Full-adoption of digital payment methods?
Barriers and barrier-breakers from a Swedish bank customer perspective

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To all past, present, and future PhD students!

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Glossary of abbreviations

Adopters-accepters (AAs)

Adopters-resisters (ARs)

Artificial intelligence (AI)

Automated teller machine (ATM)

Central bank digital currency (CBDC)

Digital payment methods (DPMs)

Financial technology (FinTech)

Innovation diffusion theory (IDT)

Innovation resistance theory (IRT)

Kontantupproret (KU)

Ordinal logistic regression (OLR)

Technology acceptance model (TAM)

Theory of perceived risk (TPR)

Variance inflation factor (VIF)

Young bank customers (YBCs)

x

Abstract

Digitalisation and the Covid-19 pandemic have accelerated the decrease in demand for cash worldwide. This also concerns Sweden, which might be on its way to being the first cashless country in the world. The idea of a cashless society is motivated by various assumed benefits, although it also entails certain inherent challenges. The overall aim of this thesis is to describe and analyse the relationships between barriers and barrier-breakers, respectively, by considering two groups of bank customers, i.e., adopters-accepters and adopters-resisters, and their intentions to fully adopt digital payment methods. A supplementary aim is to investigate moderating effects, because those can affect how barriers and barrier-breakers may increase or decrease the intention to adopt digital payment methods. The thesis includes two papers, one focusing on barriers and the other on barrier-breakers.

An online questionnaire was sent to the two groups of Swedish bank customers, i.e., young bank customers (representing adopters-accepters) and a social media group of cash advocates called Kontantupproret (representing adopters-resisters). The results reveal that adopters-accepters perceived privacy and access barriers to be significantly related to the intention to fully adopt digital payment methods, while adopters-resisters perceived only the impersonalisation barrier as significant. Moreover, both groups highlighted the credibility barrier-breaker, and the adopters-resisters also perceived usefulness and social influence as barrier-breakers in relation to the intention to fully adopt digital payment methods. Additional tests show that bank customers' past experience may increase the negative effect of the privacy, access, and impersonalisation barriers on the intention to fully adopt digital payment methods. At the same time, the impersonalisation barrier may decrease the positive effect of the barrier-breakers.

Keywords: Cashless society, Digital payment methods, Full-adoption, Barriers, Barrier-breakers, Bank customers, Adopters-accepters, Adopters-resisters, Sweden

Summary in Swedish

Digitaliseringen och Covid-19 pandemin accelererade det minskande kontantbehovet över hela världen och även i Sverige, som kan vara på väg att bli det första kontantlösa landet i världen. Idén till ett kontantlöst samhälle motiveras av olika fördelar, men samtidigt finns det också utmaningar. Det speglar två sidor av samma mynt. Det övergripande syftet med denna licentiatuppsats är att beskriva och analysera sambandet mellan barriärer respektive barriärbrytare och två grupper av bankkunders avsikter att fullt ut välja digitala betalningsmetoder. Ett kompletterande syfte är att fokusera på moderationseffekter eftersom de kan påverka hur barriärer och barriärbrytare kan öka eller minska avsikten att använda digitala betalningsmetoder. Licentiatuppsatsen innehåller två artiklar, som behandlar barriärer respektive barriärbrytare.

Ett enkätformulär skickades online till de två grupperna av bankkunder, dvs. unga bankkunder (som representerar "adopters-accepters") och en social media-grupp som kämpar för att behålla kontanter i samhället och som kallas Kontantupproret (vars medlemmar representerar "adopters-resisters"). Resultaten visar att "adopters-accepters" uppfattade integritets- och åtkomstbarriärer signifikant relaterade till avsikten att fullt ut använda digitala betalningsmetoder, medan "adopters-resisters" bara uppfattade opersonligheten som en betydande barriär. Båda grupperna uppfattade trovärdighet som en barriärbrytare, och "adopters-resisters" ansåg även att användbarhet och socialt inflytande var viktiga barriärbrytare i förhållande till avsikten att fullt ut välja digitala betalningsmetoder. Tillkommande tester visar att bankkunders tidigare erfarenheter kan öka den negativa effekten av integritets-, åtkomst- och opersonlighetsbarriärer. Opersonlighetsbarriären kan också minska den positiva effekt som olika barriärbrytare för med sig.

Nyckelord: Kontantlöst samhälle, Digitala betalningsmetoder, Fullständig adoption, Barriärer, Barriärbrytare, Bankkunder, "Adopters-accepters", "Adopters-resisters", Sverige

List of papers

This thesis is based on the following two papers.

Paper A

Title: Barriers to bank customers' intention to fully adopt digital payment methods

Authors: Irina Dimitrova, Peter Öhman, and Darush Yazdanfar

Status: Published in *International Journal of Quality and Service Sciences* (2022), Vol. 14, No. 5, pp. 16–36.

Paper B

Title: Barrier-breakers' influence on full-adoption of digital payment methods

Author: Irina Dimitrova

Status: A revised version has been submitted to an international journal.

1 Introduction

Everyone can create money; the problem is to get it accepted.

– Hyman Minsky

1.1 Background

In 1950, with the advent of the first computer-based banking services in America, the idea of a cashless society was born (Bátiz-Lazo *et al.*, 2014; Gießmann, 2018). The process started slowly, but, overall, the development of digitalisation has increased in pace in recent decades (Oertzen and Odekerken-Schröder, 2019). Internet banking was introduced in the 1990s, followed by mobile banking in the 2000s (Jiménez and Díaz, 2019). Today, bank cards, Internet banking, and mobile banking are generally accepted digital payment methods (DPMs).

Various digital payment alternatives have continuously been promoted by the banking industry and policymakers (Cohen *et al.*, 2020), and this process was intensified by the Covid-19 pandemic (Chen *et al.*, 2020; Leong *et al.*, 2022). In fact, rumours of Covid-19 spreading through cash use prompted retailers to replace cash acceptance with DPMs, even though the evaluated risk of Covid-19 infection through money exchange proved to be low (Foster and Greene, 2021). In a survey conducted in the USA in 2020, 58 per cent of the studied customers stated that they started to pay online after 2019 (Foster and Greene, 2021).

Movement towards a cashless society is a pressing issue worldwide (Fabris, 2019), not least in the Nordic countries (Arvidsson *et al.*, 2017). In Sweden, cash transactions are decreasing every year (Arvidsson, 2019), and cash payments were around just 6 per cent of the total number of transactions before the pandemic (Sveriges Riksbank, 2019). Driven by the pandemic, this proportion has continued to decrease (Sveriges Riksbank, 2021), although a sudden spike in cash demand increased automated teller machine (ATM) visits at the beginning of the current military crisis in Ukraine (Bankomat, 2022). Just a year ago, the Swedish government introduced a law requiring the biggest Swedish banks to offer cash services (Sveriges Riksbank, 2021).

Nevertheless, most bank branches in Sweden are cashless and the number of physical bank branches is gradually decreasing (Sveriges Riksbank, 2021). Considering these facts, researchers have recommended that Sweden is an appropriate setting for further studies of a potential cashless society. Rehncrona (2018) suggested choices of and preferences for payment methods for further research, and Larsson *et al.* (2016 p. 89) emphasised "a need for

more research on how personal financial behaviour may change in relation to the development of mobile and digital technology".

A cashless society sounds amazing, in view of all its potential benefits, for example, the possibility of paying independently of time and space (Rehncrona, 2018). However, we should also think about the potential challenges that can occur, such as the restriction of personal privacy (Larsson *et al*., 2016).

There are always two sides to a coin, so in this thesis, challenges will be treated as barriers and benefits as barrier-breakers. It should also be noted that the implementation and adoption of any technology are hindered by barriers (Moriuchi, 2021), and that barriers are related to perceived risks (Kuisma *et al*., 2007; Ram and Sheth, 1989) due to the significant role of such risks in innovation adoption and resistance (Sheth, 1981). Based on the overlapping of these concepts in many studies, risks and barriers are used as synonyms in this thesis.

Since "cashless society" can have an ambiguous meaning (Bátiz-Lazo *et al*., 2014, Rivera, 2019) and the concept is very abstract per se, this thesis uses the term "full-adoption of DPMs", meaning that DPMs are the only available payment means in society. Previous studies have mostly covered the early phases of DPM adoption. Dilaver (2014), Laukkanen (2016), and Yang *et al*. (2015), among others, focused on initial adoption, while Chawla and Joshi (2019), Oertzen and Odekerken-Schröder (2019), and Poromatikul *et al*. (2019) are among those who studied the post-adoption phase. Arvidsson *et al*. (2017) are among the few focusing on the full-adoption phase, although only from the merchant's perspective. Although full-adoption has been briefly discussed also by Lee *et al*. (2005) and Akana and Ke (2020), there seems still to be a lack of theoretical and empirical research on the full-adoption of DPMs from a customer perspective, not least in developed countries (Koenig-Lewis *et al*., 2015).

Given that Sweden some years ago was ranked in third place in terms of technology and infrastructure readiness among 90 developed and developing countries (Thomas *et al*., 2016), it is, indeed, an attractive case for research on the full-adoption phase. Full DPM adoption has not happened yet and could be described as "utopian" or a "fantasy" (Eaton, 2018). The focus of this thesis is accordingly on bank customers' intention to fully adopt DPMs. Intention could be a good predictor of actual future behaviour, according to the literature (Gupta and Arora, 2017; Lee, 2009; Martins *et al*., 2014). However, Moghavvemi *et al*. (2015) argued that external factors may affect the intention-behaviour relationship, and that intention does not always lead to action. This

possible limitation is known as the intention-behaviour gap. Nevertheless, this thesis uses intention as a predictor of actual behaviour with the proviso that the possible direct relationship between intention and actual behaviour to adopt DPMs has not been proven by previous research.

In a full-adoption scenario, it is useful to focus not only on barriers but also on barrier-breakers. First, implementing any technology brings about the emergence of various barriers that may slow or hinder the adoption process. In the case of DPMs, previous studies together with practice have highlighted the importance of several barriers, namely, privacy, security, access, and impersonalisation barriers (Laukkanen, 2016; Yang *et al*., 2015). Second, in searching for a solution, various barrier-breakers identified in the literature aim to eliminate or at least reduce the existing barriers to full DPM adoption. In particular, the ease-of-use, usefulness (e.g., Lee, 2009; Oertzen and Odekerken-Schröder, 2019), social influence (Tan and Leby Lau, 2016), and credibility (Rajaobelina *et al*., 2019) barrier-breakers appear to increase the intention to fully adopt.

