Barriers to bank customers’ intention to fully adopt digital payment methods

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Abstract
Purpose – The purpose of this study is to empirically investigate the relationship between a set of functional and social–psychological barriers and bank customers’ intention to fully adopt digital payment methods (DPMs).

Design/methodology/approach – The data were collected via an online questionnaire sent to two samples of Swedish bank customers, namely, adopters-accepters (i.e. young bank customers) and adopters-resisters (i.e. a group opposing a cashless society). Hypotheses were tested by applying an ordinal regression model.

Findings – Regarding the adopters-accepters, privacy and access barriers can be obstacles to the full adoption of DPMs. The adopters-resisters perceived all five studied barriers as significant, though only the impersonalisation barrier seemed to matter when the barriers were related to their intention to fully adopt DPMs. Moreover, the results suggest that barriers have a stronger negative effect on the intention to fully adopt among those with extensive experience of DPMs.

Practical implications – 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.

Originality/value – In this under-researched area, this study provides empirical knowledge of the influence of various barriers on the intention of bank customers characterised as adopters-accepters and adopters-resisters to fully adopt DPMs.

Keywords Technology adoption, Retail banks, Digital innovations, Customer intention

Introduction
Financial payment channels have developed significantly since the 1950s and 1960s when the first automated teller machines were introduced in the USA (Bártiz-Lazo et al., 2014). For example, telephone banking in the 1980s was followed by internet banking in the 1990s and 10 years later by mobile banking (Jiménez and Díaz, 2019). Of particular interest is that
various digital payment methods (DPMs) have gradually replaced cash, leading to both advantages and disadvantages for bank customers. That the “digital coin” has two sides has been described as follows: “Digitalisation makes payments easier and smoother but also creates risks that need to be managed” (Sveriges Riksbank, 2019, p. 4).

Most research has focussed on advantages related to the adoption of innovations such as internet banking and mobile banking, assuming that new technologies should be adopted because they are good enough (Laukkanen and Kiviniemi, 2010). The possibility of making digital transactions despite the time of day and location is beneficial for bank customers (Rehncrona, 2018; Zhang et al., 2018) and banks have identified other advantages of DPMs, such as reducing bank branch, transportation and distribution costs (Bátiz-Lazo et al., 2014; Lundberg et al., 2014).

This raises the question of the possibility of a cashless society, as often discussed by governments and banks (although it mainly concerns bank customers). As the cashless society concept can be perceived in different ways (Bátiz-Lazo et al., 2014; Rivera, 2019), this study applies the term “full adoption”, i.e. a situation in which the only available payment methods are digital. Few studies (Lee et al., 2005) have paid attention to the full-adoption phase, a phase more or less neglected in previous research. Instead, most studies have focussed on the initial adoption phase (Humbani and Wiese, 2019) or the post-adoption phase (Oertzen and Odekerken-Schröder, 2019).

As indicated, the movement towards the full adoption of DPMs requires attention to more than just benefits: one can imagine bank customers who are worried about their privacy and security, who cannot pay for their goods at the check-out, who must wait for hours to access their money or get proper service using DPMs. These risks are related to functionality (i.e. privacy, security and access) and to social–psychological issues such as impersonalisation. Trust can also be included in the latter risk category because of its significant impact on customers’ behavioural intentions (Berraiès et al., 2017). Although other risks have been emphasised in the literature, the five mentioned above seem significantly related to DPMs (Featherman and Pavlou, 2003; Yang et al., 2015).

Recent research on the increased adoption of DPMs has mostly been conducted in developing countries (Chawla and Joshi, 2019; Inegbedion et al., 2019; Jain and Gabor, 2020). For example, the ongoing demonetisation in India has forced millions of people to start adopting DPMs despite the frequent use of cash payments and the risk of the financial exclusion of vulnerable groups (Sivathanu, 2019). One of the relatively few studies examining the DPM adoption process in a highly digital-based country was conducted by Arvidsson et al. (2017), but only from the Swedish merchants’ perspective. This means that there is still a lack of research on the possible full adoption of DPMs from the customer perspective in developed countries such as Sweden, which could be the first country in the world that completely abandons cash (Sveriges Riksbank, 2019).

Although some DPM studies have investigated adopters versus non-adopters (Lian and Yen, 2013; Zhang et al., 2018) or different groups of non-adopters (Laukkanen, 2016; Laukkanen et al., 2008), there seems to be less research comparing various groups of adopters (Chaouali and Souiden, 2019). However, generations Y and Z have become increasingly attractive for banks and young bank customers (YBCs) are more interested in adopting new technologies and innovations than are other groups of customers (Tan and Leby Lau, 2016). Although studies have investigated young customers in general, there are calls for additional research on their financial consumption related to ongoing digital developments (Larsson et al., 2016). In this study, the group of YBCs is characterised as adopters-accepters, i.e. individuals who have already adopted and are willing to continue to use DPMs. At the same time, some customers are used to resisting innovations such as DPMs (Laukkanen, 2016). In Sweden, there is such a formally organised group called Kontantupproret (KU), which comprises bank customers with diverse demographic
profiles eager to keep cash as a payment method (Arvidsson et al., 2017). These are characterised as adopters-resisters.

The purpose of the study is to investigate the relationship between functional and social–psychological barriers, on one hand, and the intention to fully adopt DPMs, on the other, comparing the perceptions of the above groups of bank customers in Sweden, where traditional cash payments total just 6% of all payments (Sveriges Riksbank, 2019). Group differences are additionally examined in terms of the moderating role of past experience because it can affect how different barriers are perceived and may increase or decrease the intention to adopt DPMs (Laukkanen and Kiviniemi, 2010).

The remainder of this paper starts with a section addressing the frame of reference, including hypothesis development. A section on methods is followed by a presentation of the empirical results. A concluding discussion closes the paper.

Frame of reference and hypothesis development

Digital payment methods

An overall definition of digital payments is “payments made using electronic devices and channels” (Pizzol et al., 2018, p. 634). Different researchers have used different terms, such as payment instruments (Karoubi et al., 2016), cashless payments (Fabris, 2019), online payments (Yang et al., 2015) and electronic money (Singh, 2004). The common denominator is that they all exclude cash as a payment method. As indicated, this study targets the possible full adoption of DPMs. In doing so, it considers the official DPMs regulated by the Swedish Government, i.e. bank cards (debit and credit cards), internet banking and mobile banking. Blockchain-related DPMs are currencies not under the control of governments and regulations (Sveriges Riksbank, 2019) and are, therefore, not treated here.

