of study one, which identified factors that influence customers' adoption of electronic prescriptions, a quantitative survey (study two) that involved 500 participants (responses), explored the relevance of the 31 factors. The survey then further clarified the existence of a positive or negative predictive values between these factors and the adoption of electronic prescriptions. The identified factors were structured according to the derived constructs such as relative advantage, compatibility, complexity, trialability, connectivity, integration, consistency, flexibility, personalization, and perceived risk. For each construct, specific recommendations were developed that guide

community pharmacies on how to increase customer acceptance of electronic prescriptions by addressing the factors that influence adoption

Finally, Table 87 showcases the third research aim, which predicted the extent of electronic prescription adoption among customers. The quantitative survey and subsequent analysis allowed the forecasting of potential market changes, aiding community pharmacies in future business model adoptions.

Table 87: Research aim 3 and achievement

Aim 3: Project the extent to which customers will adopt electronic prescriptions to purchase prescription drugs online at community pharmacies in Germany.
How this has been achieved: This aim was also achieved through study two. The data collected from the survey was then analyzed using multiple regression analysis and correlation analysis to predict the extent to which customers will adopt electronic prescriptions. The findings of this study provided valuable insights into the potential market change due to the implementation of electronic prescriptions in Germany and helped to identify business model changes that can be adopted by community pharmacies to increase their omnichannel capabilities and remain competitive.

In summary, a review of the Tables illustrates the successful achievement of the research aims, affirming the study's valuable contributions. Having demonstrated the fulfillment of the research aims, the author now proceeds to the next section, explaining the study's contribution to academic knowledge.

Contribution to academic knowledge

This research significantly contributes to the academic field by meticulously examining the adoption of electronic prescriptions for online purchasing of prescription drugs at

community pharmacies in Germany. The combination of a comprehensive literature review, qualitative interviews, and quantitative survey led to the development of a holistic understanding that significantly advanced the research dialog in this field. Furthermore, the adopted approach to synthesize DOI and Shi et al.'s omnichannel dimensions into a single framework led to profound comprehensive finings in respect to specific research context of this study. While DOI puts a focus predominantly on technology-based factors, and it does not fully encapsulate the factors of omnichannel retailing, Shi et al.'s omnichannel dimensions offer an a usefull and proven framework to understand customer behaviors in an omnichannel retail context. Hence, additional dimensions such as connectivity, integration, consistency, flexibility, and personalization could be also taken into consideration. By merging these two theoretical perspectives, the study constructs a more holistic approach to analyze customers' adoption in the specific case of electronic prescriptions. This integration, thus, offers a richer and more nuanced view of the factors affecting adoption behaviors, extending beyond the scope of either DOI or the omnichannel dimensions alone. This integrated framework reveals a series of insightful findings:

- **Relative advantage:** The research affirms Rogers' (2003) notion that a higher perceived relative advantage expedites the adoption of an innovation. The data suggests that electronic prescriptions are perceived to hold a greater advantage compared to traditional paper-based methods, substantiating this facet of DOI. Hence, participants who recognized the advantages of electronic prescriptions, such as time-saving, online ordering with home delivery, and access to medication availability information, were more likely to adopt electronic prescriptions.

- **Compatibility:** The study establishes that the adoption of electronic prescriptions is positively associated with their compatibility with the users' past experiences and needs, a finding consistent with the literature (Rogers, 2003).
- **Complexity:** While no significant predictive value for the adoption of electronic prescriptions was found, factors related to complexity, such as intuitive usage, were identified as relevant. This provides valuable implications for product and process design in the implementation of digital sales channels of community pharmacies.
- **Trialability:** As in general suggested by Rogers (2003), offering opportunities to experiment with electronic prescriptions reduces perceived risk and enhances the likelihood of adoption. Therefore, both elements (a) the opportunity for users to experiment with electronic prescriptions as well as (b) comprehensive explanations and integration trustworthy providers can contribute to a positive trial experience.
- **Observability:** Although not specifically focused on after study one, this construct remains integral to the broader understanding of adoption factors in DOI. As many participants could not clearly distinguish observability form relative advantage it will be interesting in future studies to delve deeper into this issue.
- **Connectivity:** The findings align with Shi et al.'s observations that a well-connected omnichannel experience positively influences adoption. However, a segment less motivated towards digital communication was identified, indicating varying customer preferences.
- **Integration:** The results corroborate Shi et al.'s proposition that well-integrated information systems across channels contribute to a better omnichannel experience and increased adoption rates. Nonetheless, the integration of personalized marketing and sales offers was found not to support adoption in the context of electronic prescriptions.