As different groups of bank customers may perceive the full-adoption of DPMs differently (Lee *et al*., 2005), this thesis distinguishes between adopters-accepters (AAs) and adopters-resisters (ARs). AAs represent individuals who have already adopted and are willing to continue to increasingly use DPMs (cf. Planing, 2014). Given the possible coexistence of adoption and resistance, ARs represent individuals who have started using DPMs but are reluctant to use them more frequently (cf. Ram, 1987).

Although previous studies (e.g., Lian and Yen, 2013) have investigated adopters and non-adopters (e.g., Laukkanen *et al*., 2008; Lee *et al*., 2005), there is still a lack of research on various groups of adopters. While many studies have used adoption and acceptance as synonyms, Planing (2014) differentiated between these two concepts. Relatedly, adoption and resistance seem to be opposite and mutually exclusive, but they may nevertheless coexist (Ram, 1987). The fact that technology adoption will continue highlights the importance of research on various types of adopters; for example, AAs may become ARs in the future.

It must be noted that, in studying the adoption of financial service innovations, customers have rarely been targeted as research objects by researchers (Laukkanen, 2016). However, young bank customers (YBCs) are of interest because they usually adopt new technologies and innovations faster than do others (Tan and Leby Lau, 2016), giving them a rich technology experience. Although numerous studies examine young customers in general, there are calls for additional research on their financial consumption amidst

rapid digital development (Larsson *et al.*, 2016). In this thesis, YBCs are seen as representatives of AAs. There are also customers who generally reject innovations completely or somewhat (Laukkanen, 2016). In Sweden, the social media group Kontantupproret opposes the exclusive use of DPMs (Arvidsson *et al.*, 2017). Only a few studies have examined bank customers' rejection behaviour (Laukkanen, 2016), and one of the novelties of this thesis is that it also investigates such a group of bank customers, i.e., the KU group, as representatives of ARs.

1.2 Research question and aims

Based on the reasoning presented above, the thesis addresses the following research question:

- What are the relationships between barriers and barrier-breakers, respectively, and bank customers' intention to fully adopt DPMs?

The overall aim is to empirically describe and analyse the relationships between barriers and barrier-breakers, respectively, by considering two groups of bank customers, i.e., AAs and ARs, and their intentions to fully adopt DPMs. A supplementary aim is to investigate moderating effects, because those can influence how barriers and barrier-breakers may increase or decrease the intention to adopt DPMs.

The thesis contains two separate papers, the first (Paper A) focusing on barriers and the second (Paper B) on barrier-breakers. As indicated, various barriers can make the adoption process more difficult, and the aim of Paper A is to empirically investigate the relationship between a set of barriers and various bank customers' intention to fully adopt DPMs. Similarly, various barrier-breakers can make the adoption process easier. The aim of Paper B is therefore to empirically examine the relationships between barrier-breakers and various bank customers' intention to fully adopt DPMs.

Only official and publicly accepted DPMs are within the scope of this thesis. The focus is on generally accepted payment methods such as bank cards, Internet banking, and mobile banking. Existing and emerging digital currencies such as Bitcoin or various central bank digital currencies (CBDCs) are still not fully regulated by governments and are thus excluded from this thesis.

The rest of the thesis is structured as follows: The frame of reference (section 2), is followed by presentations of the methodology (section 3), a

summary of the papers (section 4), and concluding remarks (section 5). The thesis ends with the full texts of the two papers.

2 Frame of reference

2.1 Transition to digital payment methods

Before discussing the cashless society at greater depth, it would be beneficial to look briefly back on the history of "money", starting from barter exchange, followed by trading with shells and stones and then gold and silver, and ending in the use of coins, cheques, and banknotes, i.e., fiat money (Rivera, 2019; Thomas *et al*., 2016). The means of value exchange have gone through many stages over the ages to reach today's state, i.e., the digital money era (Thomas *et al*., 2016). Generally, all these previous forms of money have used some type of physical object, and at the end of the 20th century it was thought that cash would always be part of the payment system, despite all the new payment methods (Worthington, 1995).

However, the idea of a society without cash is nothing new. Related to the first computer-based bank services in America, people started to talk about a future without cash (Alt *et al*., 2018; Gießmann, 2018). Bátiz-Lazo *et al*. (2014, p. 104) described the "cashless society" as follows: "development in automation and computer technology will usher in a 'cashless society' in which all transactions are processed electronically without any use of paper money or checks".

Considering that just 1.4 per cent of transactions by value use cash in Sweden (Eaton, 2018) and that just 9 per cent of Swedes paid for their last purchase with cash (Sveriges Riksbank, 2021), the scenario of a possible cashless society seems realistic. Although we have seen a big change in the payment process in a relatively short time, the use of cash varies among parts of the world, including in Europe. It is interesting, for example, to compare Sweden and Germany, two developed countries geographically close to each other. Germany has the potential to go cashless, but statistics show that cash is still customers' dominant choice of payment method (Ng *et al*., 2021). Even in the largest developed countries, such as the USA, Canada, and Australia, many customers perceive cash as the preferred payment method with respect to ease-of-use, acceptance, and cost (Bagnall *et al*., 2016) and as a store of value in crisis (Chen *et al*., 2021).

In financial innovation research, adoption processes are found to go through various phases (e.g., Martins *et al*., 2014; Oertzen and Odekerken-

Schröder, 2019; Sivathanu, 2019). Dilaver (2014), Laukkanen (2016), and Yang *et al*. (2015) investigated the initial adoption phase, i.e., when customers start using DPMs. Chawla and Joshi (2019), Oertzen and Odekerken-Schröder (2019), and Poromatikul *et al*. (2019) studied the post-adoption phase, when there is more frequent use of DPMs than other payment methods. Few studies (e.g., Akana and Ke, 2020; Lee *et al*., 2005) have mentioned the concept of full-adoption, and previous research has seldom focused on this phase. The full-adoption phase can be regarded as the end of the post-adoption phase, when customers have past experience of DPMs without the possibility of choosing any physical substitute. In other words, full-adoption exists when bank customers use only a certain way of paying (e.g., DPMs).

An overall definition of digital payments is "payments made using electronic devices and channels" (Pizzol *et al*., 2018, p. 634). Different researchers have employed different formulations, such as payment instruments (Karoubi *et al*., 2016), online payments (Yang *et al*., 2015), electronic money (Singh, 2004), and cashless payments (Fabris, 2019; Pizzol *et al*., 2018). However, common to all these formulations is that they exclude cash as a payment method. To avoid misunderstandings, the term "digital payment methods (DPMs)" is applied here.

As indicated, the speed of transition from physical money to DPMs has differed from country to country. Swedish bank customers have reached the post-adoption phase, making Sweden one of the countries closest to the full-adoption of DPMs (Sveriges Riksbank, 2021). This could be because of Sweden's tendency to be an innovative country (Taalbi, 2019). Singapore is another country known for the development of innovations and for possibly stopping accepting cash (Ng *et al*., 2021). Although the Covid-19 pandemic has currently forced this transition to some extent all over the world (Sveriges Riksbank, 2021), economic and/or cultural barriers in some countries may slow the initial or post-adoption process by years or even decades. For example, most customers in developing countries lack adequate access to a sufficiently developed financial system (Rivera, 2019).

Today, the digitalisation of payments is an often discussed and experienced phenomenon. However, as Figure 1 shows, the history of DPMs began in the 1960s with the implementation of the first computers in the banking industry (Bátiz-Lazo *et al*., 2014). In Sweden, the initial adoption phase of the first DPM, i.e., bank cards, was followed by a post-adoption phase, when readiness differed depending on the types of customers and their willingness to pay with bank cards. In 1990s, the adoption of Internet banking began, followed by a post-adoption period. The development of digital

technologies accelerated, and later on another DPM was released, i.e., mobile bank applications.
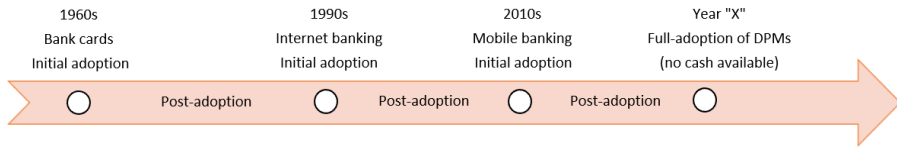
Figure 1. Timeline: DPM adoption phases in Sweden.

The DPM adoption timeline in Figure 1 has prompted researchers and governments to start thinking about the near future. Arvidsson (2019) has forecasted that most Swedish merchants will stop accepting cash by 2025. Considering the constant decrease in cash use, full-adoption of DPMs no longer seems unrealistic, but just a matter of time.

2.2 Cash vs. digital payment methods

According to Thomas *et al*. (2016), Sweden is among the countries most materially ready to take the next step in DPM development. This means that it already possesses digital payment system solutions, infrastructure, and regulations. Although the USA was ranked close to Sweden, cash is still preferred by many American customers (Bagnall *et al*., 2016). Although the focus of this thesis is on DPMs, it is important to discuss them in relation to cash. Furthermore, full-adoption of DPMs (i.e., a cashless society) cannot be investigated without paying attention to cash as part of the traditional payment system.

2.2.1 Advantages and disadvantages of cash

Cash plays a significant role in the payment system. This payment method is not only smooth but is also considered to favour the privacy of Swedish customers (Lundberg *et al*., 2014). According to Singh (2004), Australians, for example, preferred to pay with cash for small transactions, considering it the most convenient payment method. Although the Covid-19 pandemic changed payment habits to some extent, Australian and also Canadian customers still demand cash as a store of value (Chen *et al*., 2021). Recently, a US survey showed that customers prefer cash due to better control and lack of additional requirements, in comparison with DPMs (Alvarez *et al*., 2022).

However, criminal abuse, money laundering, and corruption are among the main weaknesses of cash globally (Rivera, 2019). Moreover, it is difficult to use cash over great distances and when large amounts are involved (Bátiz-Lazo et al., 2014). Numerous studies from various countries have emphasised high costs as a major disadvantage of using cash (Arvidsson et al., 2017; Bátiz-Lazo et al., 2014; Lundberg et al., 2014; Worthington, 1995). These costs originate from cash administration, transportation, theft, etc. For these reasons, the banking industry is working hard to promote various types of DPMs as substitutes for cash.

