

Emotions, perceived risk and intentions to adopt emerging e-banking technology amongst educated young consumers

Emotions, risk
and e-banking
adoption

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Abstract

Purpose – The purpose of this paper is to examine the association between consumers' emotions towards emerging e-banking technology, perceived risk and subsequent intention to adopt emerging e-banking technology.

Design/methodology/approach – An online questionnaire was used to collect data, which were analysed in a quantitative study. The final sample of 224 educated young consumers, familiar with emerging e-banking technology, allowed testing of the research hypotheses by applying confirmatory factor analysis and structural equation modelling (SEM).

Findings – The empirical results indicate that deterrence emotions and hedonic motivation are associated with consumers' perceived risk and, subsequently, their intention to adopt emerging e-banking technology. Additionally, analysing the moderating role of hedonic motivation in the association between consumers' deterrence emotions towards emerging e-banking technology and their perceived risk highlights the significant association of deterrence emotions with perceived risk, regardless of the presence of hedonic motivation.

Originality/value – This study demonstrates the association between consumers' emotions, perceived risk and subsequent intention to adopt emerging e-banking technology whilst underscoring the importance of distinguishing between different types of emotions and their corresponding appraisals.

Keywords Perceived risk, Performance-risk concerns, Psychological-risk concerns, Emerging e-banking technology, Negative emotions, Deterrence emotions, Loss emotions, Positive emotions, Hedonic motivation, Behavioural intention

Paper type Research paper

1. Introduction

E-banking, an umbrella term describing the provision of banking products and services through electronic channels, offers several benefits to consumers. However, it also poses potential risks that contribute to consumers' perceived risk, in turn making the latter risk a key factor determining the intention to adopt e-banking technology. Although perceived risk has been conceptualised in different ways, previous literature suggests that this factor is a multi-dimensional construct (Featherman and Pavlou, 2003; Kaur and Arora, 2020; Martins *et al.*, 2014; Yang *et al.*, 2015). Empirical studies (e.g. Farah *et al.*, 2018; Kolodinsky *et al.*, 2004; Liu *et al.*, 2019; Roy *et al.*, 2017; Thakur and Srivastava, 2014; Wu *et al.*, 2017) mainly follow Featherman and Pavlou (2003, p. 454) and define perceived risk as “the potential for loss in the pursuit of a desired outcome of using an e-service”. Featherman and Pavlou (2003) decomposed perceived risk into two main categories: performance and psychosocial risks.

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They regarded performance-related risks, i.e. performance, financial, privacy and time risks, as the salient dimensions of perceived risk, whilst dropping social risk due to its insignificant role and arguing psychological risk to be a less important dimension of perceived risk.

Applying perceived risk as a multi-dimensional construct in the e-banking adoption context has resulted in mixed findings in terms of the number and order of dimensions (Kaur and Arora, 2020; Martins *et al.*, 2014; Namahoot and Laohavichien, 2018; Yang *et al.*, 2015). Apart from these findings, examining perceived risk as a multi-dimensional construct represents an attempt to reflect on nearly all aspects of perceived risk. However, these dimensions do not encompass all concerns, especially in relation to the influence of psychological concerns on perceived risk. Psychological risk pertains to the risk that a product's performance may negatively affect the consumer's peace of mind, potentially resulting in loss of self-esteem due to the frustration of not fulfilling a buying goal (Featherman and Pavlou, 2003; Martins *et al.*, 2014). Although this definition refers to a specific negative emotion, frustration, it does not indicate the influence of a broad range of emotions on perceived risk. According to the field of risk assessment and decision-making, perceived risk has been acknowledged in two qualitatively different modes of information processing: risk as feeling, referring to the emotional and affective mode and risk as analysis, referring to the logical mode (Slovic *et al.*, 2004; Tompkins *et al.*, 2018). The emotional mode is characterised by the affective, intuitive and automatic processing of risky situations (Tompkins *et al.*, 2018).

In fact, emotions play an underlying role in obtaining information across different types of decisions and can have varied influences on risk assessment (Lerner *et al.*, 2015; Lerner and Keltner, 2000, 2001). The precise influence of emotions on perceived risk depends on the problem domain and on the type and level of uncertainty of the risky situation (Druckman and McDermott, 2008; Kugler *et al.*, 2012). Furthermore, different emotional reactions might arise from different risk appraisals (Lerner *et al.*, 2015). Given a risky situation, Lerner and Keltner (2000, 2001) argued that emotions of anger and fear can suddenly arise based on an appraisal of certainty and control. Given a specific class of products or services, Chaudhuri (1998, 2001) noted that the emotions aroused during a period of trial and demonstration can be derived from consumers' previous knowledge of that class of products or services. Given a new technological event, Beaudry and Pinsonneault (2010) argued that emotions are triggered in the anticipation period based on users' expectations of how a new technological event will influence their performance.

Accordingly, emerging e-banking technology can be considered a new technological event that constitutes a risky situation for consumers who are familiar with existing e-banking technology. Also, negative and positive emotions might arise when using emerging e-banking technology and/or during its anticipation period, i.e. during trials and demonstrations (Abikari *et al.*, 2022).

Given these assumptions, this study aims to contribute to the e-banking adoption literature by examining the association between consumers' emotions, perceived risk and, subsequently, their behavioural intention to adopt emerging e-banking technology such as mobile wallets and digital currencies. This study is guided by Abikari *et al.* (2022), who centred their research on the influence of negative emotions on behavioural intention to adopt e-banking technology, examining closely associated variables within technology adoption models. However, their research omitted to examine the association between negative emotions and other significant factors in e-banking adoption, such as perceived risk and suggested further studies on that matter.

The current study notes that emotional (i.e. affective, intuitive and automatic) information processing is important, alongside logical information processing, when consumers determine their perceived risk and, subsequently, their behavioural intention to adopt emerging e-banking technology. To enhance precision, this study considers perceived risk to be a second-order construct with performance-related dimensions (i.e. risk as analysis) and

differentiates between various types of emotions. Accordingly, this study underscores the significance of differentiating between various types of emotions and their corresponding appraisals to accurately examine the association between consumers' emotions, perceived risk and, subsequently, their intention to adopt emerging e-banking technology. This study attempts to advance our knowledge of psychological factors associated with perceived risk, excluding those already determined as part of the psychological dimension of perceived risk.

The paper is structured as follows. [Section 2](#) reviews the relevant literature, discusses perceived risk, emotions and behavioural intention and develops hypotheses. [Section 3](#) presents the research method and the results of the AMOS-based structural equation modelling (SEM) estimations. [Section 4](#) presents the discussion. The paper ends with a conclusion in [section 5](#), covering the theoretical contribution, managerial implications, limitations and suggestions for future research.