Perceived risks and innovation resistance

The theory of perceived risk (TPR) states that risks always entail accompanying benefits (Yousafzai, 2012). In the digital banking context, perceived risk has been defined as “the potential for loss in the pursuit of a desired outcome of using an e-service” (Featherman and Pavlou, 2003, p. 454) and as “a prominent barrier to customers’ acceptance of online banking” (Lee, 2009, p. 130). This study applies the latter definition but focusses on several barriers impeding bank customers’ intention to fully adopt DPMs. Perceived risks have been found to play a key role in the DPM adoption process (Yang et al., 2015), so various risks may limit customer readiness to take further steps towards full adoption (Thomas et al., 2016). Several studies have applied the technology acceptance model, related to TPR (Lee, 2009; Yang et al., 2015). Considerably fewer studies have applied innovation resistance theory (IRT) to investigate perceptions of innovations (Kuisma et al., 2007; Laukkanen, 2016); however, the risk barrier concept in IRT embraces topics such as privacy and security (Ram and Sheth, 1989).

It should be emphasised that although the concepts of perceived risks and resistance seem different, their operationalisation in the innovation context is often similar. Sheth (1981) reported on the significant role of perceived risks in innovation adoption and resistance and Ram and Sheth (1989) developed the perceived risk concept into functional and psychological barriers. Because of the overlapping of concepts, risks and barriers are used as synonyms here.

Hypothesis development

Functional barriers

Privacy is the ability of individuals to have control over their own private information (Johnson et al., 2018). Different aspects of privacy such as monitoring, lack of control over private data and management reliance on this data can influence customers’ ways of thinking and acting and Pizzol et al. (2018) and Shankar et al. (2020) have
highlighted that privacy issues may change customer behaviour in terms of digital payments. This indicates that both YBCs, with their limited financial experience and knowledge and the ones born in the cash era, may have concerns about how their private financial data are used in a digital world (Zhang et al., 2018). Thus, both adopters-accepters and adopters-resisters can be exposed to the invasion of privacy because they already use DPMs. For example, vulnerable customers may easily be targeted by merchants because of the everyday monitoring of their financial behaviour on the internet (Larsson et al., 2016) and obligatory acceptance of cookies may lead to unwanted tracking on bank websites (Yu et al., 2016). Taken together, privacy is among the most-discussed risks on the road to the full adoption of DPMs by various groups of bank customers (Bátiz-Lazo et al., 2014; Larsson et al., 2016; Lundberg et al., 2014; Rehncrona, 2018; Thomas et al., 2016; Zhang et al., 2018). The following hypotheses are formulated:

**H1a, b.** The higher the privacy barrier, the lower the intention of adopters-accepters (a) and adopters-resisters (b) to fully adopt DPMs.

Closely linked to privacy risk is a security risk (Shankar et al., 2020). However, privacy and security are not always overlapping, as the monitoring of customers’ habits by companies does not compromise their security but does invade their private life. Therefore, security risks are here treated as a separate functional barrier based on TPR (Lee, 2009). Mobile applications arguably offer relatively high security, not only online but also in physical shops (Thorngren, 2014). However, many customers perceive mobile payments as too easy to access and conduct and security is perceived to decrease when customers can use their money in a fast and easy way without any additional effort (Rehncrona, 2018). Based on previous research (Dahlberg et al., 2015; Larsson et al., 2016; Thomas et al., 2016; Shin, 2021), security is identified as a significant risk in the digital payment process and Lian and Yen (2013) indicated that even adopters perceive security as a major risk because of the potential risk that data can be stolen and misused. Despite ongoing technical improvements, mobile payments are perceived as insecure (Rehncrona, 2018; Shankar et al., 2020). The security level in e-commerce and m-commerce, therefore, affects customers’ choice of payment methods, and will likely also affect their intention to use only DPMs. This leads to the following hypotheses:

**H2a, b.** The higher the security barrier, the lower the intention of adopters-accepters (a) and adopters-resisters (b) to fully adopt DPMs.

Access is related to usage and value barriers (Ram and Sheth, 1989). Based on previous studies (Auer and Böhme, 2020; Larsson et al., 2016; Laukkanen, 2016), it seems as though DPMs can limit bank customers’ access to their money. Therefore, the stability of DPMs via online channels is a sensitive matter for all adopters (Yang et al., 2015). It is important that bank customers can quickly access useful assistance (Zhang et al., 2018) or visit a physical bank office when disruptive issues arise (Shin, 2021). The importance of minimising disruption in digital banking is also emphasised because it impedes customers from accessing their money. Arvidsson et al. (2017) reported that bank customers must sometimes wait a long time to access their digital money or may be unable to pay for their purchases using DPMs. Wasted time and limited access to one’s savings seem to be realities for all bank customers. The hypotheses are as follows:
The higher the access barrier, the lower the intention of adopters-accepters (a) and adopters-resisters (b) to fully adopt DPMs.

**Social–psychological barriers** Impersonalisation is a concept similar to service risk (Yang et al., 2015) and is related to the lack of face-to-face communication in the digital banking context (Laukkanen and Kiviniemi, 2010). Kuisma et al. (2007) linked this barrier to customers’ habits and how innovations can change their routines. Laukkanen et al. (2008) and Mozaﬁari et al. (2021) stated that it is difﬁcult to replace personal service with internet service, and that adopters of DPMs can be exposed to poor payment services (Yang et al., 2015). Impersonalisation is related not only to habits and routines but also to service features such as waiting, time wasting and support availability related to telephone and online queues (Brown et al., 2005).