2.2.2. Advantages and disadvantages of digital payment methods

Nowadays, many activities in our lives depend on digitalisation. Most everyday activities, such as communication, shopping, working, studying, relaxing, and leisure activities, are managed using various digital gadgets. This digitalisation is pushing us to adapt ourselves at a rapid pace. Speaking of shopping, we are already familiar with several payment methods that can be used in the checkout stage, including bank card transactions, online transactions, mobile applications, and e-wallets. Use of such DPMs is increasing in the everyday payment process and more and more people tend to use them (Arvidsson et al., 2017; Larsson et al., 2016; Sveriges Riksbank, 2020).

The possibility of conducting transactions at any time of day and from any location is an important advantage of DPMs (Rehncrona, 2018). Another advantage of DPMs is that they reduce the costs of transporting and distributing cash (Bátiz-Lazo et al., 2014; Lundberg et al., 2014). Mobile applications are increasingly popular for payments, and these applications offer relatively high security not only online but also in physical shops (Johnson et al., 2018). However, customers still perceive some DPMs as too easy to use, so they are perceived as insecure (Rehncrona, 2018). In the next sections, the disadvantages of DPMs in terms of barriers and the advantages in terms of barrier-breakers will be discussed.

2.3 Barriers related to digital payment methods

2.3.1 The barrier concept

A point of departure for the first study of this thesis is the theory of perceived risk (TPR) and innovation resistance theory (IRT). Perceived risks play a key role in the process of adopting digital payment systems (Yang et al., 2015), and these risks may limit the readiness to fully adopt DPMs (Thomas et al., 2016).

As studies (e.g., Laukkanen, 2016; Martins *et al.*, 2014; Yang *et al.*, 2015) have investigated both perceived risks and barriers in the banking context, a review of these concepts is required. According to Featherman and Pavlou (2003, p. 454), perceived risk is defined as "the potential for loss in the pursuit of a desired outcome of using an e-service". However, since this thesis uses the barrier concept, it follows the definition of Lee (2009, p. 130), that perceived risk is "a prominent barrier to consumers' acceptance of online banking".

These barriers could be categorised as functional and social-psychological (cf. Ram and Sheth, 1989). The three types of functional barriers under study are the privacy barrier (Larsson *et al.*, 2016; Pizzol *et al.*, 2018; Yang *et al.*, 2015), security barrier (Wopperer, 2002; Yang *et al.*, 2015), and access barrier (Barnes, 2007; Karoubi *et al.*, 2016; Thomas *et al.*, 2016). The two social-psychological barriers under study are the impersonalisation barrier (Larsson *et al.*, 2016; Singh, 2004) and trust barrier (Rehncrona, 2018; Singh, 2004; Yang *et al.*, 2015). These concepts and the related definitions are presented in Figure 2.

Risks (TPR)	Barriers (IRT)	Barriers (thesis)
Privacy risk Disclosure of consumer's private information	**Risk barrier** Degree of risk inherent in an innovation, such as the possibility of bank account misuse (i.e., privacy and security risks)	**Privacy barrier** Monitoring, lack of control over private data
Security risk System or software of e-banks and third parties is unstable or vulnerable to network attacks		**Security barrier** Data can be stolen and misused
------------------------	------------------------	------------------------
Functional/time risks Online payments will not render the benefits consumers expect due to system limitations/ wasted time and waiting for the completion of the entire online payment process	**Usage/value barriers** Innovation's incompatibility with consumer's practices or habits/inability to produce economic or performance-based benefits	**Access barrier** Unavailability due to system breakdowns and errors
------------------------	------------------------	------------------------
Service/psychological risks Encountering low-quality service/ uncertainty in online payments will affect customer's mood	**Tradition barrier** Personality, habits, and routines	**Impersonalisation barrier** Lack of personal, face-to-face services
------------------------	------------------------	------------------------
Trust Willingness to perform payment transactions over the Internet and expectation that the payment platform will fulfill its obligations		**Trust barrier** Lack of reliability and trustworthness in digital payment system

Note: TPR = Theory of perceived risk; IRT = Innovation resistance theory

Figure 2. Concept matching, Paper A.

The first column shows the five introduced concepts based on TPR, adopted and modified by Yang *et al*. (2015). These authors suggested that the most common investigated risks are the privacy risk (i.e., disclosure of a consumer's private information), security risk (i.e., the system or software of e-banks and third parties is vulnerable to network attacks), and trust risk (i.e., the willingness to use DPMs with the expectation that payment platforms fulfil their requirements). In addition, they proposed the functional/time and service/psychological risks.

The second column includes the main concepts based on innovation resistance theory (IRT) implemented by Kuisma *et al*. (2007) and Laukkanen

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and Kiviniemi (2010). These authors investigated various barriers such as the risk barrier (i.e., the degree of risks inherent in an innovation, such as bank account misuse) and the usage/value barrier (i.e., the innovation's incompatibility with consumer practices or habits and its inability to produce economic or performance-based benefits). Also highlighted was the tradition barrier related to personality, habits, and routines.

The third column presents the concepts used in this thesis. These concepts were adopted and/or modified from the concepts in the previous two columns. Here, simplicity and a balance between theory and practice were desired. The privacy and security barriers in the third column correspond to the privacy and security risks (Yang *et al.*, 2015) and risk barriers (Kuisma *et al.*, 2007; Laukannen and Kiviniemi, 2010). The access barrier corresponds to the functional risk and the usage/value barrier. Karoubi *et al.* (2016) argued that previous studies have paid limited attention to the issues of access, time-wasting, and availability. Time-wasting and availability are, however, logically related to the access concept, for example, unavailability of DPMs due to technical issues (Karoubi *et al.*, 2016). The impersonalisation barrier emphasised by Singh (2004) corresponds to service/psychological risks (Yang *et al.*, 2015) and the tradition barrier (Kuisma *et al.*, 2007; Laukannen and Kiviniemi, 2010). The trust barrier is adopted from Yang *et al.* (2015) and is here treated as distrust.

The barrier as a concept was adopted from IRT, while every selected barrier in this thesis was adopted and modified based on previous studies and/or a combination of TPR and IRT, as illustrated in Figure 2. A point of departure was to find the balance between relevant theory and up-to-date practice. The functional and social-psychological barriers are described below.

2.3.2 Functional barriers

Privacy is a frequently discussed factor affecting the development of full digitalisation and a cashless society (Bátiz-Lazo *et al.*, 2014; Dahlberg *et al.*, 2008; Larsson *et al.*, 2016; Lundberg *et al.*, 2014; Rehncrona, 2018; Thomas *et al.*, 2016). Recent years have indicated a need for more legislation to protect consumers' data and their private lives. Vulnerable groups of people may easily become the targets of merchants due to everyday monitoring of their private behaviour on the Internet (Larsson *et al.*, 2016). Researchers (e.g., Larsson *et al.*, 2016; Scarpi *et al.*, 2022) have highlighted the need for additional investigations of what and how privacy issues may change consumer behaviour in terms of digital payments and access to big data.

Based on previous studies (Dahlberg *et al*., 2015; Larsson *et al*., 2016; Thomas *et al*., 2016; Wopperer, 2002), *security* is identified as one of the most significant factors affecting digital payments. The security level in e-commerce and m-commerce has a strong impact on customers' choice of payment methods. Thomas *et al*. (2016) highlighted the need for increased knowledge of security issues, since fraud and hacker attacks exist in relation to DPMs. Even though e-commerce and m-commerce websites are protected, there is always a potential risk that data and/or money can be stolen and misused by hackers (Wopperer, 2002). For example, private financial data can relatively easily be stolen online, and regular DPMs are perceived to be insecure (Moriuchi, 2021). Some customers may even perceive that banks allow their customers "to be robbed" due to poor security arrangements. A problem here is that accessibility and security do not go hand in hand, and the security level is perceived to be lower when customers can use their money quickly and conveniently without any particular effort (Rehncrona, 2018). Relatedly, Kahn *et al*. (2017) emphasised the importance of security investigation as the basis on which banks and policymakers can build customer confidence in payment instruments, while Dahlberg *et al*. (2015) described the important role of security together with trust.

In theory, it is possible for bank customers to access their money 24/7, but in practice digital payments can occasionally fail. Despite this, the *access barrier* has seldom been highlighted in previous DPM studies. However, according to Thomas *et al*. (2016, p. 359), one challenge is as follows: "Similarly, if access to the internet, smartphones or mobile telephony is costly in relation to the average wage, then the infrastructure becomes less available for both companies and individuals to access. This reduces the readiness of a country for digital money adoption". In case customers encounter any disruptive issues related to bank service access, or feel impatience (Kamalul Ariffin *et al*., 2018), it can be important to visit a physical bank office (Shin, 2021). The importance of disruption of e-banking is also emphasised because it can impede customers from accessing their money when needed (Arvidsson *et al*., 2017; Barnes, 2007).

2.3.3 Social-psychological barriers

The *impersonalisation barrier* exists on several levels in bank-customer relationships. A first issue is that digital money changes customer perceptions of money's value. When people lack direct physical contact with their money, it is easier to spend more money and buy unnecessary things (Larsson *et al*., 2016). A second issue is that the lack of face-to-face communication increases

customer dissatisfaction with banks, because customers may need personal attention and interaction (Singh, 2004). Personal interaction between customers and bank representatives is rated highly (Barnes, 2007; Strandberg *et al.*, 2015). Even in Sweden, where digitalisation is a big part of everyday life, most customers prefer to be able to choose when to use and not use artificial intelligence (AI) in application/technical usage (Insight Intelligence, 2018). It is important for banks to take this into account when applying any AI solution. For example, chatbots are often evaluated negatively in bank-customer communication (Insight Intelligence, 2018). A third issue is waiting time, or queues. Telephone and online queues, together called tele-queues (Brown *et al.*, 2005), are a potential problem in bank services.

All the above issues can be related to and summarised under the concept of impersonalisation, which has become increasingly common in the digital world because of the rapid transition from human-to-human to human-to-machine interaction. Impersonalisation is interpreted as "rid of such human characteristics as sympathy, warmth, etc; dehumanize" (Collins, 2014). This definition is confirmed by studies arguing that impersonalisation is a negative factor in bank-customer relationships (Bátiz-Lazo *et al.*, 2014; Dimitrova and Öhman, 2021; Singh, 2004).