2. Theoretical background and hypothesis development

2.1 Perceived risk

As indicated, perceived risk has been applied as a second-order construct comprising several dimensions in the e-banking adoption context. Performance-related dimensions of perceived risk are defined as follows: (1) performance risk refers to failing to deliver the desired benefits due to the possibility of the results not being as they were designed to be; (2) financial risk refers to the potential monetary loss from the initial outlay of purchasing the product and to the possible cost of its subsequent maintenance; (3) privacy risk refers to the possible loss of personal information without the user's knowledge; and (4) time risk refers to the probability of losing time because of having to replace the product or learning how to use it when it does not perform to expectations.

The psychosocial-related dimensions of perceived risk are psychological risk and social risk. Psychological risk is seen as the risk that the performance of the product will negatively affect consumers' self-perception and as the potential loss of self-esteem from the frustration arising from not achieving buying goals. Social risk refers to the possibility of losing status in a social group as a result of adopting a product or service ([Featherman and Pavlou, 2003](#); [Martins et al., 2014](#)).

[Kaur and Arora \(2020\)](#), [Luo et al. \(2010\)](#), [Martins et al. \(2014\)](#) and [Yang et al. \(2015\)](#) emphasised the important influence of performance-related dimensions on perceived risk. They discussed psychological risk as a less important dimension of perceived risk in mobile payment, mobile banking (MB), Internet banking (IB) and online banking adoption. In contrast, [Namahoot and Laohavichien \(2018\)](#), dropping the concept of social risk, showed that psychological risk is the most salient dimension of perceived risk in the behavioural intention to adopt IB. Based on a systematic literature review, [Naeem et al. \(2022\)](#) examined the various results pertaining to the risk dimensions and identified their different applications. They argued that the perceived risk dimensions probably vary depending on the e-banking services involved. Accordingly, this study follows these previous studies and limits its analysis to the performance-related dimensions of perceived risk introduced as the foundation of risk perception by [Featherman and Pavlou \(2003\)](#) and [Martins et al. \(2014\)](#). This enables the study to examine perceived risk through the lenses of risk as feeling and risk as analysis, whilst treating emotions as a kind of broad psychological concern apart from the psychosocial dimensions of perceived risk, i.e. psychological and social risks.

2.2 Perceived risk and emotions

Studies have focussed on risk as feeling in the risk assessment, decision-making and psychology disciplines ([Lerner and Keltner, 2000, 2001](#); [Loewenstein et al., 2001](#); [Peters et al.,](#)

2004; Sjöberg, 2007; Williams *et al.*, 2003). The main argument is that feelings or emotions arise in reaction to an appraisal of an event important to an individual (Bagozzi *et al.*, 1999; Beaudry and Pinsonneault, 2010). Lerner and Keltner (2000, 2001) illustrated how appraisals of low certainty and low individual control arouse fear in individuals, whereas appraisals of high certainty and high individual control arouse anger. Accordingly, anger and fear seem to have opposite influences on people's risk assessment and perception. Whereas fearful people make pessimistic risk estimates and risk-averse choices, angry people make optimistic risk estimates and risk-seeking choices. Applying this argument, research has achieved various results. Peters *et al.* (2004) and Burns *et al.* (2012) argued that people who experience greater negative emotions (i.e. mixed emotions including anger and fear) perceive greater risk. Yang and Chu (2018) similarly argued that fear, anger, anxiety, disgust and sadness are positively associated with perceived risk. Conte *et al.* (2013) noted that both angry and fearful people tend to engage in more risk-seeking behaviour than do people in a neutral emotional state. Druckman and McDermott (2008) sensibly raised the importance of the problem domain in determining the precise role of emotions, whilst their results are in line with those of Lerner and Keltner (2000, 2001) and show that different negative emotions exert opposite effects on risk-seeking behaviour. Kugler *et al.* (2012) also highlighted that the influence of different emotions on risk-taking or risk-avoiding behaviour depends on the type and degree of uncertainty that an individual faces. Scovell *et al.* (2022) supported the influence of negative emotions on risk perception, calling for more research into the extent to which negative emotions differ in perceived risk in different contexts. These last arguments imply that the gravity of the research domain is salient when accurately examining the role of emotions in perceived risk.

In the e-banking adoption context, the association between negative emotions and consumers' perceived risk has received relatively little attention. However, the role of negative emotions in e-banking adoption has been examined by Abikari *et al.* (2022), demonstrating that loss emotions significantly influence the behavioural intention to adopt emerging technology through effort expectancy and performance expectancy. The study applied the appraisal framework of Beaudry and Pinsonneault (2010), originally developed in the context of information technology (IT). This framework is based on the degree to which an individual appraises a new IT event as an opportunity or a threat and the degree to which an individual perceives control over this event's expected outcomes. The threat appraisal refers to "the degree to which an event facilitates or hinders achievement of personal goals", whereas the expected control appraisal refers to "the degree to which they feel they have control over the realization of the expected consequences of a given event" (Beaudry and Pinsonneault, 2010, p. 639). Given a new IT event perceived as a threat, the two categories of negative emotions, i.e. deterrence emotions (e.g. anxiety, fear, worry and distress) and loss emotions (e.g. anger, dissatisfaction, disappointment, annoyance, frustration and disgust), indicate perceived control and perceived lack of control over expected consequences. Since the emotional reaction can be reported personally by consumers (Bagozzi *et al.*, 1999; Tompkins *et al.*, 2018) and considering the mentioned appraisal framework alongside the arguments related to negative emotions and perceived risk, the following hypotheses are formulated:

- H1. Deterrence emotions are positively associated with perceived risk.
- H2. Loss emotions are positively associated with perceived risk.

Regarding positive emotions, in the context of e-banking adoption, they pertain to hedonic motivation, which refers to the enjoyment, fun, pleasure and entertainment that arise from using different e-banking technologies (Abikari *et al.*, 2022; Chauhan *et al.*, 2022; Salimon *et al.*, 2017; Venkatesh *et al.*, 2012; Yaseen and Qirem, 2018). Following previous studies, this study

applies the hedonic motivation concept in referring to the enjoyment, fun and entertainment associated with emerging e-banking technology (e.g. mobile wallets and digital currencies). It assumes that the hedonic motivation reported by consumers comes from their previous knowledge of using e-banking services (cf. Chaudhuri, 1998, 2001). Koenig-Lewis *et al.* (2015) suggested that the perceived enjoyment of using mobile payment services lowers their perceived risk. Similarly, Wu *et al.* (2017) indicated that the fun and enjoyment derived from using mobile payment services have a strong negative impact on perceived risk. In the risk assessment context, Sjöberg (2007) argued that negative emotions play a more significant role than do positive emotions in influencing perceived risk. In line with this argument and taking into account the findings of Koenig-Lewis *et al.* (2015) and Wu *et al.* (2017), this study hypothesises a direct association between hedonic motivation and perceived risk and a moderating role of hedonic motivation in the association between the two mentioned types of negative emotions:

- H3. Hedonic motivation is negatively associated with perceived risk.
- H4. The association between deterrence emotions and perceived risk is moderated by hedonic motivation.
- H5. The association between loss emotions and perceived risk is moderated by hedonic motivation.