Although impersonalisation is arguably a risk in bank–customer relationships (Bátiz-Lazo et al., 2014; Singh, 2004), the differences between bank customer groups must be considered. Compared with other bank customers, younger ones are more interested in innovations and are seen as more adaptable to changes in a digital banking direction (Martins et al., 2014; Shin, 2021; Tan and Leby Lau, 2016). Similarly, studies indicate that certain bank customers are generally more likely to be vulnerable when digital innovations are implemented in the banking sector (Guido et al., 2020; Laukkanen et al., 2008). They experience difﬁculties adopting innovations (Laukkanen, 2016), so traditional banking is the preferred ﬁnancial channel for most of them (Jiménez and Díaz, 2019). The fact that the two groups seem to have different views of this matter leads to the following hypotheses:

**H4a.** The impersonalisation barrier is unrelated to adopters-accepters’ intention to fully adopt DPMs.

**H4b.** The higher the impersonalisation barrier, the lower the intention of adopters-resisters to fully adopt DPMs.

Yang et al. (2015, p. 13) used the following definition of trust in the online payment context: “a psychological state leading to the willingness of customers to perform payment transactions over the internet and expect the payment platform fulﬁlling its obligations, irrespective of customers’ ability to monitor or control payment platform’s actions”. This means that the fundamental role of trust as the basis of long-term relationships is highlighted in the off-line and online bank–customer relationship (Berraies et al., 2017; Mozaﬁari et al., 2021) and trust seems to remain crucial for customers even if they overcome other barriers (Poromatikul et al., 2019).

Although trust is often related to the security of payment systems in terms of safeguarding private data (Shin, 2021; Singh, 2004), customers’ trust in intermediaries during the payment stage depends on their choice of payment method (Rehncrona, 2018). For example, Swedish bank customers perceive digital banking to be relatively trustworthy because of Sweden’s highly developed infrastructure (Dahlberg et al., 2015). Customers’ beliefs may also differ between big cities and rural regions in the same country, and depending on people’s ages (Dimitrova and Öhman, 2021). For example, individuals fighting to keep cash as a payment method are more likely than others to express their resistance (Laukkanen, 2016) and to display less trust in alternative payment methods; at the same time, YBCs are more likely to trust new digital bank services (Yang et al., 2015). The following hypotheses are formulated:
**H5a.** The trust barrier is unrelated to the intention of adopters-accepters to fully adopt DPMs.

**H5b.** The higher the trust barrier, the lower the intention of adopters-resisters to fully adopt DPMs.

**Control variables**
As this study focuses on various bank customers, age is of interest and is accordingly included as a control variable. Income (Johnson et al., 2018; Martins et al., 2014) and location (Yang et al., 2015) are also considered important in this context, not least because the perceptions of DPMs may differ between high- and low-income individuals and between urban and rural dwellers (Dimitrova and Öhman, 2021). Past experience is considered because adopters already have experience of DPMs (Chaouali et al., 2017). Gender is also found to be significant in this context (Jiménez and Diaz, 2019).

**Method**

**Questionnaire development**
Questions related to the barriers under study were primarily adopted from previous studies (Table 1). As can be seen, the privacy items (PB 1–3) and security items (SB 1–4) were based on Featherman and Pavlou (2003), Martins et al. (2014) and Yang et al. (2015), while the trust items (TB 1–3) were adopted from Featherman and Pavlou (2003), Poon (2008) and Van der Cruïjsen et al. (2017). The access items (AB 1–3) and the impersonalisation items (IB1-5) were based on and modified from the literature mentioned in the Table. The last access item (A4) and the trust item T4, together with some of the abovementioned items, were inspired by a qualitative approach in the form of virtual passive observation (Kozinets, 2010). A single main method is normally considered sufficient to sustain a study, but as the use of an additional method may contribute to better research, virtual passive observation was used as a complementary method in formulating the questionnaire. For several weeks when preparing the current study, some of the main Swedish bank social media pages were observed with a focus on followers’ comments regarding access, impersonalisation and trust items. The data obtained was manually analysed and relevant items were used in the questionnaire design (Table 1).

The questionnaire was cross-revised by the authors to limit potential bias (Podsakoff et al., 2003). A pilot study was conducted and the feedback from 31 pilot respondents of various ages was used to improve the questions in terms of wording, phrasing and comprehensibility for different age groups.

The questionnaire included a short cover letter presenting the aim of the study and background questions (for the descriptive statistics regarding the background questions, see Table 2). The main part of the questionnaire comprised statements related to the five barriers (Table 1 in the “Empirical results” section), responded to using four-point Likert scales anchored at 1 (strongly disagree) and 4 (strongly agree). As respondents tend to overuse “neither” options, the lack of a midpoint option forced the respondents to choose non-neutral responses, helping avoid potential central tendency bias and social desirability bias (Albaum et al., 2010; Nadler et al., 2015).

**Sampling and data collection**
The online questionnaire was sent to YBCs (as representatives of adopters-accepters) with a focus on individuals 18–29 years old. This age range is common in young customer research.
| Construct          | Item | Item description                                                                 | Cronbach’s α  | Factor loadings  |
|--------------------|------|---------------------------------------------------------------------------------|---------------|------------------|
|                    |      |                                                                                 |               |                  |
| Privacy barrier    | PB1  | My personal information can be used without my knowledge when signing up to use DPMs | 0.786/0.878   | 0.768/0.857      |
|                    | PB2  | My digital transactions can be monitored and tracked                            |               |                  |
|                    | PB3  | DPMs reveal my payment habits                                                   |               |                  |
| Security barrier   | SB1  | My bank account can be hacked                                                   | 0.883/0.915   |                  |
|                    | SB2  | I can be exposed to fraud if I use DPMs                                         |               |                  |
|                    | SB3  | Worry about logging in via bank websites/apps or entering my bank card number   |               |                  |
|                    | SB4  | DPMs are not secure                                                             |               |                  |
| Access barrier     | AB1  | Forgotten/lost PIN code/password can be an obstacle to making digital transactions | 0.752/0.794   |                  |
|                    | AB2  | I cannot make digital transactions due to system breakdowns                     |               |                  |
|                    | AB3  | Technical problems with DPMs will lead to wasted time                           |               |                  |
|                    | AB4  | More shops accept only DPMs                                                     |               |                  |
| Impersonalisation barrier | IB1  | Waiting time is long in tele- or chat queues                                   | 0.600/0.695   |                  |
|                    | IB2  | I find personal customer service more pleasant than self-service alternatives   |               |                  |
|                    | IB3  | Chatbots give better service than do bank employees                            | n/a*          |                  |