Trust is the basis of long-term relationships. Customers' trust in intermediaries during the payment stage depends on the customers' choice of payment method (Rehncrona, 2018). Regarding the online payment context, Yang *et al.* (2015, p. 13) adopted Mayer *et al.*'s (1995) definition of "trust" as "a psychological state leading to the willingness of customers to perform payment transaction over the Internet and expect the payment platform fulfilling its obligations, irrespective of customers' ability to monitor or control payment platform's actions". Trust is often related to how secure payment systems are in terms of handling private data (Singh, 2004). Customers' beliefs may differ even within a country, for example, between rural regions and big cities. Moreover, bank customers perceive DPMs as not as trustworthy as they should be for some financial activities (Singh, 2004). Lack of trust can lead to lower perceived functionality in digital payments, and in a worst-case scenario, the system may not work at all (Arvidsson, 2014).

2.4 Barrier-breakers related to digital payment methods

2.4.1 The barrier-breaker concept

The barrier-breaker concept is used in response to the barrier concept in IRT, aiming to emphasise the positive factors that can break or at least reduce

certain barriers. Some studies have used the terms "enablers", "motivators", "drivers", or "facilitators" for positive factors and the term "inhibitors" for negative factors affecting the adoption of innovations (e.g., Chouk and Mani, 2019; Humbani and Wiese, 2019; Ng *et al*., 2021). However, a point of departure for Paper B is the "determinant" concept in the technology acceptance model (TAM) and the related concepts of "motivator" in the innovation diffusion theory (IDT).

The barrier-breakers under study are ease-of-use (Davis *et al*., 1989; Laukkanen, 2016), usefulness (Davis *et al*., 1989), social influence (Davis *et al*., 1989; Venkatesh *et al*., 2003), and credibility (Luarn and Lin, 2005). Ease-of-use and usefulness have been found to positively affect the adoption of DPMs (Thomas *et al*., 2016). Studies by Martins *et al*. (2014), Tan and Leby Lau (2016), and Venkatesh *et al*. (2003) have considered social influence to be significant in the adoption process. Perceived credibility has more or less been neglected in previous modified versions of TAM, although its importance is evidence based (Luarn and Lin, 2005). However, considering various crises and the fast-changing environment, credibility is of interest in relation to the current topic. All these concepts and definitions are illustrated in Figure 3.

Determinants (TAM extensions)	Motivators (IDT)	Barrier-breakers (thesis)
Perceived ease-of-use Degree of effort required for technology use	**Complexity** Degree to which an innovation is perceived as difficult to use	**Ease-of-use** Easy to learn and use a technology
Perceived usefulness Degree of expectations compared with actual performance	**Relative advantage** Degree to which an innovation is perceived as providing more benefits than its predecessor	**Usefulness** Degree of convenience and required time
Perceived social influence Influence of people important to the customer in her/his decision to use a technology; public or social context where user can observe others' behavior	**Observability** Extent to which an innovation is visible to the members of a social system, and to which the innovation's benefits can be easily observed and communicated	**Social influence** Public or family's/friends' influence; status in society
Perceived credibility Extent to which a consumer believes that there are no security and privacy threats	**Compatability/trialability** Degree to which a service is perceived as consistent with user's existing values, beliefs, habits, and present and previous experiences/capacity to experiment with new technology and minimize certain fears of the unknown	**Credibility** Official acceptance, legitimacy, and certification based on professional/authorized privacy and security measures

Note: TAM = Technology acceptance model; IDT = Innovation diffusion theory

Figure 3. Concept matching, Paper B.

The first column shows the relevant concepts derived from TAM and its extensions based on the work of Davis *et al*. (1989), Luarn and Lin (2005), and Venkatesh *et al*. (2003). Davis *et al*. (1989) described perceived ease-of-use as the degree of effortless technology use, and perceived usefulness as the degree of expectations relative to actual performance. Davis *et al*. (1989) and Venkatesh *et al*. (2003) described perceived social influence in terms of the people important to the customers in their decision to use a technology. Koenig-Lewis *et al*. (2015, p. 544) defined the concept in the following way: "public or social context where users can observe others' behavior". Perceived credibility is described as the extent to which a customer believes that there are no security and privacy threats connected to using DPMs (Luarn and Lin, 2005).

The second column includes concepts derived from innovation diffusion theory (IDT) based on Rogers (1995). Wang *et al*. (2018) applied IDT in the banking context and used the first two concepts presented in Figure 3. Based on the similarities of the definitions, complexity is linked to perceived ease-of-use and relative advantage refers to perceived usefulness in column 1. Observability, described as the observed benefits possible to communicate in an easy way (Al-Jabri and Sohail, 2012), corresponds to perceived social influence. In addition, comparing the definitions of compatibility and of trialability reveals similarities to the concept of perceived credibility in column 1.

The third column presents the concepts used in this thesis. They are adopted and/or modified from the concepts listed in the previous two columns. Based on perceived ease-of-use (Davis *et al*., 1989) and reversed complexity (Rogers, 1995; Wang *et al*., 2018), the ease-of-use barrier-breaker is relevant in the context of DPMs. Similarly, the usefulness barrier-breaker concept corresponds to perceived usefulness (Davis *et al*., 1989) and relative advantage (Rogers, 1995; Wang *et al*., 2018). The remaining barrier-breakers, i.e., social influence and credibility, are related to the corresponding determinants in the TAM extension and the corresponding motivators in the IDT model.

2.4.2 The selected barrier-breakers

The *ease-of-use barrier-breaker* is found to be significant for customers' intention to use new payment methods (Laukkanen, 2016). The development of most technologies is driven largely by customers' desire for more convenience (Sivathanu, 2019). However, innovations such as the newest smartphones equipped with many features can be perceived as too complex (Mun *et al*., 2017). DPMs, for example, are expected to be effortless to use: it should be possible to execute all payments around the clock, no matter where (Bravo *et al*., 2019; Rehncrona, 2018).

Usefulness is related to the expected advantages that users can accrue from adopting a technology (Kurila *et al*., 2016), and it could positively affect the DPM adoption process (Thomas *et al*., 2016). Usefulness is essential to customers' intentions and behaviour in adopting different innovations in financial services (Yang *et al*., 2015), and is related to efficiency and effectiveness (Roy *et al*., 2018), such as more convenience, more transparency, 24/7 access, and faster/smoother transactions (Zhang *et al*., 2018). Another important feature of usefulness of DPMs is to be free of error, i.e., accurate (Davis *et al*., 1989).

Social influence is a determinant positively related to customer intention (Martins *et al*., 2014) in the extension of the TAM2 model (Lai, 2017). Studies have investigated the effect of social influence on customer intention regarding technology adoption, and social influence is evaluated as most important for predicting customers' intention in this respect (Martins *et al*., 2014; Tan and Leby Lau, 2016). It is important to note that social influence is significant in the early stages of mandatory technology use (Lai, 2017; Venkatesh *et al*., 2003). Thus, it can be assumed that this determinant will also be significant in terms of the full-adoption of DPMs, i.e., when no non-digital payment alternative is available.

Credibility is a trust-based factor but at the same time is distinguished from trust (Luarn and Lin, 2005). According to Wang *et al*. (2003), credibility is part of the trust concept. According to Gupta and Arora (2017), credibility was added by Luarn and Lin (2005) and Koksal (2016) as a determinant in extensions of the TAM model in relation to m-banking adoption. The concept emerged in the 1970s and is context dependent. For example, there is a difference in credibility between private banks and central banks (Aguir, 2018). However, it is assumed that credibility applies to every bank, and that credibility plays an important role in monetary policy. Such policy is credible when the public believes in a bank's strategy. Also important is that "the lack of credibility can hinder the achievement of a certain goal because expectations are formed in a context of mistrust" (Aguir, 2018, p. 93).

2.5 Various groups of bank customers

Significant factors contributing to superior bank performance are service, innovation, and financial aspects (Boström *et al*., 2015). In this regard, it is important to investigate various types of bank customers and their intention to fully adopt DPMs. Many bank customers in developed countries have already adopted and accepted DPMs (Ng *et al*., 2021). Several years ago, 70 per cent of Swedish bank customers reported using mobile bank applications (Sveriges Riksbank, 2019), indicating that some customers do not use their mobiles to pay. Comparisons between adopters and non-adopters are relatively common in previous studies (e.g., Laukkanen, 2016; Laukkanen and Kiviniemi, 2010). However, there are some bank customers who use DPMs while also partly resisting them (Laukkanen and Kiviniemi, 2010; Ram, 1987). As indicated, this thesis focuses on two groups of bank customers: YBCs representing AAs, and bank customers who actively sympathise with the social media group Kontantupproret representing ARs.

As mentioned in the first section of this thesis, young adults include university students. The age range of YBCs differs among studies, most of which define YBCs as 18–29 years old. In Sweden, as in most countries, people must be 18 years old to manage their own bank accounts. Additionally, most university students also fit in this age group. In terms of payment habits, YBCs adopt new technologies relatively quickly and are more likely to pay with DPMs rather than cash (Bagnall *et al*., 2016; Laukkanen, 2016; Lundberg *et al*., 2014). In Sweden, YBCs tend to trust and adopt DPMs (Sveriges Riksbank, 2020). They are already adopters with a high willingness to continue to use DPMs, and may therefore be suitable to represent AAs.

A specific group of customers studied here consists of members of the social media group Kontantupproret, a Swedish word roughly meaning "rebellion for cash". The main impetus for forming this group was to highlight the need for cash as a payment method. Moreover, since many banks in Sweden do not accept cash or in some cases are even branchless, Kontantupproret fights for the re-acceptance of cash by banks (Arvidsson *et al*., 2017). Although statistics indicate a lower demand for cash (Eaton, 2018), the discussions in this group show that there are still various problems related to DPMs. Following the example of Laukkanen (2016), this group of bank customers may be suitable to represent ARs.

Regarding the development of the digital payment system in Sweden, most of the population are bank customers with at least some DPM experience. Logically, it can be assumed that people belonging to the two selected groups of bank customers have already adopted DPMs although not to the same extent.