2.3 Perceived risk and behavioural intention

Behavioural intention is a measure of individuals' interest in adopting a new e-banking technology and is found to significantly and directly influence the adoption behaviour (Martins *et al.*, 2014; Venkatesh *et al.*, 2012). Scholars have studied the impact of perceived risk on consumers' behavioural intention to adopt e-banking technologies such as IB, MB and mobile payment (Alalwan *et al.*, 2014; Farah *et al.*, 2018; Giovanis *et al.*, 2019; Lafraxo *et al.*, 2018; Martins *et al.*, 2014; Roy *et al.*, 2017). Chauhan *et al.* (2022) showed that perceived risk has a significant negative impact on consumers' behavioural intention to adopt e-banking services. Liu *et al.* (2019) and Al-Saedi and Al-Emran (2021) showed that perceived risk is one of the most dominant predictors of mobile payment adoption. Regarding MB adoption, Riquelme and Rios (2010) indicated that consumers' willingness is negatively influenced by perceived risk. Similarly, Tan and Lau (2016) argued that perceived risk is one of the strongest predictors of consumers' behavioural intention to adopt MB. Whilst most research supports this relationship (Alalwan *et al.*, 2018; Giovanis *et al.*, 2019; Kaur and Arora, 2020; Sobti, 2019; Thusi and Maduku, 2020), Farah *et al.* (2018) claimed that perceived risk appears to be an insignificant predictor of consumers' intention to adopt MB. Regarding IB adoption, Alalwan *et al.* (2014) emphasised the impact of perceived risk on consumers' behavioural intention. Martins *et al.* (2014) also noted that perceived risk is a strong predictor of intention to adopt IB. The following hypothesis is accordingly formulated:

- H6. Perceived risk is negatively associated with consumers' behavioural intention to adopt emerging e-banking technology.

2.4 The research model

The preceding hypotheses lead to the theoretical model shown in Figure 1. This model simultaneously examines the association between emotions and consumers' perceived risk as a multi-dimensional construct, as well as the association between perceived risk and behavioural intention to adopt emerging e-banking technology. Additionally, this model depicts the moderating role of positive emotions in the association between negative emotions and perceived risk. In this model, negative emotions are derived from the appraisal of

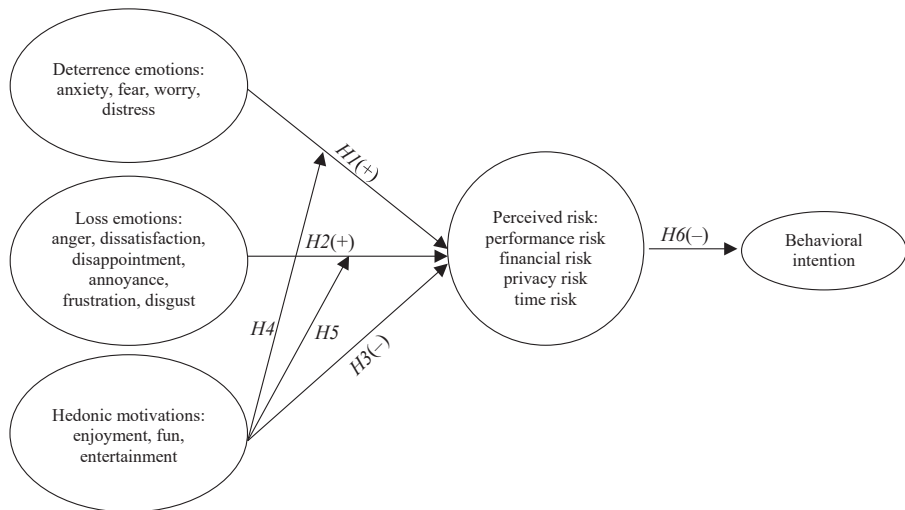


Figure 1.
Research model

Source(s): Created by author

emerging e-banking technology and categorised as deterrence and loss emotions. Positive emotions, called hedonic motivation, are derived from consumers' prior knowledge of using e-banking technology. Perceived risk is considered a second-order construct with four performance-related dimensions, i.e. performance risk, financial risk, privacy risk and time risk. Behavioural intention is a measure of individual interest in adopting emerging e-banking technology.

3. Research method

3.1 Population and sample

Most people in countries such as Sweden use various e-banking services and know about their implications and functions (Nourallah and Öhman, 2021). Sweden has been recognised as one of the world's most cashless countries, presenting its well-established e-banking technology (Dostov *et al.*, 2021). The general population of this research can be defined as consumers who are familiar with e-banking services. However, it is required to narrow down this population to a target population by refining the general population based on specific attributes that are of interest and relevance to the study (Asiamah *et al.*, 2017). Tan and Lau (2016) recognise young consumers as the group showing the strongest preference for emerging e-banking technology. Whilst many young consumers may already utilise e-banking services and understand e-banking's purpose and functionality, they may require additional information to differentiate between current and emerging e-banking technology (Arias-Oliva *et al.*, 2019; Nourallah and Öhman, 2021). Given basic financial and technological knowledge for differentiating between current and emerging e-banking technology, university students as a group of young consumers with a high preference for new e-banking technology are considered a target population of interest (Arias-Oliva *et al.*, 2019; Peterson and Merunka, 2014; Tan and Lau, 2016).

Although this study was conducted in Sweden due to the researcher's access to Swedish university students, the ultimate aim was to include both Swedish and foreign students in the study. Convenience sampling was applied to achieve this mix of students, as it is a non-probability sampling method with criteria such as easy accessibility, availability at a given

time and geographical proximity (cf. Etikan *et al.*, 2016). Considering the limitation of this sampling process, it is important to acknowledge that the results of this study may not be applicable to different populations. To enhance the generalisability of the findings, the demographic characteristics of respondents (i.e. gender, age, education level, citizenship and income level) are considered as control variables, as suggested by Shiau *et al.* (2024).