Modified from Featherman and Pavlou (2003), Martins et al. (2014), Yang et al. (2015), Laukkanen (2016), virtual passive observation, Lee (2009).
| Construct       | Item | Item description                                                                 | Cronbach’s α  | Factor loadings  | Reference                              |
|-----------------|------|-----------------------------------------------------------------------------------|---------------|-----------------|----------------------------------------|
|                 |      |                                                                                   | n = 105/388   | n = 105/388      |                                        |
| IB4             | The lack of personal contact is an obstacle to relying on DPMs                    |               | 0.774/0.756     | Modified from Yang et al. (2015)        |
| IB5             | I buy more when paying with DPMs                                                 |               | n/a*            | Larsson et al. (2016)                   |
| IB6             | I want to have the possibility to choose between bank employees and chatbots if in need of support |               | 0.707/0.642     | Modified from Van der Cruijsen et al. (2017) |
| Trust barrier   | TB1  | I regularly check my digital transactions                                          |               | 0.639/0.601     | Modified from Poon (2008)               |
|                 | TB2  | DPMs are risky                                                                    |               | 0.772/0.762     | Modified from Featherman and Pavlou (2003) |
|                 | TB3  | Option to choose between different payment methods (swish, internet banking, bank card and cash) |               | 0.668/0.701     | Modified from Van der Cruijsen et al. (2017), virtual passive observation |
|                 | TB4  | DPMs work as they should                                                          |               | n/a*            | Virtual passive observation            |
|                 | IF1  | I plan to use only DPMs in the future                                             |               | n/a             | Modified from Chaouli et al. (2017)     |

**Notes:** n/a = Not applicable; *Items with weak correlations were removed; Cronbach’s α: Adopters-accepters (YBCs) = 105, Adopters-resisters (KU) = 388; Factor loadings: Adopters-accepters (YBCs) = 105, Adopters-resisters (KU) = 388
| Variables                                 | Values | Adopters-accepters (YBCs) | Adopters-resisters (KUs) |
|-------------------------------------------|--------|---------------------------|--------------------------|
| Swedish bank customer                     | Yes    | 105 (100%)                | 388 (100%)               |
|                                           | No     | NV                        | NV                       |
| Age, years                                | 18–29  | 105 (100%)                | 23 (5.9%)                |
|                                           | 30–41  | n/a                       | 63 (16.2%)               |
|                                           | 42–53  | n/a                       | 92 (23.7%)               |
|                                           | 54–65  | n/a                       | 129 (33.2%)              |
|                                           | >65    | n/a                       | 81 (20.9%)               |
| Income per month                          | <SEK 20,000 | 89 (84.8%)                | 104 (26.8%)              |
|                                           | SEK 20,000–29,999 | 11 (10.5%)               | 105 (27.1%)             |
|                                           | SEK 30,000–39,999 | 2 (1.9%)                  | 91 (23.5%)              |
|                                           | SEK 40,000–49,999 | NV                       | 27 (7.0%)               |
|                                           | SEK 50,000–59,999 | NV                       | 9 (2.3%)                |
|                                           | >SEK 59,999 | 3 (2.9%)                  | 13 (3.4%)               |
|                                           | Do not want to share | 3 (2.9%)                 | 39 (10.1%)              |
| Location                                  | Big city (i.e. Stockholm, Göteborg or Malmö) | 10 (9.5%)               | 113 (29.1%)             |
|                                           | City (population 50,000–200,000) | 68 (64.8%)               | 79 (20.4%)              |
|                                           | Small city (population 15,000–50,000) | 15 (14.3%)               | 71 (18.3%)              |
|                                           | Village (population under 15,000) | 12 (11.4%)               | 125 (32.2%)             |
| Payment usage frequency                   | Bank card | Never | NV | 21 (5.4%) |
|                                           |        | Rarely | 4 (3.8%) | 138 (35.6%) |
|                                           |        | Often  | 33 (31.4%) | 174 (44.8%) |
|                                           |        | Very often | 68 (64.8%) | 55 (14.2%) |
|                                           | Cash | Never | 45 (42.9%) | 10 (2.6%) |
|                                           |        | Rarely | 56 (53.3%) | 71 (18.3%) |
|                                           |        | Often  | 3 (2.9%) | 170 (43.8%) |
|                                           |        | Very often | 1 (1.0%) | 137 (35.3%) |
|                                           | Internet banking | Never | 6 (5.7%) | 35 (9.0%) |
|                                           |        | Rarely | 24 (22.9%) | 133 (34.3%) |
|                                           |        | Often  | 44 (41.9%) | 187 (48.2%) |
|                                           |        | Very often | 31 (29.5%) | 33 (8.5%) |
|                                           | Swish (mobile app) | Never | 2 (1.9%) | 112 (28.9%) |
|                                           |        | Rarely | 13 (12.4%) | 183 (47.2%) |
|                                           |        | Often  | 42 (40.0%) | 84 (21.6%) |
|                                           |        | Very often | 48 (45.7%) | 9 (2.3%) |
| Gender                                    | Male | 49 (46.7%) | 205 (52.8%) |
|                                           | Female | 55 (52.4%) | 181 (46.6%) |
|                                           | Other | 1 (1%) | 2 (0.5%) |

| Interval (Likert scale)                   | Min | Max | Mean (SD) | Mean (SD) | VIF | VIF |
|-------------------------------------------|-----|-----|-----------|-----------|-----|-----|
| n = 105                                   | n = 388 | n = 105 | n = 388 |
| Privacy barrier (PB1–3)                   | 3   | 12  | 6.80 (2.577) | 9.95 (2.442) | 1.516 | 1.906 |
| Security barrier (SB1–4)                  | 4   | 16  | 8.71 (3.069) | 11.74 (3.502) | 1.421 | 1.874 |
| Access barrier (AB1–4)                    | 4   | 16  | 7.71 (2.871) | 12.70 (2.877) | 1.597 | 1.888 |
| Impersonalisation barrier (IB1, 2, 4 and 6) | 4  | 16 | 9.49 (2.739) | 13.09 (2.632) | 1.623 | 1.954 |
| Trust barrier (TB1–3)                     | 3   | 12  | 7.89 (1.913) | 9.47 (1.839) | 1.593 | 2.025 |
| Intention (IF1)                           | 1   | 4   | 2.98 (0.930) | 1.18 (0.552) | n/a   | n/a   |

Table 2. Notes: YBCs = Young bank customers; KU = Kontantupproret; n/a = Not applicable; NV = No value; SD = Standard deviation; VIF = Variance inflation factor.