2.6 Research model

The research model illustrates how the aforementioned concepts in papers A and B are related to the DPM concept. Moreover, the model shows the role of the moderating variables and the control variables.
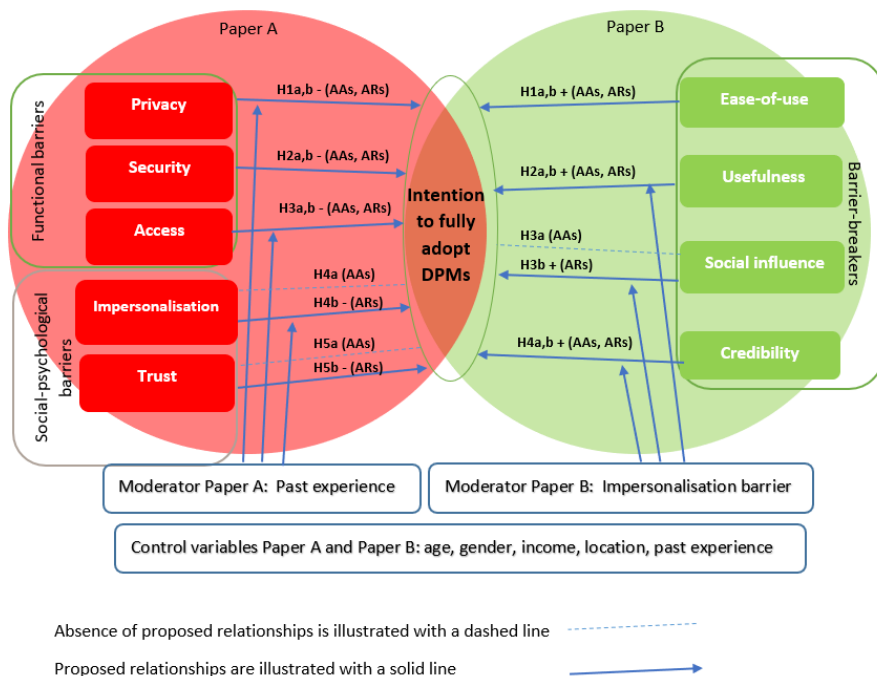
Figure 4. Overall research model.

On the left (red) side of Figure 4, the barriers in Paper A are divided into two main categories, i.e., functional and social-psychological barriers. The right (green) side of the figure shows the barrier-breakers investigated in Paper B. The red and green circles overlap each other in the shared concept of intention to fully adopt DPMs. The two circles also show that adoption and resistance may coexist, in that ARs are one of the two customer groups under study.

The hypotheses related to the two groups of bank customers (i.e., AAs [YBCs] and ARs [KU]) are included in the model. In Paper A, five main hypotheses were developed to test the relationships between the privacy, security, access, impersonalisation, and trust barriers and the intention to fully adopt DPMs. According to the model, AAs and ARs perceive the impersonalisation and trust barriers differently, illustrated by two different lines in Figure 4. The hypotheses and the results of the hypothesis tests are presented in section 4, "Summary of the papers".

In Paper B, four main hypotheses were developed to test the relationships between the ease-of-use, usefulness, social influence, and credibility barrier-breakers and the intention to fully adopt DPMs. Notably, AAs and ARs are expected to perceive the social influence barrier-breakers differently, illustrated by the dashed and solid lines in Figure 4. These hypotheses and the related test results can also be found in section 4.

The moderating roles of past experience discussed in Paper A and the impersonalisation barrier discussed in Paper B are also integral parts of the model. Based on the study of Renouf *et al.* (2010), past experience is used as a moderator in the additional analysis in Paper A because it may affect the relationships between barriers and the intention to fully adopt DPMs. The impersonalisation barrier discussed in Paper B may have a key role in the relationships between barrier-breakers and the intention to fully adopt DPMs, especially during and after the Covid-19 pandemic (Dimitrova and Öhman, 2021; Mozafari *et al.*, 2022). By replacing human-to-human services with human-to-machine services, the impersonalisation barrier appears to negatively affect the positive relationships between barrier-breakers and the intention to fully adopt DPMs.

In addition to the main concepts, the literature has highlighted the importance of age, gender, income, location, and past experience as control variables in this context (Venkatesh *et al.*, 2003; Yousafzai, 2012). Considering the samples of YBCs and Kontantupproret members, age continues to be of interest. Gender appears to be a significant factor in relation to financial decisions, with women normally having more concerns than do men (Guido *et al.*, 2020). Whether individual income is low or high may influence the adoption process (Johnson *et al.*, 2018; Martins *et al.*, 2014), as can location, i.e., whether individuals are rural or urban dwellers (Yang *et al.*, 2015). Past experience is also included as a control variable because bank customers are expected to already have experienced DPMs. In line with Renouf *et al.* (2010), past experience is used as a control variable at certain stages of analysis and also as a moderator in the additional analysis. The moderating variables and control variables are shown in the research model in Figure 4.

3 Methodological considerations

3.1 Philosophy of science

At the beginning of every scientific study, the researcher needs to look back to the roots of the philosophy of science and answer related questions in order

to find a suitable paradigm and approach for the study. This includes the choice of research question, literature, study design, and methods for data gathering and analysis. The researcher's experiences and beliefs cannot be omitted, particularly not in the social sciences.

Positivism seems aligned with this thesis, in which data are measured statistically as they are, i.e., objectively. Positivism is very strict as to its assumptions, however, which differs from the aim of this thesis with its focus on bank customer intention. Moreover, the empirical data are based on respondents' perceptions. Skinner (1976) argued that mental states such as intentions and perceptions should not be ignored just because it is difficult to be completely objective about them. Since intentions and perceptions are not simply black and white, this thesis is more closely aligned with behaviourism, as a developed part of positivism.

Behaviourism was originally primarily related and limited to actual physical behaviour based on stimuli measured using experimental methods. Operant behaviourism was later developed, focusing on purpose and intention, particularly oriented to the future when something will happen (Skinner, 1976). Diesing (1966) emphasised that behaviourists can also use other methods such as surveys to measure internal factors. In this thesis, intention, as an unobservable factor, is studied in a behaviouristic way by means of survey research.

As illustrated in Figures 5a and 5b, Kleineberg (2021) described the objective-subjective dimension based on the elephant metaphor, illustrating how multiple blind persons perceive an elephant in different ways depending on their perspectives. There are different versions of the metaphoric elephant story in Indian folklore, telling of six blind men who heard of an animal called an elephant but did not know what it was like. The first person touched the trunk and said, "The elephant is like a snake", the second person touched the ear and said, "No, it is like a fan", and so on. In other words, the reality of the elephant can be perceived in different ways based on different subjective experiences.
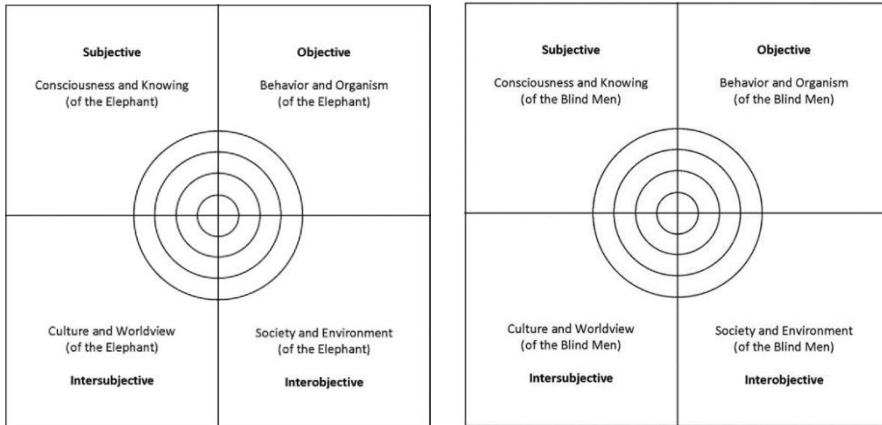
Figure 5a, b. Levels of being and knowing (Kleineberg, 2021).

Figure 5a presents the four levels of being (ontology) of the elephant. The elephant illustrates the research phenomena, which can be related to the intention to fully adopt DPMs. Quadrant 1 (upper left) refers to first-person internal phenomena, i.e., thoughts, feelings, and perceptions, which refer to the nature of reality (ontology). In this thesis, the reality is subjective since intention is a subjective factor (Diesing, 1966). Figure 5b presents the four levels of knowing (epistemology) of the blind men. Quadrant 2 (upper right) refers to behaviour measured objectively, i.e., the third-person external perspective of the researcher.

Foxall (1986) argued that a stimulus-response behavioural approach is fundamental to the science of consumer behaviour. In particular, individuals' behaviour and pre-behaviour (i.e., intention) are subjective phenomena (see the elephant metaphor) that depend on environmental factors, here concerning the adoption of innovations. External factors appear to be more important than individuals adopting roles according to conditions they encounter in the environment. This could be illustrated by human-technology relationships and, in particular, by payment systems (cf. Burrell and Morgan, 1979). This thesis investigates bank customers' intention to fully adopt DPMs through the lens of behaviourism as a research philosophy.

3.2 Literature selection

All sources used in this thesis were carefully selected based on their relevance and credibility. Various search tools were used, with Google Scholar and Emerald Insight, among others, being preferred because they offered a large

number of sources in one place and useful filter options. Google Scholar was used with caution, however, due to the mixed types of sources it identified. Only peer-reviewed, ABS-ranked journals or books, book chapters, and reports from credible publishers were selected for further investigation. The credibility of publishers was based on their reputation and the information provided on their websites.

This thesis draws mostly on recently published peer-reviewed articles. The adoption of DPMs as part of the digitalisation process is a rapidly changing issue requiring updated literature, i.e., from the 2019–2022 period. However, sources from earlier years were also examined when deemed relevant. This type of business research literature review allowed this to be a state-of-the-art thesis, supported by robust and evidence-based studies (cf. Snyder, 2019).

Various keywords and combinations thereof were used during the search process to select sources for further review. At the very beginning of the process, broader and more abstract words such as "cashless", "cashless society", "digitalisation", and "financial" were used, and the relevant sources were downloaded and added to our customised database. The search process continued with the use of more concrete words and phrases, such as "adoption", "full adoption", "digital payment method", "digital banking", and "bank customers/consumers", primarily located in titles and abstracts.

3.3 Main and complementary methods

A survey was chosen as the main quantitative method for papers A and B. Vellido *et al.* (2000) emphasised the practical value of this method in e-commerce studies, while the need for more quantitative studies of barriers was highlighted by Joachim *et al.* (2018). The questionnaire used in papers A and B was based primarily on previous studies, but also on virtual passive observation (i.e., netnography), which was applied as a complementary method to build relevant and up-to-date questions.