- **Consistency:** The research illustrates the diversity of customer preferences regarding information depth, highlighting also in this context the need for a personalized approach to maintain attractiveness of omnichannel services.
- **Flexibility:** Reflecting Shi et al.'s concept, the research underscores the desire for flexibility, particularly for a seamless omnichannel shopping experience. Hence, the integration of as many processes as possible between online and offline channels can enhance adoption rates.
- **Personalization:** Diverging from Shi et al.'s findings, this study also clearly identified mixed attitudes towards personalization in the context of electronic prescriptions. This demonstrates the nuanced nature of this construct, especially when it comes to personalized sales offers based on the prescription information.
- **Perceived Risk:** The results correspond with Shi et al.'s findings, confirming that consistent and personalized attention can reduce perceived risk. Furthermore, one of the significant findings from the multiple regression analyses was the identification of perceived risk as a factor with the strongest predictive value for the adoption of electronic prescriptions. This indicates that participants who expressed a higher level of comfort and confidence regarding the digital transmission of prescription data were more likely to adopt electronic prescriptions.

Overall, the study significantly contributes to a more nuanced understanding of electronic prescriptions adoption. This research not only enhances the theoretical comprehension but also provides tangible, implementable strategies for practitioners intending to boost adoption rates, as outlined in the subsequent section.

Contribution to professional knowledge

In Chapter 6 of this study, the research findings regarding research aim 2 were discussed in the context of the customer journey and were further related to the innovation decision-making process as proposed by Rogers (2003). The conclusions drawn from these discussions offer substantial advancements in professional understanding of the adoption process for electronic prescriptions within community pharmacies.

To make these insights actionable for practitioners, these findings have been distilled into a practical, easy-to-remember framework called ADOPT: Awareness, Decision, Operation, Promotion, and Trust.

Each element of the ADOPT model corresponds to specific stages of both the customer journey towards electronic prescription adoption, and Rogers' stages of the innovation decision process. In integrating the ADOPT framework with the findings discussed in Chapter 6, it is essential to consider the corresponding stages of the customer journey which are reflective of the innovation decision-making process as outlined by Rogers (2003). As explained in Chapter 2, the innovation decision process, as described by Rogers, incorporates the stages of Knowledge, Persuasion, Decision, Implementation, and Confirmation. Each phase of this process can be correlated with the ADOPT framework and the customer journey, as described below.

A – Awareness: This stage corresponds with the knowledge phase in Rogers' innovation decision process, where individuals become aware of an innovation and seek information about it. In the context of the ADOPT framework, 'awareness' entails informing customers about the existence of electronic prescriptions, their benefits, and how to use them. It involves strategies such as developing a secure, accessible online portal, connecting the portal

with the ERP system for real-time stock information, and effective promotion of the service. Developing awareness of electronic prescription services among customers through an up-to-date and user-friendly website/portal and the promotion of benefits through social media, advertising, and local events at the respective pharmarcy.

D – Decision: This stage maps onto Rogers' persuasion phase, where individuals form attitudes towards the innovation. The 'decision' stage of the ADOPT framework focuses on assisting customers in making informed decisions by offering demonstrations and providing clear information about electronic prescription usage. This helps to shape positive attitudes towards the innovation, thus promoting its adoption.

O – Operation: The 'operation' phase aligns with Rogers' decision phase, where individuals engage in activities leading to the choice to adopt or reject the innovation. Here, community pharmacies should ensure a seamless and efficient operation of the electronic prescription process, facilitating the customers' decision to adopt this innovation.

P – Promotion: This phase corresponds to the implementation phase of Rogers' process, where the innovation is put into use. In the 'promotion' stage of the ADOPT framework, community pharmacies need to encourage customers to become frequent users of the electronic prescription service through promotions and by continuously updating the online portal to meet changing customer needs. Promotions and discounts should not be linked to the electronic prescription used or planned to be used but should rather be general to encourage the next purchase.

T - Trust: The 'trust' stage of the ADOPT framework maps onto the confirmation phase of Rogers' process, where individuals seek reinforcement for the innovation decision made. Trust building measures like data security, updates on order status, and customer support contribute to the customers' confirmation of the decision to adopt electronic prescriptions.