Descriptive statistics
and these individuals are over Sweden’s age of legal consent, i.e. 18 years. The YBC group was chosen based on the demographic characteristics and similar behaviour of young university students (Tan and Leby Lau, 2016; Yang et al., 2015). Teachers of nine randomly selected education programmes at a Swedish university were contacted to distribute the online questionnaire to their students via their course platforms or by email in the spring of 2020. In total, 913 students were reached and 105 completed questionnaires were received after three reminders. The response rate of 11.5% is considered relatively acceptable, as most online surveys are characterised by very low response rates (Baltar and Brunet, 2012).

In parallel, the questionnaire was published on the KU social media page, which had more than 13,000 followers at the time of the study. Of those, 1,600 were active followers considered potential questionnaire respondents (as representatives of adopters-resisters). This group consists of a broad range of individuals with a common interest in keeping cash as a payment method (Arvidsson, 2014). Over three weeks in the spring of 2020, 388 completed questionnaires were gathered from these respondents, for a response rate of 24.2%.

**Data analysis and model specification**

Construct reliability was tested using Cronbach’s α test. In the next analytical step, the item values of each of the five constructs were summated into one new factor for each construct, which is a standard procedure in social science studies. However, as recommended by Shevlin et al. (1997), a factor analysis was conducted to justify the aggregation of items into factors. Descriptive analysis of frequencies was conducted to give an overall view of the background questions, and a Spearman correlation analysis was conducted. In addition, the variance inflation factor (VIF) was used to test for multicollinearity.

The hypotheses were tested using ordinal logistic regression (OLR), applied by Laukkonen (2016) when testing hypotheses in this research field. OLR was used given the ordinal character of the dependent variable. Dittrich et al. (2007) discussed the possibility of using summed Likert scale data as parametric data. Accordingly, the five variables based on summed item responses were analysed as covariates in OLR for each sample. Due to the common warning regarding empty cells with zero frequencies, the results of goodness-of-fit testing can be uncertain and considered a limitation. According to Smith and McKenna (2012), however, this issue does not affect other types of OLR tests, so their results can be analysed and taken into consideration.

The underlying OLR estimation equation for both samples is as follows:

\[ Y = \beta_0 + \sum_{j=1}^{k} \beta_j X_{ij} + \mu_j \]

where

- \( Y \) = dependent variable.
- \( \beta_0 \) = constant.
- \( \beta_j \) = parameter to be estimated.
- \( X_{ij} \) = the independent variables.
- \( \mu_j \) = random error.

Considering that Chaouali et al. (2017) have called for attention to the influence of past experience on bank customers’ intention to use DPMs, the moderating effect of all respondents’ experiences was tested in an additional analysis (\( n = 493 \)). The software extension PROCESS macro was used.
Empirical results

Table 1 presents the constructs, items, item descriptions, Cronbach’s α coefficients, factor loadings and references related to each item. For four of the five constructs, the Cronbach’s α coefficients are above 0.60, which is considered acceptable (Laukkanen and Kiviniemi, 2010). The exception is the trust construct, for which the coefficients are around 0.45 for the two samples. However, reliability test results can vary based on the type of scale used, and lower values can be assumed for four-point Likert scales (Nadler et al., 2015). Therefore, the trust construct was kept for further analyses.

The factor loadings exceed the recommended level of 0.5 (Gupta and Arora, 2017), confirming a strong correlation between items, except for two impersonalisation items (IB3 and IB5) and one trust item (TB4), which were removed from further analyses. The five summed variables, which correspond to the main constructs, were used in the ordinal regression analysis. The result of the VIF test indicates a fairly low risk of multicollinearity. All values are below the “rule of thumb” maximum accepted coefficient of 10 (Lee, 2009).

Table 2 presents the descriptive statistics. All of the respondents had at least one account in a Swedish bank. Every YBC respondent was 18–29 years old, while the KU group included individuals of various ages. The YBC group reported lower income levels than did the KU group, which was natural given that the YBCs were students. Regarding location, most YBCs (64.8%) lived in cities (population 50,000–200,000), while the KU respondents were fairly equally distributed among the location alternatives. Past experience shows that the YBCs, on average, are more familiar with DPMs than are the KU respondents; however, for cash the situation was reversed. The gender distribution was fairly equal in both groups, though there were slightly more women among the YBCs and slightly more men among the KU respondents.

Table 2 also presents the minimum and maximum values, means and standard deviations of the summed variables for the two samples. Note that the number of variable items differs, which affects the minimum, maximum and mean values. Also note that the KU group has significantly higher mean values for every barrier, while the intention to use only DPMs is higher in the YBC group.

Spearman correlation coefficients are shown in Tables 3 and 4. For the YBC group, there are negative and significant relationships between the privacy items (PB1–3) and the dependent variable, i.e. the intention to fully adopt DPMs. The other barriers have one item each, i.e. SB1, AB4, IB4 and TB2, that is significantly correlated to the dependent variable. The correlation analysis based on the KU group indicates significant negative relationships between almost all independent variable items and the dependent variable, the only exceptions being AB1 and TB1.

The empirical results of the OLR analysis indicate that most relationships are insignificant for both groups (Table 5, Panels A and B). Four hypotheses are supported for the YBC group while four hypotheses are rejected for the KU group (Table 6).