3.2 Demographic characteristics of respondents

Table 1 presents the demographic profile of participants in this study. Concerning demographic data, almost six out of ten participants were female and most were 18–35 years old (90.17%). Accordingly, the sample can be said to represent young individuals familiar with emerging e-banking technology. Regarding education level, approximately 37% of the participants had a bachelor's degree, 51% a master's degree and 11% a Ph.D. International students accounted for over half of the participants (60%) and most respondents (55%) had a monthly income of under SEK 10,000.

3.3 Measurement instrument and data collection

This study used an online survey in both Swedish and English to sample students who were studying in Swedish universities (see Appendix). This study relied on self-reported data but tried to minimise the bias associated with such data by providing clear instructions at the beginning of the questionnaire. The questionnaire had an introduction clearly explaining the target of the study and asking participants to answer questions by considering emerging

Demographic	Count
<i>Gender</i>	
Female	132
Male	90
Gender variant	1
Preferred not to answer	1
<i>Age</i>	
Under 18 years	1
18–25 years	93
26–35 years	109
36–45 years	20
Over 45 years	1
<i>Education</i>	
Bachelor's degree	83
Master's degree	115
Ph.D. degree	26
<i>Citizenship</i>	
Domestic	89
International	135
<i>Income per month (SEK)</i>	
<10,000	125
10,000–19,999	39
20,000–29,999	42
>30,000	11
Preferred not to answer	7

Note(s): Total number = 224

Source(s): Created by author

Table 1.
Sample characteristic

e-banking technology such as digital currency and mobile wallets, helping participants to recall emerging e-banking technology. Additionally, the questionnaire emphasised that participation was completely voluntary and anonymous (De Reuver and Bouwman, 2015). The survey began with demographic information and was followed by the second part, which included two general questions regarding participants' experience with emerging e-banking technology. These questions were included in the survey to exclude students who had never used or heard of such technologies. The majority of the participants in this sample reported using emerging e-banking technology (120 out of 224), whilst others confirmed that they had heard of such technology.

The third part included questions related to negative and positive emotions towards emerging e-banking technology, consumers' perceived risk and their behavioural intention to adopt emerging e-banking technology. Participants indicated their opinions on a five-point Likert scale ranging from "1 = strongly disagree" to "5 = strongly agree".

A hyperlink to the Google survey form was sent to students via email, Facebook, WhatsApp, Instagram and Telegram, reaching a total of 850 students from various universities across Sweden. A warning message was formulated asking the recipient to ignore the post if she/he was no longer a student at a Swedish university. Postcard and message reminders were sent to all email addresses and posted every month to online social media groups and channels. Data were obtained from April to September 2020, resulting in a total of 252 responses. Of these, responses from 28 people were excluded either because of the respondents' lack of experience with emerging e-banking technologies or because they did not answer all the questions. Finally, 224 valid questionnaires were considered for further data analysis, i.e. a 26% valid response rate.

3.4 Data analysis

According to Hair *et al.* (2014), the minimum sample size for models with seven or fewer constructs is 150, under the three given requirements of normal distribution, zero missing data and modest communalities of 0.5. Considering zero missing data as well as the multivariate normality and communality test results, the sample size of this study was sufficient for further estimations.

SEM was applied for data estimation. Given normal data distribution, SEM requires careful consideration of sample size and missing data as they can profoundly influence the results (Hair *et al.*, 2014). Therefore, a test of normality and communality was conducted to evaluate the normality of the data distribution and confirm adequate sample size using SPSS 28.0 software. Using SPSS AMOS 29.0 software, confirmatory factor analysis (CFA) was conducted to assess the psychometric properties of perceived risk as a second-order construct with four performance-related dimensions. CFA enables the researcher to investigate how well the observed indicators represent the constructs (Hair *et al.*, 2014). Perceived risk as the second-order construct was included in the research structural model. The overall fit, reliability and validity of this model, including the second-order construct of perceived risk, were further tested using SPSS AMOS 29.0 software. Finally, the model was evaluated to estimate the hypotheses.

The first-order constructs of perceived risk (i.e. performance, financial, privacy and time risks) each have at least three indicators or observed variables. Examining the relationship of the first- and second-order constructs begins with the model assessment of the first-order constructs; this is followed by addressing the validity and reliability of the first-order constructs and then analysing the re-specified second-order model using the same procedure as in testing the first-order model (Collier, 2020; Shek and Yu, 2014). The results of the model assessment of the first-order constructs for perceived risk are shown in Table 2. Overall, the results of the CFA show that all the indicators significantly loaded on the determined

Construct	Mean	Standardized factor loading	t-value	p-value
<i>Performance risk</i>				
PR1	2.77	0.775	**	
PR2	2.84	0.763	12.145	***
PR3	3.01	0.718	11.301	***
PR4	2.96	0.817	13.161	***
PR5	2.94	0.744	11.788	***
<i>Financial risk</i>				
FR1	3.05	0.733	**	
FR2	3.22	0.742	10.947	***
FR3	2.72	0.799	11.794	***
FR4	2.96	0.841	12.393	***
<i>Privacy risk</i>				
PVR1	3.17	0.827	**	
PVR2	3.26	0.772	11.993	***
PVR3	3.37	0.746	11.584	***
<i>Time risk</i>				
TR1	2.43	0.713	**	
TR2	2.57	0.780	10.641	***
TR3	2.56	0.775	10.584	***
TR4	2.67	0.709	9.790	***

Note(s): Model fit statistics: $\chi^2 = 180.084$, $df = 98$, $\chi^2/df = 1.83$; CFI = 0.960, TLI = 0.951, RMSEA = 0.06 and SRMR = 0.0454

** Items constrained for identification purposes; *** p -value < 0.001

The mean value is based on a five-point Likert scale, "1 = strongly disagree" to "5 = strongly agree"

Source(s): Created by author

Table 2.
Model assessment of first-order CFA model of perceived risk

unobservable constructs. All loadings of indicators of the perceived risk dimensions are at an acceptable level (>0.7; see Hair *et al.*, 2014). This indicates that the indicators are capturing an acceptable amount of variance in their unobservable constructs (i.e. performance risk, financial risk, privacy risk and time risk).

As can be seen in Table 2, different indices show the overall model fit of a CFA model of perceived risk. The result of the normed chi-square (χ^2) test is 1.83, indicating a very good fit for the CFA model of the first-order constructs of perceived risk. The normed χ^2 suggests a very good fit for the CFA model if the value is below 2.0 and an acceptable fit when the value is between 2.0 and 5.0 (Hair *et al.*, 2014). The next fit indices are the comparative fit index (CFI) and the Tucker–Lewis index (TLI). Both values (CFI = 0.960, TLI = 0.951) indicate an acceptable overall model fit. According to Bentler and Bonett (1980), the cutoff CFI value for an acceptable fit is >0.90, indicating that 90% of the covariation in the data can be repeated by the model.