In addition to facilitating the understanding of electronic prescription adoption, this ADOPT framework helps community pharmacies identify opportunities to improve the customer experience, understand pain points and barriers, and address these challenges effectively. Thus, it contributes significantly to the professional knowledge of community pharmacy practitioners and sets a clear roadmap for electronic prescription service adoption.

Limitations

Of course, it is important to also acknowledge the limitations of any study, as they provide valuable insights into areas where improvements can be made in future research. In the case of this study, despite its rigorous methodology, there are still several limitations that need to be addressed. These limitations include factors such as the sample size, the generalizability of the findings, or potential biases in the data. By identifying and addressing these limitations, future researchers can build upon this study and create even more meaningful and impactful research in the field of community pharmacies and omnichannel retailing. Therefore, the following section will explain the main limitations of this study.

First, as the sample size of the qualitative interview was ten, the study may have missed out important perspectives or experiences that could be needed to identify relevant factors of adoption of electronic prescriptions. In addition, the small sample size may limit the depth and richness of the data collected, as there may be a limited range of responses and experiences represented in the data. Moreover, the fact that the interviews were only conducted in one region that is geographically close to the author represents a regional limitation. Hence, the findings of study one may not be generalizable to other regions of Germany. Finally, while efforts were

made to ensure confidentiality and data protection according to the university's guidelines, the self-reported nature of the interviews may also lead to social desirability bias, where participants may have provided answers, they felt were more socially acceptable, rather than their true opinions. All of these limitations may have prevented the identification of all relevant factors, leading to the study's inability to address them all.

Regarding study two, the online survey may suffer from selection bias as it was voluntary, and participants that are more likely to adopt electronic prescriptions may have been more likely to respond to the survey. This could lead to overestimation of the intention to adopt electronic prescriptions (AB1) and therefore may not accurately reflect the broader population's adoption. Furthermore, the adoption forecast based on the regression analysis showed to a certain extent some incoherence's with the answer to the dependent variable AB1, which indicates that further research may be necessary to explore more factors affecting the adoption of electronic prescriptions. This may also indicate that throughout study one not all relevant factors were identified. Moreover, the fact that the survey predominantly used Likert-scale questions may lead to some limitation as Likert scales typically have a limited number of response options, which may not fully capture the complexity of the respondent's opinion.

By addressing these limitations, future research can help to further understand the impact of electronic prescriptions and digitalization on community pharmacies in Germany.

Implications for future research

The potential impact of electronic prescriptions on community pharmacies including both business-related topics such as omnichannel effects as well as health-oriented ones such

as the overall quality of care remains unexplored in some important areas. For instance, Verhoef et al. (2017) emphasize the need for future research to investigate the effects of mobile technologies on both online and offline customer behaviour, as discussed in the literature review.

For example, the challenges that community pharmacies face in implementing electronic prescription technology solutions have not been thoroughly investigated so far. This is evident in the ongoing implementation period, which has already exceeded 10 years. Therefore, future studies could explore which electronic prescription system fits best with the factors that were identified as important for customers in this present study.

Future research could also investigate how community pharmacies can effectively communicate the benefits of electronic prescriptions to their customers, especially in terms of the significant advantages over the classic paper prescription process. This study showed that it is critical for increasing the adoption rate of electronic prescriptions. In addition, future studies could also explore the specific process expectations that customers hold regarding the use of electronic prescriptions, so that community pharmacies can tailor their processes to provide high levels of customer convenience. In a similar way, it is also recommended to investigate the specific communication channels preferred by different customer groups. This can help community pharmacies to tailor their communication strategies to meet the needs and preferences of their customers. In addition, it would be beneficial to explore how the use of different communication channels may influence customer behaviour and decision-making, and identify any potential barriers to accessing advice through these channels.

In a close context to communication, this study found some contradictory results regarding the effect of discounts on the adoption of electronic prescriptions. On the one hand, some customers perceived discounts as a positive incentive to adopt electronic prescriptions.

On the other hand, some customers were skeptical of discounts and perceived them as an attempt to manipulate them into using electronic prescriptions. Therefore, the impact of discounts on the adoption of electronic prescriptions is unclear and requires further investigation in future research. Additionally, in this context it might also be interesting to differentiate between personalized discounts and non-personalized discounts.

Finally, the study focused on customer ratings and did not explore the underlying reasons behind their ratings. Future research could investigate the reasons behind user preferences and behaviour to better understand their needs and expectations.