Two of the three functional barriers are in line with the hypotheses for the YBCs, while all three hypotheses are rejected for the KU group. H1 states that a higher privacy barrier leads to a lower intention to fully adopt DPMs. The regression results in a negative sign at the 5% significance level for the adopters-accepters, indicating that YBCs with higher concerns about privacy issues are less likely to fully adopt DPMs. For the adopters-resisters, the results indicate that the privacy barrier has no significant influence on the intention to fully adopt DPMs, so H1a is supported while H1b is rejected. H2a and H2b are rejected because the results indicate that the security barrier has no significant influence on the intention to use only DPMs among either YBCs or the KU group. Moreover, access problems could be an obstacle among adopters-accepters (β < 0.05), which is in line with H3a.
| Construct | PB1 | PB2 | PB3 | SB1 | SB2 | SB3 | SB4 | AB1 | AB2 | AB3 | AB4 | IB1 | IB2 | IB4 | IB6 | T1 | T2 | T3 | Intention |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|
| PB1       | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |
| PB2       | 0.564** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |
| PB3       | 0.365** | 0.652** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |
| SB1       | 0.638** | 0.475** | 0.274** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |
| SB2       | 0.568** | 0.409** | 0.299** | 0.716** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |
| SB3       | 0.521** | 0.405** | 0.259** | 0.571** | 0.615** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |     |           |
| SB4       | 0.521** | 0.406** | 0.265** | 0.638** | 0.654** | 0.728** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |     |           |
| AB1       | 0.296** | 0.105 | 0.157 | 0.371** | 0.435** | 0.492** | 0.387** | 1.000 |     |     |     |     |     |     |     |     |     |     |     |           |
| AB2       | 0.289** | 0.359** | 0.251** | 0.416** | 0.410** | 0.386** | 0.310** | 0.448** | 1.000 |     |     |     |     |     |     |     |     |     |     |           |
| AB3       | 0.303** | 0.385** | 0.337** | 0.253** | 0.286** | 0.309** | 0.241* | 0.406** | 0.686** | 1.000 |     |     |     |     |     |     |     |     |     |           |
| AB4       | 0.207* | 0.271** | 0.262** | 0.287** | 0.295** | 0.253** | 0.402** | 0.229** | 0.502** | 0.488** | 1.000 |     |     |     |     |     |     |     |     |           |
| IB1       | 0.339** | 0.318** | 0.318** | 0.199* | 0.256** | 0.262** | 0.213* | 0.393** | 0.420** | 0.478** | 0.253** | 1.000 |     |     |     |     |     |     |     |           |
| IB2       | 0.190 | 0.141 | 0.275** | 0.092 | 0.036 | 0.036 | 0.143 | -0.146 | 0.061 | 0.040 | 0.188* | 0.092 | 1.000 |     |     |     |     |     |     |           |
| IB4       | 0.312** | 0.295** | 0.358** | 0.269** | 0.294** | 0.319** | 0.312** | 0.256** | 0.377** | 0.323** | 0.382** | 0.385** | 0.288** | 1.000 |     |     |     |     |     |           |
| IB6       | 0.096 | 0.149 | 0.223* | 0.013 | 0.116 | 0.299** | 0.308** | 0.165 | 0.232* | 0.244* | 0.263** | 0.264** | 0.262** | 0.295** | 1.000 |     |     |     |     |           |
| TB1       | -0.035 | 0.204* | 0.196* | 0.111 | 0.101 | 0.150 | 0.115 | 0.208* | 0.316** | 0.141 | 0.078 | 0.179 | 0.099 | 0.066 | 0.170 | 1.000 |     |     |     |           |
| TB2       | 0.497** | 0.449** | 0.283* | 0.569** | 0.549* | 0.569** | 0.665** | 0.356** | 0.473** | 0.392** | 0.537 | 0.319** | 0.084 | 0.389** | 0.215* | 0.238* | 1.000 |     |           |
| TB3       | 0.162 | 0.128 | 0.161 | 0.217* | 0.300** | 0.335** | 0.333** | 0.202* | 0.262** | 0.139 | 0.193* | 0.164 | 0.179 | 0.099 | 0.450** | 0.179 | 0.257** | 1.000 |     |           |
| Intention | -0.250** | -0.195* | -0.240* | -0.222* | -0.191 | -0.170 | -0.169 | -0.052 | -0.170 | -0.175 | -0.518 | -0.014 | -0.014 | -0.319* | -0.067 | -0.015 | -0.299** | 0.052 | 1.000 |     |           |

Notes: **Correlation is significant at the 0.01 level (two-tailed), * Correlation is significant at the 0.05 level (two-tailed); n = 105; YBCs = Young bank customers; PB1–3 = Privacy barriers; SB1–4 = Security barriers; AB1–4 = Access barriers; IB1, 2, 4 and 6 = Impersonalisation barriers; TB1–3 = Trust barriers; Intention = Intention to fully adopt DPMs
Table 4. Spearman correlation analysis for adopters-resisters (KU)