Furthermore, the values of the root mean square error of approximation (RMSEA), i.e. 0.06, and the standardised root mean square residual (SRMR), i.e. 0.0454, provide additional support that the model fits the data. RMSEA and SRMR values lower than 0.05 and of 0.05–0.08 indicate good and adequate model fit, respectively (Hair *et al.*, 2014; MacCallum *et al.*, 1996).

Table 3 shows the reliability and validity results for the perceived risk constructs. The results of both Cronbach's alpha and composite reliability (CR) tests indicate that the four first-order constructs of perceived risk have an acceptable level of reliability. Cronbach's alpha and CR have the same cut-off criteria, i.e. higher than 0.7 for acceptable reliability (cf. Hair *et al.*, 2014).

Table 3 shows that the average variance extracted (AVE) values for all first-order constructs of perceived risk exceed 0.5, indicating good convergent validity of the construct. According to Fornell and Larcker (1981), if the AVE exceeds 0.5 and is higher than the squared correlation coefficients between constructs, discriminant validity is established. Table 4 shows the squared correlation coefficients of the constructs under study and the AVE values; the results indicate an acceptable level of discriminant validity.

In the next step, the re-specified second-order model is established to compare the goodness-of-fit of the first- and second-order models of perceived risk. Indeed, the second-order model can be considered a particular type of the first-order model. The decision of whether a construct should be structured as a first- or second-order construct model is related to the meaningfulness of the model and the underlying theory (Shek and Yu, 2014). The goodness-of-fit results for the second-order model are presented in Table 5 and confirm that the model fit is acceptable. The value of the normed χ^2 (1.875) of the second-order model is slightly higher than the normed χ^2 of the first-order model. Whilst the CFI and TLI values for the second-order model of perceived risk are somewhat lower than the values for its first-order model, the RMSEA value is the same in both models. The SRMR value is higher for the second-order model than the first-order model. The normed χ^2 value as well as the other mentioned goodness-of-fit criteria is slightly worse for the second-order model.

The first-order model of perceived risk thus fits slightly better than does the second-order model. This is predictable, since a model with second-order constructs can never display a better fit than a model with correlated first-order constructs (De Leon *et al.*, 2020). However,

Table 3.
Reliability and convergent validity of perceived risk constructs

Construct	Cronbach's alpha	Composite reliability	AVE
Performance risk	0.875	0.875	0.583
Financial risk	0.861	0.861	0.609
Privacy risk	0.823	0.825	0.612
Time risk	0.833	0.832	0.554

Source(s): Created by author

Table 4.
Discriminant validity of research constructs

Construct	1	2	3	4	5	6	7	8
1. Performance risk	0.583							
2. Financial risk	0.519	0.609						
3. Privacy risk	0.362	0.362	0.612					
4. Time risk	0.388	0.245	0.256	0.554				
5. Deterrence emotions	0.144	0.123	0.088	0.051	0.596			
6. Loss emotions	0.088	0.061	0.038	0.077	0.375	0.537		
7. Hedonic motivation	0.020	0.001	0.008	0.025	0.000	0.011	0.740	
8. Behavioural intention	0.054	0.022	0.042	0.091	0.202	0.024	0.062	0.796

Source(s): Created by author

Table 5.
Goodness-of-fit statistics for the second-order CFA model of perceived risk

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
Second-order construct model of perceived risk	187.458	100	1.875	0.957	0.949	0.06	0.0481

Source(s): Created by author

the second-order model has an acceptable fit and has theoretical support and grounding, meaning that perceived risk as a second-order construct can be included in the research structural model shown in Figure 1 (Featherman and Pavlou, 2003; Martins *et al.*, 2014).

Before evaluating the research structural model, the overall measurement model was examined for its reliability and validity. Table 6 shows that the overall measurement model attained CR and convergent validity since the CR values exceed 0.7 and the AVE values exceed 0.5 (cf. Hair *et al.*, 2014).

As can be seen in Table 6, the loadings of all indicators in Figure 1 are at an acceptable level (>0.7), except for “distress” and “disgust”. However, since the loadings of these indicators are remarkably close to the acceptable level, it was decided to keep them in the model. Table 6 indicates that the fit indices are within the acceptable range ($\chi^2 = 727.121$, $df = 450$, $\chi^2/df = 1.615$; CFI = 0.937, TLI = 0.930, RMSEA = 0.051, SRMR = 0.052). When the assessment of the measurement model was established, the research structural model was tested to examine the relationships between the constructs and evaluate the research hypotheses.

To test the suggested research model, a two-step approach was utilised. First, four causal associations were examined (H1, H2, H3 and H6), with the moderating role of hedonic motivation being excluded. In this step, the model was also tested without and with the

Constructs	Standardized factor loading	<i>t</i> -value	<i>p</i> -value	Composite reliability	AVE
Perceived risk (Second-order construct model)				0.905	0.708
Performance risk	0.958	10.327	***		
Financial risk	0.865	**			
Privacy risk	0.766	8.859	***		
Time risk	0.762	8.507	***		
Deterrence emotions				0.779	0.596
Distress	0.688	**			
Anxiety	0.747	10.122	***		
Fear	0.812	10.853	***		
Worry	0.835	11.080	***		
Loss emotions				0.789	0.537
Anger	0.762	**			
Dissatisfaction	0.723	10.951	***		
Disappointment	0.716	10.845	***		
Annoyed	0.781	11.913	***		
Frustration	0.716	10.834	***		
Disgust	0.698	10.537	***		
Hedonic motivation				0.863	0.740
HM1	0.909	**			
HM2	0.861	16.540	***		
HM3	0.808	15.284	***		
Behavioural intention				0.902	0.796
BI1	0.956	**			
BI2	0.884	20.925	***		
BI3	0.830	18.385	***		

Note(s): Model fit statistics: $\chi^2 = 727.121$, $df = 450$, $\chi^2/df = 1.615$; CFI = 0.937, TLI = 0.930, RMSEA = 0.051 and SRMR = 0.052

** Items constrained for identification purposes; *** *p*-value < 0.001

Source(s): Created by author

Table 6.
Properties of the overall measurement model

inclusion of demographic characteristics of participants (i.e. gender, age, education level, citizenship and income level) as control variables. This was done to identify possible correlations between these variables and behavioural intention.

Table 7 shows the results of the structural model without the inclusion of the control variables. The results indicate that deterrence emotions are positively associated with perceived risk, suggesting that H1 is supported (p -value <0.001). However, there is no empirical evidence to support H2, i.e. that there is an association between consumers' loss emotions towards emerging e-banking technology and perceived risk. H3 is supported, indicating that hedonic motivation is negatively associated with consumers' perceived risk (p -value <0.05). H6 is confirmed, indicating that perceived risk is negatively associated with consumers' behavioural intention to adopt emerging e-banking technology (p -value <0.001). The structural model of causal associations indicates that deterrence emotions and hedonic motivation are associated with consumers' perceived risk and, in turn, with their behavioural intention to adopt emerging e-banking technology. This model explains 22% of consumers' perceived risk and 9% of their behavioural intention to adopt emerging e-banking technology.