Hence areas for future research exist, and it is important to continue to explore and understand the impact and adoption of electronic prescriptions in the community pharmacy environment. This study has laid the groundwork for further research and has highlighted areas for future investigation. As Petrakaki et al. (2012, p.436) conclude, "possibilities are endless and future research is required to indicate which of them, and how, are going to be materialised."

Summary

This research project aimed to evaluate the impact of electronic prescriptions on community pharmacies in Germany and identified factors that influence customers' usage of electronic prescriptions. The project was divided into two studies – a qualitative study and a quantitative study – to address the research aims and questions.

The qualitative study aimed to identify relevant factors that positively or negatively influence the adoption of electronic prescriptions in community pharmacies in Germany. The study used semi-structured interviews with ten participants, which were analyzed using

thematic analysis. As a result, ten constructs including 31 factors were identified. Observability was excluded as a construct in study two because it was found that the benefits and advantages of using electronic prescriptions were already widely expressed by participants in other constructs. Hence, study one provided a solid foundation for study two, which involved analyzing the factors and correlations related to the adoption of electronic prescriptions.

In study two, the aim was to investigate the factors influencing the adoption as well as projecting the extent to which customers will adopt electronic prescriptions to purchase prescription drugs online in community pharmacies in Germany. The study used an online survey with a sample size of 500 participants, which was analyzed using descriptive statistics and multiple regression analysis. The results showed that perceived risk, relative advantage, compatibility, personalization, connectivity, consistency, and flexibility were all significant predictors of adoption, with varying levels of impact. The most significant factors were perceived risk, relative advantage, and compatibility, suggesting that addressing concerns around safety and emphasizing the benefits and advantages of electronic prescriptions are critical for increasing adoption rates. Additionally, the study found that personalization and flexibility are also important factors for customers, which indicates a need for community pharmacies to tailor their services to individual needs and preferences. Finally, the study identified several implementation challenges, including the integration of online and offline processes and the need for accessible and easy-to-use communication channels. Overall, the findings suggest that community pharmacies will need to invest in digital technology solutions so that they can provide customer with a central and secure digital hub to manager their electronic prescription processes.

As the sun sets on this research project, it can be concluded that the study provided valuable insights into the impact and adoption of electronic prescriptions at community

pharmacies in Germany. However, it is not only about the findings and the data, but rather the journey of exploration and discovery, the passion for uncovering new insights, and the hope for an ongoing future of nearly 18,000 community pharmacies and the customer they serve.

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Appendix

Appendix 1: Interview agenda study one

1. **General Introduction:**
    a. Interviewer provides a short introduction to the overall research topic

2. **Opening Questions:**
    a. Have you ordered medicine (either RX or non-prescription drugs) online?
    b. If yes, what was your major motivation to use an online channel?
    c. If yes, did you order at your local pharmacy or via a pure online pharmacy?
    d. (If not, can you imagine ordering RX at your community pharmacy via a digital channel?)
    e. If you can imagine, what is important for you that you will use electronic prescription via a digital channel at your community pharmacy?

3. **Construct: Complexity**
    a. Did you find it rather easy or complicated to use electronic prescription?
    b. What factors made it complicated to use?
    c. What factors made it easy to use?

4. **Construct: Tribality**
    a. Did the fact that you could easily try electronic prescription motivate you to use it?
    b. If yes, why?
    c. If no, why?

5. **Construct: Perceived risk**
    a. What kind of risk have you perceived before, during and after the use of electronic prescription?

6. **Construct 4: Perceived Compatibility**
    a. Did you feel that the process of getting the medicine is very different from the paper-based prescription process?
    b. If yes, why?
    c. If no, why?

7. **Construct: Observability**
    a. Do you see a benefit in using electronic prescription?
    b. If yes, why?
    c. If no, why?

8. **Construct: Perceived relative advantage**
    a. What are the main advantages of using electronic prescription?

9. **Construct: Personalization**
    a. Would you often use electronic prescription if you would get personalized offers based on your sales records?
    b. If yes, why?
    c. If no, why?

10. **Construct: Consistency**
    a. How important is it for you that product information and communication is consistent amongst offline as well as online sales channel?

11. **Construct: Flexibility**
    a. Do you expect flexible omnichannel services such as "click and collect"; "online advice" etc. offered by your community pharmacy?
    b. If yes, why?
    c. If no, why?