The questionnaire used is shown in the Appendix, where the main variables as well as their operational definitions, items, and supporting sources are presented. When developing the questionnaire, all items were cross-revised in order to reduce the potential bias (cf. Podsakoff *et al.*, 2003). A pilot study was conducted as an essential step when developing the survey instrument (cf. Hazzi and Maldaon, 2015). In total, 31 mixed-age respondents were contacted for testing and improving the readability and comprehensibility of the items (cf. Chawla and Joshi, 2019). The questionnaire included a brief cover letter presenting the aim of the study, followed by three

main sections. The first section comprised a filter question selecting only respondents who were customers of Swedish banks; this was followed by the core section related to the hypotheses, comprising items regarding barriers and barrier-breakers. At the end of the questionnaire, demographic items were included. The demographic section was presented late in the questionnaire to allow respondents to focus directly on the main topic and to prevent respondents from leaving the questionnaire before seeing the main items (cf. Dillman, 2007).

The questions in the core section used a four-point Likert scale anchored at 1 (strongly disagree) and 4 (strongly agree), since this allows the relative measurement of concerns (cf. Cottrill and Thakuriah, 2015). Moreover, since the respondents may overuse "neither" options, Likert scales without midpoints are considered appropriate as they avoid central tendencies and social desirability biases (Albaum *et al.*, 2010). Moreover, reliability test results can vary based on the type of scale, indicating that lower values can be assumed for four-point than six-point Likert scales (Nadler *et al.*, 2015).

This main method could be considered good enough to sustain a study by itself, but use of a supplementary method could contribute to increased credibility (Hussein, 2009). The supportive role of a qualitative method in building a reliable questionnaire with appropriate variables was therefore implemented in Paper A. Regarding Paper B, data were collected solely using a traditionally developed questionnaire, because no relevant data were observed during the netnography process.

Netnography, particularly virtual passive observation, was developed by Kozinets (2010) in the 1990s. "Netnography" is a portmanteau combining the words "Internet" and "ethnography", and is considered a modern version of ethnography. However, a significant difference from traditional ethnography is that netnography often requires only several weeks to collect data (Heinonen and Medberg, 2018). The netnography process consists of four main phases, i.e., preparation, data collection, analysis, and interpretation, and takes account of ethical issues (Kozinets, 2010). In view of the social media posts about DPM breakdowns used in Paper A, it was assumed that only barrier-related issues would be found. Social media posts of some of the main banks in Sweden were observed, particularly the followers' comments. The amount of gathered data allowed a manual analysis following the netnography process. The data collection continued until the relevant themes started to be repeated, meaning that no new themes were being discovered. The items entirely or partly based on this method referred to the access barrier,

i.e., AB2–AB4, the impersonalisation barrier, i.e., IB1–IB2, and the trust barrier, i.e., T3–T4 (see Appendix).

3.4 Samples and data collection

As indicated, the questionnaire was sent to two different samples in Sweden. The choice of samples was based on the strategy of purposive sampling, as Sweden is considered one of the countries closest to a cashless society (Sveriges Riksbank, 2019).

The first sample comprises AAs who are YBCs 18–29 years old (i.e., generations Y and Z), since this age range is common in most research on young customers (e.g., Lachance, 2012). Moreover, they belong to the generation in which the digital era began and are defined as fast adopters of new technologies (Bagnall *et al*., 2016; Laukkanen, 2016; Tan and Leby Lau, 2016). Another reason for choosing this age range is that these individuals are of legal age in Sweden, i.e., 18 years old. To be eligible to be respondents in this research, they must have had at least one personal bank account in a Swedish bank.

The thesis collected data from students at Mid Sweden University registered in both on-campus and distance courses, with the latter allowing for geographical variation. This group of YBCs was chosen based on their homogeneous demographic characteristics and similar behaviour (cf. Tan and Leby Lau, 2016). The online questionnaire was sent to 913 students in nine randomly selected programmes during the spring of 2020, via university e-mail and learning platforms. After three reminders, 105 completed questionnaires were collected for an 11.5 per cent response rate. In line with Pohlmann (2004), a test was conducted of early versus late respondents, indicating no significant difference between those who responded before and after the reminders.

At the time of the study, the second sample consisted of more than 13,000 (more or less active) members of the Swedish social media group Kontantupproret. This group includes a broad range of individuals, but with a common interest in opposing the establishment of a cashless society (Arvidsson, 2014). This sample represents ARs: they have past experience of DPMs, but are still fighting to retain cash as a payment method. Although this group is mixed in age, most members are older adults. The questionnaire was posted on the Kontantupproret page for two weeks, resulting in 388 completed responses for a 24.2 per cent response rate (i.e., 388 of the 1600 members active in the social media group completed the questionnaire).

3.5 Data analysis

The background and demographic profiles of the respondents were presented in a descriptive analysis in order to get a picture of them. A factor analysis of the Likert-scale items was conducted to purify the data and make the variables more meaningful (cf. Hair *et al.*, 2010; Wieland *et al.,* 2017). Moreover, factor analysis was applied to justify the aggregation of items into factors, and the purified item scores of each construct were summated (cf. Shevlin *et al.*, 1997). Spearman correlation analysis was a priori applied to evaluate the correlation coefficients of every item. In addition, the variance inflation factor (VIF) was measured, eliminating potential multi-collinearity between the summated variables.

The collected data were further analysed using ordinal logistic regression (OLR). To apply this type of analysis, the last version of SPSS was considered appropriate software. Logistic regression is seen as one of the most practical tools with which to test hypotheses, and several studies (e.g., Laukkanen, 2016; Vellido *et al.*, 2000) have applied it in the banking context. Based on the OLR results, the significant relationships were further tested using additional moderation analyses in papers A and B. The PROCESS macro extension was used to do so, as proposed by Hayes and Preacher (2014). In line with several previous studies, p-values ≤ 0.05 were used to decide whether or not the hypotheses were supported (e.g., Mun *et al.,* 2017).

3.6 Limitations

Admittedly, this thesis has limitations, such as the choice of samples, low response rate, possible selection bias, generalisability issues, and ethical concerns. Like all research methods, online questionnaires have their limitations and weaknesses. The low response rate is a possible limitation, as it indicates that only proactive respondents were attracted and motivated to complete the questionnaire. However, the response rate was expected to be relatively low in this case because of the general response rate issue in online surveys (cf. Baltar and Brunet, 2012).

Another type of limitation concerns using social media in collecting questionnaire data due to possible selection bias. However, since members of the Kontantupproret sample can be described as hard to reach, this method is considered appropriate (cf. Baltar and Brunet, 2012). It must also be pointed out that this quantitative method has some advantages. It is flexible, easy to use, time efficient, and can be constructed to include obligatory items in order to minimise the non-response rate (Baltar and Brunet, 2012).

The choice of samples – with the YBC sample representing AAs and the Kontantupproret sample representing ARs – could be seen as a limitation. Theoretically, the AA and AR groups may partly overlap each other based on past experience of samples of YBCs and Kontantupproret. For example, although YBCs are presented as AAs, some YBCs may still hesitate to use DPMs. Based on previous research, this thesis focuses on AAs related to YBCs, which excludes older AAs. Members of Kontantupproret are presented as ARs, but some members of that group frequently use DPMs. The sample of Kontantupproret as a social media group limits potential AR respondents outside social media from participating in the study. Since the theoretical concepts of AAs and ARs were formed after the data collection, a limitation is that no questions were asked about whether or not participants were AAs or ARs. Additionally, the data were collected based on convenience sampling, which is an obstacle to generalizability (Chaouali and Souiden, 2019). The results may differ among contexts, not least between developed and developing countries (e.g., Ng *et al.*, 2021), but perhaps also among different parts of Sweden.

Qualitative methods, netnography and, especially, passive virtual observations have some common disadvantages, including ethical issues. Patton (2002) recommended sending a permission request to those being observed. At the same time, activities such as requesting permission can affect study results (Bryman and Bell, 2015), which is why this thesis applied covered observation. Due to the lack of agreement among researchers, there are no exact criteria or requirements as to what observation types are better in given contexts (Heinonen and Medberg, 2018). Furthermore, social media constitute a public locus for data collection accessible simply by logging into the platforms (Dimitrova and Öhman, 2022; Langer and Beckman, 2005). Therefore, anybody who comments on a social media post realizes that their comments are visible to all other members of the platform. Accordingly, the way the netnography was conducted in this thesis aimed to address any associated ethical issues.

3.7 Validity and reliability

Validity concerns measuring what is intended to be measured. By increasing the validity, the risk of not achieving the expected accuracy decreases (Diamantopoulos *et al.*, 2012; Nadler *et al.*, 2015). Regarding the validity of the present results, questionnaire comprehension was tested in a pilot study including both young and elderly respondents. Moreover, several researchers have used items included in the current questionnaire. Some items were

modified and others were developed using the netnography approach. Scales established in previous studies as well as items confirmed and/or discovered with the netnography method were used in another attempt to improve the validity of this thesis.

Concerning validity, discriminant validity was tested and confirmed using Fornell and Larcker's (1981) approach. Additionally, it is argued that Likert scales without a midpoint, in this case a four-point scale, contribute to higher validity (Nadler *et al*., 2015). Using extreme-labelled categories in Likert scales, i.e., ranging from "strongly agree" to "strongly disagree", is another way to increase the validity (Weijters *et al*., 2010). Moreover, the use of multi-item scales was also considered for all of the Likert scales where no risk of redundancy existed. However, a single-item scale for the dependent variable (i.e., intention to fully adopt DPMs) was considered acceptable, since this item had been established in previous studies in the field. Diamantopoulos *et al*. (2012), among others, argued that single-item measures might be suitable for global and easily captured constructs such as satisfaction and intention, thereby avoiding the use of redundant items.

Reliability concerns the stability and consistency of the measured scales (Nadler *et al*., 2015; Peter, 1979). For the evaluation of reliability in this thesis, several tests and measures were conducted, including the above-mentioned pilot study to ensure the questionnaire's readability. All variables were statistically tested using Cronbach's alpha to evaluate the consistency and stability of the scales, with values over 0.5 having been evaluated as acceptable in several previous studies (e.g., Eriksson *et al*., 2020; Laukkanen and Kiviniemi, 2010; Laukkanen *et al*., 2008). However, the Cronbach's alpha values can be lower when using four-point Likert scales (Nadler *et al*., 2015). Weijters *et al*. (2010), among others, highlighted that higher reliability might be caused merely by an increased number of responses. An additional test applying Fornell and Larcker's (1981) approach was conducted, in which the internal consistency of all items was confirmed by composite reliability values higher than the recommended 0.6.