| Construct | PB1   | PB2   | PB3   | SB1   | SB2   | SB3   | SB4   | AB1   | AB2   | AB3   | AB4   | IB1   | IB2   | IB4   | IB6   | T1   | T2   | T3   | Intention |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|-----------|
| PB1       | 1.000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |     |     |     |           |
| PB2       | 0.705**| 1.000 |       |       |       |       |       |       |       |       |       |       |       |       |       |     |     |     |           |
| PB3       | 0.572**| 0.788**| 1.000 |       |       |       |       |       |       |       |       |       |       |       |       |     |     |     |           |
| SB1       | 0.612**| 0.441**| 0.402**| 1.000 |       |       |       |       |       |       |       |       |       |       |       |     |     |     |           |
| SB2       | 0.626**| 0.488**| 0.421**| 0.829**| 1.000 |       |       |       |       |       |       |       |       |       |       |     |     |     |           |
| SB3       | 0.511**| 0.396**| 0.376**| 0.714**| 0.734**| 1.000 |       |       |       |       |       |       |       |       |       |     |     |     |           |
| SB4       | 0.610**| 0.513**| 0.433**| 0.661**| 0.713**| 0.708**| 1.000 |       |       |       |       |       |       |       |       |     |     |     |           |
| AB1       | 0.396**| 0.338**| 0.474**| 0.488**| 0.473**| 0.427**| 1.000 |       |       |       |       |       |       |       |       |     |     |     |           |
| AB2       | 0.457**| 0.377**| 0.379**| 0.437**| 0.388**| 0.451**| 0.524**| 1.000 |       |       |       |       |       |       |       |     |     |     |           |
| AB3       | 0.466**| 0.371**| 0.388**| 0.400**| 0.456**| 0.403**| 0.478**| 0.479**| 1.000 |       |       |       |       |       |       |     |     |     |           |
| AB4       | 0.404**| 0.437**| 0.447**| 0.260**| 0.317**| 0.261**| 0.322**| 0.285**| 0.487**| 0.409**| 1.000 |       |       |       |       |     |     |     |           |
| IB1       | 0.471**| 0.384**| 0.371**| 0.408**| 0.470**| 0.376**| 0.445**| 0.394**| 0.468**| 0.539**| 0.314**| 1.000 |       |       |       |     |     |     |           |
| IB2       | 0.298**| 0.297**| 0.251**| 0.300**| 0.339**| 0.318**| 0.352**| 0.207**| 0.281**| 0.353**| 0.363**| 0.372**| 1.000 |       |       |     |     |     |           |
| IB4       | 0.380**| 0.277**| 0.268**| 0.367**| 0.390**| 0.366**| 0.446**| 0.309**| 0.357**| 0.391**| 0.316**| 0.437**| 0.408**| 1.000 |       |     |     |     |           |
| IB6       | 0.222**| 0.267**| 0.267**| 0.242**| 0.248**| 0.221**| 0.284**| 0.216**| 0.292**| 0.251**| 0.340**| 0.223**| 0.430**| 0.310**| 1.000 |     |     |     |           |
| TB1       | 0.167**| 0.113* | 0.101* | 0.188**| 0.177**| 0.112* | 0.151**| 0.102* | 0.132**| 0.210**| 0.119* | 0.105* | 0.101* | 0.156**| 0.214**| 1.000 |     |     |     |           |
| TB2       | 0.587**| 0.449**| 0.417**| 0.611**| 0.669**| 0.634**| 0.692**| 0.411**| 0.424**| 0.475**| 0.341**| 0.448**| 0.361**| 0.467**| 0.261**| 0.212**| 1.000 |     |     |     |           |
| TB3       | 0.230**| 0.271**| 0.236**| 0.206**| 0.220**| 0.253**| 0.282**| 0.147**| 0.250**| 0.239**| 0.371**| 0.187**| 0.328**| 0.234**| 0.345**| 0.137**| 0.262**| 1.000 |     |     |     |           |
| Intention | -0.211**| -0.255**| -0.228**| -0.162**| -0.209**| -0.172**| -0.211**| -0.083 | -0.192**| -0.212**| -0.417**| -0.184**| -0.172**| -0.241**| -0.242**| -0.237**| 1.000 |     |     |     |           |

Notes: **Correlation is significant at the 0.01 level (two-tailed), * Correlation is significant at the 0.05 level (two-tailed); n = 388; KU = Kontantupproret; PB1–3 = Privacy barriers; SB1–4 = Security barriers; AB1–4 = Access barriers; IB1, 2, 4 and 6 = Impersonalisation barriers; TB1–3 = Trust barriers; Intention = Intention to fully adopt DPMs.
Regarding adopters-resisters, $H3b$ is rejected due to the lack of a relationship between the variables.

Regarding the first social–psychological barrier, $H4a$ states that no relationship could be found between the impersonalisation barrier and the intention to fully adopt DPMs among YBCs ($p = 0.283$), while $H4b$ states that a higher impersonalisation barrier leads to a lower intention to fully adopt DPMs among the KU respondents ($p = 0.012$). Accordingly, both

| Hypothesis | Test results | Adopters-accepters (YBCs) | Adopters-resisters (KU) |
|------------|-------------|---------------------------|-------------------------|
| $H1$ (a negative relationship between the privacy barrier and the intention to fully adopt DPMs according to both groups) | Supported | Supported |
| $H2$ (a negative relationship between the security barrier and the intention to fully adopt DPMs according to both groups) | Rejected | Rejected |
| $H3$ (a negative relationship between the access barrier and the intention to fully adopt DPMs according to both groups) | Supported | Supported |
| $H4$ (no relationship for the YBC group and a negative relationship for the KU group between the impersonalisation barrier and the intention to fully adopt DPMs) | Supported | Supported |
| $H5$ (no relationship for the YBC group and a negative relationship for the KU group between the trust barrier and the intention to fully adopt DPMs) | Supported | Rejected |

Notes: YBCs = Young bank customers; KU = Kontantupperoret
hypotheses are supported. \( H_{5a} \) is supported while \( H_{5b} \) is rejected, as the results indicate that the trust barrier is insignificant for both groups.

The additional analysis regarding the three significant barriers (i.e. privacy, access and impersonalisation) shows that the interaction terms of the DPM experience are negative and significant (\( p < 0.001 \)). Table 7 indicates that these barriers have a stronger (weaker) negative effect on the intention to fully adopt DPMs by bank customers with high (low) DPM experience. For example, a person using DPMs more often than another person will likely suffer more from access issues, which tend to decrease the intention to fully adopt.

Discussion and concluding remarks
It can be noted that the two groups of Swedish bank customers have different views of the barriers, in that the KU group has significantly higher mean values for every barrier. Representing adopters-resisters, they are obviously more opposed to the gradual replacement of cash with DPMs (Arvidsson, 2014) and to DPMs as the only available payment alternative. Considering that 80% of the KU respondents reported using cash payments often or very often, this group tends to fight for cash in behavioural terms as well.

The corresponding proportion of DPM adopters-accepters who use cash as a common payment method is 4%. Accordingly, the YBC group seems to represent bank customers who find that digital services help them conveniently conduct their daily transactions (Gomber et al., 2017). However, two functional barriers (i.e. privacy and access barriers) are negatively related to the full adoption of DPMs by this group. This matches the results presented by Laukkanen et al. (2008). Based on their knowledge of new technologies, YBCs seem to have concerns about their digital payments being tracked and about how their private financial data can be used. The possibility of banks and other authorities tracking customers’ online payment activities, possibly leading to the invasion of private life and to privacy issues, can therefore, be seen as a serious barrier. This is related to Larsson et al.’s (2016) suggestion that YBCs are more sensitive than are other bank customers to the privacy implications of digital payments and are, therefore, keen to have control over their own private information. Another possible reason, given that the studied YBCs are university students, is that highly educated individuals are particularly concerned about privacy issues (Poon, 2008). Moreover, the significant influence of access barriers on the intention to fully adopt DPMs could be due to the impatience of YBCs (Kamalul Ariffin et al., 2018). Although they are fast learners who are open to innovations, having limited access to their money or experiencing delayed digital payments could lead to irritation and anger, which are characteristics of impatience. The access barriers perceived by the YBCs indicate a desire for the technical improvement of DPMs and related systems.