12. **Construct: Connectivity**
    a. What of the following services should be connected on- and offline?
        i. member accounts including sales history
        ii. stock levels
        iii. communication and marketing activities
        iv. consulting services
        v. vouchers

13. **Construct: Integration**
    a. Do you expect integrated services, such as pay online and pick-up at your local pharmacy?

14. **Closings Questions**
    a. Are there any factors that motivates you to use electronic prescription at your community pharmacy?

Appendix 2: Questionnaire study two

[S1a]: How old are you?
Values: 1-99

[S1b]: Age Record
Values: 1-6

1	18-29
2	30-39
3	40-49
4	50-59
5	60-69
6	70-79

[S2]: What gender are you?
Values: 1-3

1	male
2	female
3	diverse

[S3]: Where do you live?
Values: 1-99

1	Baden-Württemberg
2	Bayern
3	Berlin
4	Brandenburg
5	Bremen
6	Hamburg
7	Hessen
8	Mecklenburg-Vorpommern
9	Niedersachsen
10	Nordrhein-Westfalen
11	Rheinland-Pfalz
12	Saarland
13	Sachsen
14	Sachsen-Anhalt
15	Schleswig-Holstein
16	Thüringen

RA: How much do you agree with the following statements? I would use electronic prescription at my local pharmacy because…
Values: 1-5

1	strongly disagree
2	Disagree
3	I neither agree nor disagree
4	Agree
5	Agree

[RARA1] ...it would save me a lot of time
[RARA2a] ...I could order online and have the medication delivered to my home
[RARA3] ...I would not be bound to the opening hours anymore
[RARA4] ...I could order online and pick up the medication at the pharmacy
[RARA5] ...I could then check online whether the medication is available
[RARA6] ...I could then receive personalized offers
[RARA7] ...I could then simply check the delivery status online

PC: And how much do you agree with the following three statements? When using electronic prescription, it is important that...
Values: 1-5
1 Do not agree at all
2 Do not agree
3 Neither agree nor disagree
4 Agree
5 Agree completely
[PCPC1] ...the new process corresponds exactly to my ideas of recipe use
[PCPC2] ...there are clear advantages over the classic paper prescription
[PCPC3] ...it is very similar to my usual process for purchasing prescription drugs

CX: Which of the following factors would be important and which would be less important to you when using electronic prescription?
Values: 1-7
[CXCX1] A high degree of automation
[CXCX2] A high degree of digitization
[CXCX3] Simple and intuitive use
[CXCX4] Usability on many mobile devices
[CXCX5] Uniform use online (web store) and on mobile application (cell phone)
[CXCX6] All necessary information should be centrally available in the application
[CXTRI1] Special discounts and offers during use

TRI: I would test the electronic prescription if …
Values: 1-5
1 Do not agree at all
2 Do not agree
3 Neither agree nor disagree
4 Agree
5 Agree completely

[TRITRI2] ...the provider is trustworthy
[TRITRI3] ...I would receive a comprehensive explanation from my local pharmacy beforehand

CON: How much do you agree with the following statements? When using electronic prescription, I would like to...

Values: 1-5

1 Do not agree at all
2 Do not agree
3 Neither agree nor disagree
4 Agree
5 Agree completely

[CONCON1] ...that all possible communication channels (web store, mobile app) are connected with each other
[CONCON2] ...general advice can also be obtained via a digital channel
[CONCON3] ...,that communication (questions/consultation) is as easy to carry out as possible
[CONINT1] ...,that I can also view all relevant information (interactions, etc.) online
[CONINT2] ...,that the marketing offers can be used both offline and online
[CONINT3] ...that off- and online payments can be made
[CONF1] ...that as many processes as possible are integrated between online and offline
[CONPS1] ...do not receive personalized offers
[CONPS2] ...are explicitly informed about possible interactions

[CSr1]: How much information would you like to receive on the e-prescription?
Values: 1-7

PR: How much do you agree with the following two statements regarding data transmission? The digital transmission of electronic prescription data...
Values: 1-5

1 Do not agree at all
2 Do not agree
3 Neither agree nor disagree
4 Agree
5 Agree completely
[PRPR1] ...is not a problem for me
[PRPR2] ...should meet the highest safety standards

[AB1]: Thank you very much for your answers. Finally, we have two questions for you? How likely is it that you would use electronic prescription?
Values: 1-5

1 Very unlikely
2 Rather unlikely
3 Neither unlikely nor likely
4 Rather likely
5 Very likely

[AB2r1]: Beyond that, are there any requests or suggestions for using e-prescribing at your local pharmacy?
Open text response