3.8 Ethical considerations

The thesis pays attention to ethical considerations related to research methods. In papers A and B, the confidentiality and anonymity of the respondents were considered in the data collection. No private and sensitive data such as participants' names, pictures, and addresses were disclosed. This follows the recommendations by Vetenskapsrådet (2017).

In relation to the limitations of Paper A presented in the previous section, ethical issues could arise in the netnography process. Dimitrova and Öhman (2022) stressed that researchers need to be careful when they observe, gather, and analyse information using a method such as netnography, in order to avoid privacy concerns. In this thesis, the collected data were found in a social media platform and were publicly available to anyone with an account for that platform, so the members realised that their comments were publicly visible.

4 Summary of the papers

4.1 Paper A

In a relatively short period of time, digital development has facilitated the emergence of various DPMs, including Internet banking in the 1990s and mobile banking in the 2010s (Bátiz-Lazo *et al*., 2014; Jiménez and Díaz, 2019). The common denominators of DPMs are that they exclude cash as a payment method and that their development includes various adoption phases (e.g. Oertzen and Odekerken-Schröder, 2019). The full-adoption phase of DPMs, barely examined in previous studies, highlights not only the benefits that DPMs offer but also the challenges that bank customers may encounter. The paper is entitled "Barriers to bank customers' intention to fully adopt digital payment methods" and focuses on various barriers from the perspective of AAs (i.e., YBCs) and ARs (i.e., members of a group opposing a cashless society). The aim is to empirically investigate the relationship between a set of functional and social-psychological barriers and the bank customers' intention to fully adopt DPMs.

The research model is based on the theory of perceived risk (TPR) and innovation resistance theory (IRT). Barriers are used as synonyms for risks (cf. Chaouali and Souiden, 2019; Laukannen and Kiviniemi, 2010), and functional barriers include privacy, security, and access, while social-psychological barriers include impersonalisation and trust.

The data were collected via an online questionnaire sent to the two abovementioned groups of bank customers. An ordinal regression model (OLR) was applied for testing the hypotheses. Additional testing was conducted using the PROCESS macro extension to examine the moderating role of past experience in the relationship between the privacy, access, and impersonalisation barriers and the intention to fully adopt DPMs.

Regarding the AAs, privacy and access barriers can be obstacles to fully adopting DPMs. The ARs perceived all five barriers as significant, although only the impersonalisation barrier seems to matter in relation to the intention to fully adopt DPMs. Moreover, the results suggest that barriers have a stronger negative effect among those with extensive experience of DPMs. An overview of the hypotheses and main findings of Paper A is presented in Table 1.

Table 1. Hypothesis results, Paper A.

Hypothesis	Results	
	AAs	ARs
H1: There is a negative relationship between the privacy barrier and the intention to fully adopt DPMs according to both groups.	*Supported*	*Rejected*
H2: There is a negative relationship between the security barrier and the intention to fully adopt DPMs according to both groups.	*Rejected*	*Rejected*
H3: There is a negative relationship between the access barrier and the intention to fully adopt DPMs according to both groups.	*Supported*	*Rejected*
H4a/b: There is a) no relationship for the AAs and b) a negative relationship for ARs between the impersonalisation barrier and the intention to fully adopt DPMs.	*Supported*	*Supported*
H5a/b: There is a) no relationship for AAs and b) a negative relationship for ARs between the trust barrier and the intention to fully adopt DPMs.	*Supported*	*Rejected*

Notes: AAs = Adopters-accepters; ARs = Adopters-resisters

Although AAs rarely use cash, they perceive two functional barriers (i.e., privacy and access barriers) as negatively related to the full-adoption of DPMs, which confirms the results of Laukkanen *et al.* (2008). YBCs (representing AAs) seem to be aware of the latest technologies, and the use of their private financial data and tracking issues (i.e., website cookies) are among their concerns and therefore considered barriers. Limited access to their money can

also be a crucial barrier leading to irritation, since YBCs are known as impatient. For Kontantupproret members (representing ARs), impersonalisation is the only significant barrier to the full-adoption of DPMs. Mature bank customers are characterised as preferring face-to-face interactions, which is in line with Chaouali and Souiden (2019) and Laukkanen (2016). In relation to full-adoption of DPMs, the privacy, security, and access barriers are not significant for ARs. This could be related to their infrequent use of DPMs.

Based on the barriers affecting the intention of particular groups of bank customers to adopt DPMs, banks could implement customised measures to promote the ongoing development of digital financial services. One-dimensional digital payment systems hide potential risks that need to be addressed by governments. For example, some groups of bank customers could be excluded from the financial system. Moreover, breakdowns such as long power failures are a warning signal to society regarding its reliance on DPMs (Sveriges Riksbank, 2019). Paper A is appended at the end of this thesis.

4.2 Paper B

Citizens have become more technology dependent due to particular societal developments (Priporas *et al.*, 2017), and bank customers' readiness to accept digital technologies was promoted by the Covid-19 pandemic (Sveriges Riksbank, 2021). The transition from traditional to digital banking goes through the initial-, full-, and post-adoption phases. The full-adoption of DPMs has encountered some barriers, the influences of which need to be reduced by various barrier-breakers such as ease-of-use, usefulness, social influence, and credibility. Since 95 per cent of companies are considering implementing artificial intelligence before the end of 2025 (Mozafari *et al.*, 2022), the lack of human-to-human services may, in turn, negatively influence the barrier-breakers.

The aim of the study entitled "Barrier-breakers' influence on full-adoption of digital payment methods" is to empirically examine the relationships between various barrier-breakers and customers' intention to fully adopt DPMs. In line with Paper A, Paper B targets bank customers categorised as AAs and ARs.

The technology acceptance model (TAM) was applied because it permits one to predict and explain the influence of different variables on the intention to use a technology (Davis *et al.*, 1989). Particularly useful was TAM2, developed by Venkatesh and Davis (2000), which included ease-of-use and

usefulness, and was extended with social influence. Credibility was added to the model based on previous research in the digital banking context. The main concepts of TAM2 were compared with the concepts of innovation diffusion theory (IDT), in which Laukkanen and Kiviniemi (2010) argued that perceived ease-of-use corresponds to complexity and perceived usefulness to relative advantage. The social influence concept appears to be similar to observability, while perceived credibility is similar to compatibility and trialability.

An online questionnaire was based on well-established scales used in previous studies, cross-revised and tested in a pilot study. The collected data were analysed using statistical methods: hypothesis testing used OLR and moderation analysis used the PROCESS macro extension.

The findings reveal that only the credibility barrier-breaker seems to increase the AAs' intention to fully adopt DPMs. Credibility also seems to be an important barrier-breaker for the ARs, as are perceived usefulness and social influence. An additional analysis shows that the impersonalisation barrier reduces the impact of the barrier-breakers on DPM adoption. An overview of the hypotheses and main findings of Paper B is presented in Table 2.

Table 2. Hypothesis results, Paper B.

Hypothesis	Results	
	AAs	ARs
H1: There is a positive relationship between the ease-of-use barrier-breaker and the intention to fully adopt DPMs according to both groups.	*Rejected*	*Rejected*
H2: There is a positive relationship between the usefulness barrier-breaker and the intention to fully adopt DPMs according to both groups.	*Rejected*	*Supported*
H3a/b: There is a) no relationship for the AAs and b) a positive relationship for ARs between the social influence barrier-breaker and the intention to fully adopt DPMs.	*Supported*	*Supported*
H4: There is a positive relationship between the credibility barrier-breaker and the intention to fully adopt DPMs according to both groups.	*Supported*	*Supported*
Notes: AAs = Adopters-accepters; ARs = Adopters-resisters		

The results indicate which barrier-breakers can overcome existing barriers to the full-adoption of DPMs and that the impersonalisation barrier is crucial for a potential cashless society. Although the ease-of-use barrier-breaker is fundamental in TAM, neither AAs nor ARs perceive it as significant, which is in contrast to previous research (e.g., Martins *et al*., 2014; Poromatikul *et al*., 2019; Tan and Leby Lau, 2016; Yang *et al*., 2015). This could be because both groups are adopters and are used to paying digitally. The usefulness of DPMs is perceived as an important positive factor by ARs, confirming the results of Berraies *et al*. (2017) and Oertzen and Odekerken-Schröder (2019). Cognitive resisters expect DPMs to be free of errors (Chaouali and Souiden, 2019), while AAs perceive usefulness as a basic feature.

ARs further perceive social influence as positively related to the full-adoption of DPMs, consistent with Martins *et al*. (2014). Credibility is the only barrier-breaker perceived as significant by both groups of bank customers, showing that they have become aware of functional issues such as privacy and security. Moreover, the importance of offering personal services in digital banking (Dimitrova and Öhman, 2021; Van Pinxteren *et al*., 2020) is confirmed by the significant negative influence of the impersonalisation barrier on the relationships between the usefulness, social influence, and credibility barrier-breakers, respectively, and the intention to fully adopt DPMs.

Retail banks and merchants can use these results as a guide to what barrier-breakers might affect various customers' intention to fully adopt DPMs, and when considering appropriate measures. The impersonalisation barrier also merits attention when it comes to creating an emotional connection with customers who use DPMs. Paper B is appended at the end of this thesis.

5 Concluding remarks

5.1 Main findings

The overall research question of this thesis was: What are the relationships between barriers and barrier-breakers, respectively, and bank customers' intention to fully adopt DPMs?

The overall aim was to describe and analyse the relationships between barriers and barrier-breakers, respectively, by considering two groups of bank customers, i.e., AAs and ARs, and their intentions to fully adopt DPMs. In a

supplementary analysis, the moderating roles of past experience in Paper A and impersonalisation in Paper B were tested, indicating whether the various relationships become stronger or weaker.

In response to the overall research question and aim, the results of the two papers regarding AAs revealed that privacy and access are significant barriers to the full-adoption of DPMs. Although this group of bank customers is open to innovations, the monitoring and sharing of private data as well as technical errors and system breakdowns could reduce their intention to fully adopt DPMs. The privacy-related results confirmed Laukkanen *et al.*'s (2008) and Larsson *et al.*'s (2016) studies, strengthening that privacy issues are perceived as problematic when paying digitally. The significance of the access barrier can be related to the findings of Kamalul Ariffin *et al.* (2018) emphasising the impatience of YBCs. Credibility was the only significant barrier-breaker for AAs, indicating that verification, certification, and legitimation are important in solving privacy and security issues. Similar findings have previously been reported from other parts of the world (Luarn and Lin, 2005).