As illustrated in Table 8, the influence of the control variables gender, education level, citizenship and income level on behavioural intention is insignificant. However, the influence of the control variable age on behavioural intention can be considered significant with a p -value < 0.10 (one-tailed). The path confidence values in the results are close to the path confidence values without the inclusion of the control variables. The R -squared value of behavioural intention improved slightly to 11% (see Figure 2). Since the structural model

Table 7.

Structural model test results without the inclusion of control variables

Hypothesized relationships	Standardized estimates	t -value	p -value	Remarks
Deterrence emotions → Perceived risk	0.395	3.55	***	Supported
Loss emotions → Perceived risk	0.081	0.775	0.438	Rejected
Hedonic motivation → Perceived risk	-0.146	-2.136	**	Supported
Perceived risk → Behavioural intention	-0.291	-4.085	***	Supported

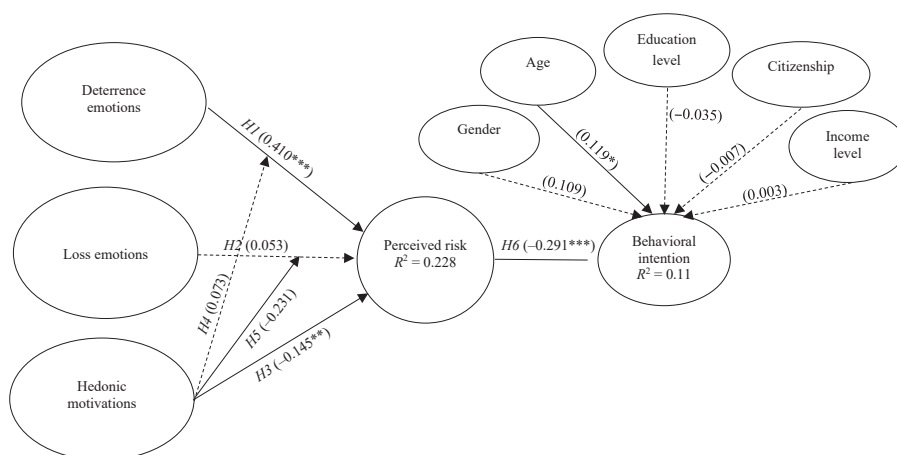
Note(s): Model fit statistics: $\chi^2 = 778.682$, $df = 452$, $\chi^2/df = 1.718$; CFI = 0.926, TLI = 0.919, RMSEA = 0.056, SRMR = 0.0717
 *** p -value <0.001 and ** p -value <0.05 (two-tailed)
Source(s): Created by author

Table 8.

Structural model test results with the inclusion of control variables

Hypothesized relationships	Standardized estimates	t -value	p -value	Remarks
Deterrence emotions → Perceived risk	0.410	3.687	***	Supported
Loss emotions → Perceived risk	0.053	0.501	0.616	Rejected
Hedonic motivation → Perceived risk	-0.145	-2.134	**	Supported
Perceived risk → Behavioural intention	-0.291	-4.114	***	Supported
Gender → Behavioural intention	0.109	1.632	0.103	Insignificant
Age → Behavioural intention	0.119	1.699	0.095*	Significant
Education level → Behavioural intention	-0.035	-0.445	0.657	Insignificant
Citizenship → Behavioural intention	-0.007	-0.100	0.920	Insignificant
Income level → Behavioural intention	0.003	0.036	0.971	Insignificant

Note(s): Model fit statistics: $\chi^2 = 969.596$, $df = 593$, $\chi^2/df = 1.635$; CFI = 0.917, TLI = 0.907, RMSEA = 0.052, SRMR = 0.0668
 *** p -value <0.001, ** p -value <0.05 (two-tailed) and * p -value <0.10 (one-tailed)
Source(s): Created by author



Note(s): Due to the insignificant influence of control variables on behavioral intention, the moderation test was conducted without them, and coefficients for *H4* and *H5* are accordingly reported in this figure.

Unstandardized coefficients are reported for *H4* and *H5*, other presented coefficients are in their standardized form.

(***) significant coefficients at *p*-value < 0.001 (two-tailed).

(**) significant coefficients at *p*-value < 0.05 (two-tailed).

(*) significant coefficients; *p*-value < 0.10 (one-tailed).

-----> Insignificant association

Source(s): Created by author

Figure 2.
The structural model of the study

indicates similar values without and with the control variables, the analysis in the second step is conducted without the inclusion of control variables.

The second step includes a mixed-model approach to examine the moderating role of hedonic motivation. Table 9 presents the results of the moderation analysis, including the unstandardised regression weights, as recommended for reporting and interpretation in moderation testing (Collier, 2020). Figure 2 displays the unstandardised regression weights pertaining to the moderating influence of hedonic motivation, whilst all other coefficients are reported in their standardised form. Considering the hypotheses H4 and H5, this study examines the moderating role of hedonic motivation in the association between deterrence

Hypothesized relationships	Unstandardized estimates	<i>t</i> -value	<i>p</i> -value
Deterrence emotions → Perceived risk	0.506	3.605	***
Deterrence emotions × Hedonic motivation → Perceived risk	0.073	0.907	0.364
Loss emotions → Perceived risk	0.123	0.708	0.479
Loss emotions × Hedonic motivation → Perceived risk	-0.231	-1.910	0.056*

Note(s): Model fit statistics: $\chi^2 = 762.405$, *df* = 447, $\chi^2/df = 1.705$; CFI = 0.922, TLI = 0.914, RMSEA = 0.055, SRMR = 0.0625

*** *p*-value < 0.001, ** *p*-value < 0.05 (two-tailed) and * *p*-value < 0.10 (one-tailed)

Source(s): Created by author

Table 9.
Moderation test results

emotions and perceived risk (H1) and the association between loss emotions and perceived risk (H2). The moderating analysis results revealed no significant empirical evidence that hedonic motivation moderates the association between deterrence emotions and consumers' perceived risk. However, hedonic motivation moderates the association between loss emotions and perceived risk, with a p -value < 0.10 (one-tailed).

4. Discussion

This study applies the concept of risk as feeling in the e-banking adoption context and examines whether consumers' emotions are associated with perceived risk and, subsequently, with their behavioural intention to adopt emerging e-banking technology.