For the KU respondents, privacy and access barriers are insignificant, suggesting that their resistance to the full adoption of DPMs is based mostly on other considerations. A

| Moderator: past experience | Effect | t-value | Sig. |
|---------------------------|--------|---------|------|
| Direct relationships      |        |         |      |
| Privacy barrier – intention to fully adopt DPMs | \(-0.0369\) | \(-6.6087\) | 0.0000* |
| Access barrier – intention to fully adopt DPMs | \(-0.0271\) | \(-6.4953\) | 0.0000* |
| Impersonalisation barrier – intention to fully adopt DPMs | \(-0.0310\) | \(-6.2532\) | 0.0000* |

Notes: Effect = Interaction terms; \( n = 493 \); Model sig., 0.0000; *\( p < 0.001 \)
possible reason for this is that these bank customers use DPMs too infrequently to be upset about privacy and access issues.

It has been suggested that bank customers tended to perceive payment via mobiles as too easy when this payment alternative was introduced, so this payment option was seen as insecure (Rehncrona, 2018). Although studies have emphasised the importance of both security and trust among DPM adopters (Lian and Yen, 2013; Yang et al., 2015), the current results are not in line with this. Neither group perceived security or trust issues as significant barriers. Regarding the security barrier, Sweden is among the countries with the least card fraud (Sveriges Riksbank, 2019), which certainly influences the notion of a high security level from an international perspective. As trust is often related to security (Dahlberg et al., 2015; Singh, 2004), it is logical that trust is also perceived as an insignificant barrier in this case. Moreover, Sweden is known as a country with a relatively high level of trust. For example, the World Values Survey (2010–2014) suggested that 60% of the population in Sweden agreed that most people can be trusted, which is a significantly higher level than in most other countries. Similarly, Swedish bank customers generally perceive DPMs as trustworthy because of Sweden’s well-developed banking infrastructure (Dahlberg et al., 2015).

Of interest is that impersonalisation is the only significant barrier for the KU respondents. Chaouali and Souiden (2019) and Laukkanen (2016) have reported that many older bank customers prefer personal contact, and cash payments in fact entail face-to-face transactions. In addition, elderly Swedish bank customers are those who primarily visit traditional bank branches (Sveriges Riksbank, 2019). This indicates the lack of such human characteristics as sympathy and warmth in the digital world. For the YBCs, there is no significant relationship between the impersonalisation barrier and the intention to fully adopt DPMs, which is in line with the findings of Tan and Leby Lau (2016).

The results presented here could be of interest to governments and banks, especially in Sweden but also in other developed countries. Governments have to consider various parties’ interests and, not least, the particular risks inherent in a one-dimensional digital payment system. For example, the financial exclusion of certain groups of bank customers must be considered, and there are strong warning signals that being exclusively reliant on DPMs could cause major disruptions in the event of a long power failure (Sveriges Riksbank, 2019). Banks have to consider the relatively high costs of using cash (Arvidsson et al., 2017) and promote a range of requested and convenient DPMs to satisfy various groups of bank customers.

On the way to realising a payment system potentially limited to digital payments, it is important to gather up-to-date knowledge of customers’ opinions, as even successful companies can fail in implementing customer-based innovations (Joachim et al., 2018). The present results indicate that there are barriers to the intention to fully adopt DPMs that cannot simply be ignored, and that these barriers vary depending on the bank customer category. Given that privacy and access issues seem to be significant barriers for adopters-accepters, every bank and the banking industry as a whole should take appropriate actions to solve current and future problems in this functionality field. The required actions include more than just following the General Data Protection Regulation regarding privacy issues and more than just repeating standardised messages about technical errors regarding access issues. Given that impersonalisation seems to be a significant obstacle for adopters-resisters, the banking industry should acknowledge that traditional face-to-face communication is still preferred by these bank customers (Chaouali and Souiden, 2019). Addressing social–psychological issues could decrease the resistance to using only DPMs. Thus, banks should be aware of the potential for financial exclusion, and a solution could be to offer multiple
payment channels. Keeping brick-and-mortar bank branches will likely attract those who resist innovations.

The way towards a cashless society could also be related to the finding that bank customers with extensive experience of DPMs are more negatively affected by the privacy, access and impersonalisation barriers regarding their intention to fully adopt DPMs. Therefore, banks would benefit from also focussing on preventing adopters-accepters from eventually becoming adopters-resisters.

As this study focusses on barriers related to DPMs only in Sweden, it is recommended that cross-cultural studies be conducted. Such studies could consider DPMs’ various advantages, which could be compared with the barriers examined here but applied to various categories of bank customers from other countries. This could help banks not only to reduce barriers but also to strengthen the advantages related to DPMs. Based on the results of our additional analysis, it also seems as though customers’ past experiences of DPM are worth investigating in more detail than was done here.

Another limitation is that our approval to access YBCs via one or several banks was refused for bank security reasons, and that the studied YBC group was limited to university students. Accessing a larger group of YBCs through banks could enrich our knowledge of these bank customers. At the same time, sampling university students enabled this study to avoid limitations related to a sample associated with a single bank because the sampled YBCs were customers of various banks. A larger number of respondents could also be desirable in future studies.

Additional studies using other methods would be of value because of the general limitations of questionnaire research, including social desirability bias and the risk of focussing on bank customers’ recalled rather than “lived” perceptions. Such studies could also connect the TPR more clearly to the IRT than could be done in this empirically-oriented study. Moreover, this study did not cover blockchain-related DPMs, cryptocurrencies or e-currencies such as the e-krona. Such extended research could provide a broader overview of future payment methods and of how they are perceived by adopters-accepters and adopters-resisters.

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