Regarding ARs as cognitive resisters, impersonalisation is perceived as the only significant barrier in relation to the full-adoption of DPMs. As suggested by Van Pinxteren *et al.* (2020), face-to-face services are of particular importance to this group of customers. At the same time, usefulness is important in forming their intention to fully adopt DPMs, confirming the findings of Oertzen and Odekerken-Schröder (2019). Credibility and social influence are also perceived as significant barrier-breakers. The credibility concept has previously been emphasised by Gupta and Arora (2017) in the digital banking context.

The findings reveal that past experience may increase the negative relationship between the privacy, access, and impersonalisation barriers, respectively, and the intention to fully adopt DPMs. This means that the negative effect is stronger for those who have relatively more past experience of DPMs. Moreover, the impersonalisation barrier may decrease the positive effect of barrier-breakers on the intention to fully adopt DPMs. For the usefulness, social influence, and credibility barrier-breakers, respectively, the positive effect is weaker for those who perceive a high impersonalisation barrier to using DPMs. This result can be explained by the general replacement of humans with machines and by the social distancing necessitated by the Covid-19 pandemic (Dimitrova and Öhman, 2021; Mozafari *et al.*, 2022).

5.2 Implications

5.2.1 Theoretical implications

As a compilation of knowledge, this thesis has identified theoretical implications that could be further explored by scholars. Three examples of such implications are mentioned below.

First, the theory of perceived risk (TPR) and innovation resistance theory (IRT) used in Paper A seem to include overlapping concepts. Privacy and security are described as perceived risks in TPR (Yang *et al.*, 2015), while privacy and security correspond to the risk barrier in IRT (Ram and Sheth, 1989). The access concept is related to functional risk in TPR (Yang *et al.*, 2015) and to the usage/value barrier in IRT (Ram and Sheth, 1989). Impersonalisation as a concept is similar to service risk in TPR (Yang *et al.*, 2015) and to the tradition barrier in IRT (Ram and Sheth, 1989). Since some studies have applied TPR and others IRT, it is relevant to highlight the similarities between the two theories. Similar overlapping concepts are also observed between TAM and IDT in Paper B. Based on this conceptual comparison, the empirical results confirmed the significance of certain concepts in the DPM adoption context, while other concepts were determined to be insignificant.

Second, this thesis investigates a combination of DPMs (i.e., bank cards, Internet banking, and mobile banking) accepted and regulated by governments. Previous studies (e.g., Jiménez and Díaz, 2019; Martins *et al.*, 2014; Zhang *et al.*, 2018) have focused on just one or two DPMs, such as Internet banking or mobile banking. Based on the present findings, availability of a combination of DPMs seems important at a time when the most commonly used payment method, i.e., cash, is on the way to being replaced by a number of DPMs. This indicates the theoretical importance of DPMs.

Third, the concept of full-adoption was proposed as a logical consequence of the pre- and post-adoption phases, and the intention to fully adopt as empirically related to various barriers (Paper A) and various barrier-breakers (Paper B). In the post-adoption phase, both the adoption of and resistance to innovations can coexist (cf. Ram, 1987). However, the full-adoption phase closes the circle and raises important theoretical questions, such as what happens when customers are obliged to adopt an innovation.

5.2.2 Practical implications

The possible full-adoption of DPMs affects various actors in the financial market (Apanasevic *et al.*, 2016; Arvidsson, 2019). As two of the main actors, retail banks and central banks can use the results of this thesis as a guide to what barriers may delay and even hinder the full-adoption of DPMs and what can break these barriers with respect to bank customers' perceptions. Financial technology (FinTech) developers are other important actors, since they may facilitate the adoption process, for example, by reducing technical errors and breakdowns and by creating back-ups. Merchants, among others, depend on the abovementioned actors, on one hand, and on what payment method bank customers may prefer, on the other. Merchants could also play a balancing role between regulators, banks, FinTech companies, and bank customers in their decision making as to what payment methods are allowed. In addition, mobile applications are still locally limited (Ng *et al*., 2021) and dependent on each merchant's choices. This kind of empirically based discussion in the Swedish context can be related to the findings of Arvidsson (2019).

The results of this thesis have highlighted that DPMs could be improved by increasing their credibility. Different actors could, for example, organise various social activities with educational purposes. This means that retail banks and central banks could consider the results not only for existing DPMs but also for future payment alternatives such as central bank digital currencies (CBDCs; e.g., the e-krona) and blockchain-based currencies. The results merit attention from even the biggest and, so far, most successful companies, because DPMs are not guaranteed to be failure free (Joachim *et al*., 2018). Different groups of bank customers also need attention, since once-size-fits-all solutions do not necessarily suit everyone (Nourallah, 2023). This thesis suggests that AAs and ARs need to be served in different ways to overcome the applicable barriers to the full-adoption of DPMs.

5.3 Suggestions for future research directions

Based on some of the limitations of this thesis (see subsection 3.6), several suggestions for future research directions can be mentioned. Since the full-adoption of DPMs is still a potential scenario, this thesis could only investigate bank customers' intentions. At a later stage, it might be possible for future studies to investigate the actual behaviour of bank customers in this context. Considering the novelty of the full-adoption concept, future studies could focus on possible relationships between certain barriers and barrier-breakers

in order to develop the research model presented here. It could, for example, be investigated whether the impersonalisation barrier could be reduced by the social influence barrier breaker.

Cross-cultural research could also be of interest, since developed and developing countries are in different positions in relation to potential cashless society systems (Ng *et al.*, 2021). Similar topics could be further applied to emerging publicly accepted DPMs such as CBDCs (e.g., the e-krona). Cross-disciplinary research representing various fields (e.g., marketing, psychology, and IT) would also seem to be relevant to the DPM context. Including the perspectives of banks, other financial companies, and merchants could also be productive in a future study.

Although perceptions are important for business research, their dynamic nature is considered a limitation (Hauff, 2019). In empirical investigations, using experimental methods or netnography as a main method could give different views of bank customers' opinions, particularly in our fast-changing digital society.

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Appendix: The questionnaire for papers A and B

Paper A			
Construct	Item	Item question	Source
Privacy barrier			
	PB1	My personal information can be used without my knowledge when signing up to use DPMs.	Modified from Featherman and Pavlou (2003) and Martins *et al.* (2014)
	PB2	My digital transactions can be monitored and tracked.	Modified from Yang *et al.* (2015)
	PB3	DPMs reveal my payment habits.	Modified from Yang *et al.* (2015)
Security barrier			
	SB1	My bank account can be hacked.	Modified from Yang *et al.* (2015)
	SB2	I can be exposed to fraud if I use DPMs.	Modified from Featherman and Pavlou (2003) and Martins *et al.* (2014)
	SB3	I worry about logging in via bank websites/apps or entering my bank card number.	Modified from Featherman and Pavlou (2003) and Martins *et al.* (2014)
	SB4	DPMs are not secure.	Modified from Yang *et al.* (2015)
Access barrier			
	AB1	Forgotten/lost PIN codes/passwords can be an obstacle to making digital transactions.	Modified from Laukkanen (2016)
	AB2	I cannot make digital transactions due to system breakdowns.	Modified from Larsson *et al.* (2016); virtual passive observation
	AB3	Technical problems with DPMs will lead to wasted time.	Modified from Featherman and Pavlou (2003) and Lee (2009); virtual passive observation
	AB4	More shops accept only DPMs.	Virtual passive observation
Impersonalisation barrier			

	IB1	Waiting time is long in tele- or chat queues.	Modified from Featherman and Pavlou (2003); virtual passive observation
	IB2	I find personal customer service more pleasant than self-service alternatives.	Modified (reversed) from Laukkanen (2016); virtual passive observation
	IB3	Chatbots give better service than do bank employees.	Modified from Shin *et al.* (2019) and Yang *et al.* (2015)
	IB4	The lack of personal contact is an obstacle to relying on DPMs.	Modified from Yang *et al.* (2015)
	IB5	I buy more when paying with DPMs.	Modified from Larsson *et al.* (2016)
	IB6	I want to have the possibility to choose between bank employees and chatbots if in need of support.	Modified from Van der Cruijsen *et al.* (2017)
Trust barrier			
	TB1	I regularly check my digital transactions.	Modified from Poon (2008)
	TB2	DPMs are risky.	Modified from Featherman and Pavlou (2003)
	TB3	I want the option to choose between different payment methods (Swish, Internet banking, bank card, and cash).	Modified from Gan *et al.* (2006) and Van der Cruijsen *et al.* (2017); virtual passive observation
	TB4	DPMs work as they are supposed to.	Virtual passive observation

Paper B

Construct	Item	Item question	Source
Ease-of-use barrier-breaker			
	EBB1	Digital transactions are easy to conduct.	Modified from Yang *et al.* (2015)
	EBB2	It is easy to learn to use DPMs.	Modified from Yang *et al.* (2015)
Usefulness barrier-breaker			
	UBB1	DPMs are more convenient to use than cash.	Modified from Yang *et al.* (2015)
	UBB2	Digital transactions can be made quickly.	Modified from Yang *et al.* (2015)
	UBB3	I will not regret if cash disappears as a payment method.	Based on Thomas *et al.* (2016)

Social influence barrier-breaker			
	SIBB1	People in my environment believe I should use only DPMs.	Modified from Venkatesh *et al.* (2003)
	SIBB2	Using DPMs gives me higher status than cash.	Modified from Venkatesh *et al.* (2003)
	SIBB3	I pay with DPMs if my friends also do that.	Modified from Venkatesh *et al.* (2003)
	SIBB4	Public opinion affects my choice of payment methods.	Based on Rivera (2019)
Credibility barrier-breaker			
	CBB1	I rely on DPMs.	Modified from Pennington *et al.* (2003)
	CBB2	Applied security measures are good enough to allow me to make digital transactions in a desired way.	Modified from Pennington *et al.* (2003)
	CBB3	DPMs are officially (i.e., publicly) accepted.	Modified from Pennington *et al.* (2003)
Intention to fully adopt DPMs	INT	I plan to use only DPMs in the future.	Modified from Chaouali *et al.* (2017)

The Papers