This study examines perceived risk as a second-order construct with four performance-related dimensions. The findings of this study add to previous studies, such as [Kaur and Aroua \(2020\)](#) and [Martins et al. \(2014\)](#), by arguing that perceived risk can be influenced not only by a logical assessment of emerging e-banking technology but also by consumers' emotions.

Applying negative and positive emotions (i.e. deterrence and loss emotions as well as hedonic motivation), the empirical results of this study indicate a positive association between deterrence emotions such as anxiety, fear, worry and distress derived from the appraisal of emerging e-banking technology and perceived risk. However, loss emotions such as anger, dissatisfaction, disappointment, annoyance, frustration and disgust derived from the appraisal of emerging e-banking technology are not associated with perceived risk. The findings also show that hedonic motivation such as enjoyment, fun and entertainment derived from the users' knowledge of using e-banking services are negatively associated with consumers' perceived risk.

Contrary to this study's expectations, the results indicate that between the two categories of negative emotions, i.e. deterrence and loss emotions, only deterrence emotions are positively related to consumers' perceived risk. On one hand, and in line with [Burns et al. \(2012\)](#), [Peters et al. \(2004\)](#) and [Yang and Chu \(2018\)](#), these findings show that negative emotions are positively related to consumers' perceived risk. On the other hand, and more importantly, along with [Lerner and Keltner \(2000, 2001\)](#), these results suggest that different categories of negative emotions derived from the appraisal of emerging e-banking technology might have different influences on consumers' risk assessment and perception. Following [Lerner and Keltner's \(2000, 2001\)](#) argument, consumers who perceive deterrence emotions, i.e. anxiety, fear, worry and distress, towards emerging e-banking technology might make pessimistic risk estimates and risk-averse choices. According to [Beaudry and Pinsonneault \(2010\)](#), deterrence emotions are evoked when people perceive an IT event as a threat and that they have control over the realisation of its expected consequences. Consumers might therefore experience deterrence emotions because they perceive emerging e-banking technology as a threat preventing them from achieving their personal goals, even though they feel control over the consequences of using this technology. This suggests that perceiving control over the consequences of using emerging e-banking technology cannot prevent deterrence emotions.

The association of loss emotions, i.e. anger, dissatisfaction, disappointment, annoyance, frustration and disgust, with perceived risk is not supported by the empirical results of this study. Following [Beaudry and Pinsonneault \(2010\)](#) and [Lerner and Keltner \(2000, 2001\)](#), participants in this study did not perceive emerging e-banking technology as a threat whose consequences they had no control over and, in turn, did not make optimistic risk estimates and risk-seeking choices.

However, [Abikari et al. \(2022\)](#) discussed that consumers' loss emotions can be associated with their behavioural intention to adopt emerging e-banking technology through effort

expectancy and performance expectancy. Accordingly, it is plausible to argue that various types of negative emotions can significantly influence e-banking adoption through different influential factors.

Applying positive emotions and building on prior research (Koenig-Lewis *et al.*, 2015; Wu *et al.*, 2017), this study also examines the moderating role of hedonic motivation in the association between consumers' negative emotions and perceived risk. Based on the significant association found between deterrence emotions and perceived risk, the empirical results reveal that hedonic motivation does not play a significant moderating role in this association. This finding suggests the usefulness of further research on the direct and moderating influence of other positive emotions, such as happiness, satisfaction, pleasure, relief, excitement, hope and anticipation (i.e. achievement and challenge emotions; Beaudry and Pinsonneault, 2010) on perceived risk regarding emerging e-banking technology. Despite the study's empirical results revealing no positive association between loss emotions and perceived risk, the results indicate that hedonic motivation might play a moderating role in this association. Although these results signal the importance of hedonic motivation, they also suggest that hedonic motivation may not uniformly play an influential moderating role across all types of negative emotions and their association with perceived risk, underscoring the importance of distinguishing between various types of negative emotions.

Finally, in line with others in the e-banking adoption context, this study shows that consumers' perceived risk is negatively associated with their behavioural intention to adopt emerging e-banking technology (Alalwan *et al.*, 2018; Giovanis *et al.*, 2019; Martins *et al.*, 2014; Sobti, 2019). Accordingly, these results empirically indicate that consumers' deterrence emotions and hedonic motivation towards emerging e-banking technology are associated with their perceived risk and, subsequently, their intention to adopt emerging e-banking technology.

5. Conclusion

5.1 Theoretical contribution

This study contributes to the e-banking adoption literature by distinguishing between different types of emotions and their corresponding appraisals when examining their impact on consumers' perceived risk and their intention to adopt e-banking technology. Indeed, the study highlights the importance of differentiating between types of emotions not only in the risk assessment context as shown by Lerner and Keltner (2000, 2001) but also in the e-banking context. The findings align with Kaur and Arora (2020) and Martins *et al.* (2014) regarding the direct impact of perceived risk on the behavioural intention to adopt e-banking technology. However, it extends this argument by indicating how perceived risk can be influenced by consumers' emotions apart from their logical assessments. The examination of the moderating role of hedonic motivation in the association between negative emotions and perceived risk draws attention to the powerful influence of negative emotions on perceived risk, even in the presence of positive emotions. These findings add to previous research, such as that of Koenig-Lewis *et al.* (2015) and Wu *et al.* (2017), which focussed solely on positive emotions arising from the use of e-banking technology. The study further enhances the research by Abikari *et al.* (2022) by suggesting that negative emotions can also play an influential role in consumers' behavioural intention to adopt e-banking technology through perceived risk. More broadly, this outcome contributes to the advancement of various adoption theories, prompting them to explicitly define and incorporate different types of negative emotions when examining consumers' adoption behaviour through perceived risk as a multi-dimensional construct.

Indeed, according to Featherman and Pavlou (2003) and Martins *et al.* (2014), consumers may experience psychological risk when frustration, arising from not achieving their buying

goals, has a negative effect on their self-esteem. Conversely, the empirical results of this study indicate that frustration – categorised as a loss emotion – does not exhibit an association with perceived risk, whereas anxiety, fear, worry and distress – i.e. deterrence emotions – do. These different findings suggest that it may be beneficial to consider a range of negative emotions that can arise from different appraisals when examining the psychological dimension of perceived risk. Therefore, a theoretical contribution of this study arguably concerns the psychological dimension of perceived risk.

5.2 Managerial implications

Consumers may obtain some information based on emotional information processing towards emerging e-banking technologies launched in the market, either before or after evaluating them (Santos and Ponchio, 2021). This information pertains to their emotional reactions based on different appraisals of e-banking technology, including the appraisal of certainty and control, consumers' previous knowledge and their expectations. The emotional information processing can play a significant role alongside logical information processing when consumers are assessing their perceived risk and, subsequently, their behavioural intention to adopt an e-banking technology (Lerner *et al.*, 2015). This study emphasises the significant role that negative emotions play in associations between consumers' perceived risk and their behavioural intention to adopt this technology, even in the presence of positive emotions.

As such, it is crucial for key stakeholders to formulate policies aimed at preventing the triggering of negative emotions, rather than focussing solely on cultivating positive emotions. This can be achieved by raising awareness amongst bank customers about e-banking services and positioning these services as opportunities that contribute to the achievement of their financial goals. Furthermore, managers and practitioners must prioritise strategies that minimise the activation of these negative emotions. To this end, whilst it is true that incorporating exciting usage incentives, such as gifts or discounts, as Wu *et al.* (2017) suggested, may help to ease consumers' perceived risk to some extent, it is even more important to address their negative emotions towards e-banking technology. Therefore, this study recommends implementing practical risk-reducing strategies, such as offering money-back guarantees or prominently displaying consumer satisfaction guarantees, which align with the suggestions of Martins *et al.* (2014).

Overall, this study highlights the need for stakeholders to pay close attention to consumers' emotional responses to emerging e-banking technologies and to prioritise risk-reducing strategies that address the underlying reasons for their negative emotions in order to promote greater adoption of these technologies.

5.3 Limitations and suggestions for future research

This study has two main limitations. First, the participants were young and educated individuals, whilst older or less educated individuals probably possess fewer technical skills and thus feel different negative and positive emotions. Studies of other consumer groups, including the most vulnerable ones, are thus encouraged. Second, the data were gathered in Sweden, a developed country that has a high level of e-banking technology adoption (Dimitrova *et al.*, 2022). Although the study tries to diminish bias by including foreign students in its sample, studying consumers' emotions towards emerging e-banking technology in other countries with different cultures and levels of technology usage could produce interesting findings related to the types of influential emotions. Furthermore, conducting similar research in developing countries still in the transmission stage could provide insightful results.

It also would be interesting to narrow this research to a specific type of consumers who are strongly resistant to adopting e-banking technology, especially in developed countries such

as Sweden. This approach would allow researchers to gain knowledge of this group of consumers, ultimately helping to move towards full adoption of e-banking technologies (Dimitrova *et al.*, 2022). It is worth noting that the data for this study were collected during the COVID-19 pandemic, which prompted significant changes in how people use technology. For instance, contactless technology such as e-banking became an unavoidable choice for consumers (Al-Sharafi *et al.*, 2022). Consequently, the emotional reactions reported by consumers during this period might have been especially strong or weak due to the lockdowns and social distancing. It would be of interest to investigate the long-term impact of the pandemic on consumers' perception of e-banking technology and their emotional responses to it.

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Emotions, risk
and e-banking
adoption

(The Appendix follows overleaf)

Gender	Age (years)	Education
<i>Part one: demographic information</i>		
Female	under 18	Bachelor's student
Male	18–25	Master's student
Transgender male	26–35	Ph.D. student
Transgender female	36–45	
Gender variant/non-conforming	≥45	
Not listed		
Prefer not to answer		
<i>Income (SEK)</i>		
<10,000	10,000–19,999	20,000–29,999 > 30,000
<i>Citizenship</i>		
Domestic student	International student	
<i>Part 2: general question</i>		
Have you ever heard of new emerging e-banking technologies such as digital currency (e.g. bitcoin) and mobile wallets? Yes No		
Have you ever used a kind of new emerging e-banking technology such as digital currency (e.g. bitcoin) and mobile wallets? Yes No		
Constructs	Items	Sources
<i>Part 3: main items</i>		
Deterrence and loss emotions	Please rate the degree to which you feel each emotion when you encounter a new emerging e-banking technology such as digital currency and mobile wallet	Beaudry and Pinsonneault (2010)
Hedonic motivation	HM1: Using new e-banking technology such as digital currency and mobile wallets is fun HM2: Using new e-banking technology such as digital currency and mobile wallets is enjoyable HM3: Using new e-banking technology such as digital currency and mobile wallets is entertaining	Venkatesh et al. (2012) and Salimon et al. (2017)
Performance risk	PR1: New e-banking technology such as digital currency and mobile wallets might not perform well and create problems with my credit PR2: The security systems built into new e-banking technology such as digital currency and mobile wallets are not strong enough to protect my money PR3: The probability of something going wrong with the performance of new e-banking technology such as digital currency and mobile wallets is high PR4: Considering the expected level of service performance of new e-banking technology such as digital currency and mobile wallets, it would be risky for me to use PR5: Servers of new e-banking technology such as digital currency and mobile wallets may not perform well	Featherman and Pavlou (2003) and Martins et al. (2014)

Table A1.
Questionnaire

(continued)

Constructs	Items	Sources
Financial risk	FR1: The chance of losing money is high if I use new e-banking technology such as digital currency and mobile wallets FR2: Using new e-banking technology such as digital currency and mobile wallet subjects my money to potential fraud FR3: Using new e-banking technology such as digital currency and mobile wallets would lead to a financial loss for me FR4: Using new e-banking technology such as digital currency and mobile wallets subjects me to financial risk	Featherman and Pavlou (2003) and Martins <i>et al.</i> (2014)
Privacy risk	PR1: The chances of using new e-banking technology such as digital currency and mobile wallets and losing control over the privacy of my financial information are high PR2: Using new e-banking technology such as digital currency and mobile wallets would lead to a loss of privacy because my personal information would be used without my knowledge PR3: Internet hackers (criminals) might take control of my money if I use new e-banking technology such as digital currency and mobile wallets	Featherman and Pavlou (2003) and Martins <i>et al.</i> (2014)
Time risk	TR1: I think that if I use new e-banking technology such as digital currency and mobile wallets, then I will lose time due to having to switch to a different payment method TR2: Using new e-banking technology such as digital currency and mobile wallets would lead to a loss of convenience for me because I would have to waste a lot of time fixing payment errors TR3: Considering the time that I would invest to switch to (and set up) new e-banking technology such as digital currency and mobile wallets, it would be risky TR4: The possible time loss from having to set up and learn how to use new e-banking technology such as digital currency and mobile wallets is high	Featherman and Pavlou (2003) and Martins <i>et al.</i> (2014)
Behavioural intention	BI1: I intend to use new e-banking technology such as digital currency and mobile wallets in the future BI2: I plan to use new e-banking technology such as digital currency and mobile wallets in the future BI3: I predict that I will use new e-banking technology such as digital currency and mobile wallets in the future	Martins <i>et al.</i> (2014) and Venkatesh <i>et al.</i> (2012)

Source(s): Created by author

Table A1.

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