

# CUSTOMERS' INTENTION TO USE DIGITAL SERVICES IN RETAIL BANKING – AN INFORMATION PROCESSING PERSPECTIVE

*Complete Research*

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## Abstract

*Service digitization increasingly impacts work and life. A frequent example is Internet banking. While customers act independently from time and space constraints, banks benefit from significantly lower transaction costs compared to branches. However, customers use online channels for distinct transactions and favor physical interactions with bank advisors for others. To understand the underlying drivers for the intention to use digital banking services, we derive a research model that is theoretically grounded in the Information Processing View. It is validated in a quantitative study with 338 evaluations among retail banking customers. The results indicate that customers' information requirements and process risk negatively impact intended digital process use. In contrast, process experience positively impacts the intended digital process use. This paper is, to our best knowledge, the first to explore the role of information requirements and process-specific characteristics in detail. It guides practitioners in establishing more effective and efficient digital banking services.*

*Keywords: Internet banking, digital retail banking services, user behaviour, Information Processing View.*

## 1 Introduction

Within the last decade services have become increasingly digitized. The two most widely used digital services refer to online shopping and Internet banking (Eurostat 2013a). A major driver for this digitization of customers' activities is access to the Internet. 59 percent of the population in the European Union accesses the Internet on a daily basis – a doubling in comparison to 2006 (Eurostat 2013b). The shift from physical to digital services has particularly accelerated in retail banking. Within the European Union the average Internet banking usage is 40 percent, an increase of 11 percentage points compared to 2008 (European Central Bank 2013). In the same period the number of physical bank branches has declined by 8 percent (European Central Bank 2013).

The shift towards online channels is attractive for both, customers and banks. On the one hand, customers benefit from the digitization of banking services. Advantages include increased convenience as well as independence from space and time constraints through twenty-four-seven service availability on the Internet (Koufaris 2002, Carter and Bélanger 2005). On the other hand, banks take advantage of lower channel costs. While the average cost for a branch transaction amounts to \$ 4.00, it is only \$ 0.09 per transaction in online channels (PWC 2012). Therefore, financial institutions extend their online services continuously and aim to increase the overall online channel usage. However, customers avoid to use distinct banking services online. For example, the majority of customers favors the branch and physical interaction with the bank advisor for investment products, mortgages, and loans (Booz 2010; Capgemini 2012). This is particularly challenging for banks with retail customers, as they operate in a highly competitive environment with high cost-pressure. Thus, financial institutions need to understand which factors drive the intended use of digital banking services to increase online channel usage and to decrease the average cost per transaction respectively.

Existing literature investigates factors that drive the use of digital services. In this regard, the Technology Acceptance Model (Gefen et al. 2003; Pikkarainen et al. 2004; McKechnie et al. 2006), the Diffusion of Innovation Theory (Bradley and Stewart 2003; Montoya-Weiss et al. 2003; Ozdemir and Trott 2009), the Theory of Planned Behavior (Hsu 2004; Hsu et al. 2006, Pavlou and Fygenson 2006), and the Process Virtualization Theory (Overby 2008, Overby et al. 2010, Barth and Veit 2011) are widely used as theoretical lenses. However, little attention has been paid to the role of information and its impact on the use of digital services (Laukkanen and Kiviniemi 2010). A more thorough understanding is valuable, as digital service delivery in general and Internet banking in particular heavily rely on the exchange of information. Accordingly, customers require information about the service, its inherent delivery steps and their sequence to consume it appropriately. First research results underline the importance of information in online environments and find that information requirements can vary across customers (Reibstein 2002). Further research indicates that customers' information requirements are linked to the attitude towards the underlying service (Smith et al. 2011). However, it remains vague how information requirements and related factors impact the intention to use digital services – in particular in the area of retail banking. This leads to the following research question:

*How do information requirements and process-specific characteristics impact the intention to use digital retail banking services?*

This paper establishes an information processing perspective to approach the research question. With a foundation in the Information Processing View (IPV), we complement the theoretical frames of existing studies that explain the usage intentions of digital services. Besides the focus on the role of information requirements for the intention to use digital retail banking services, the paper also incorporates further IPV-related determinants. We conduct a quantitative study that investigates eight customer-facing processes in the area of retail banking. The findings contribute to a more comprehensive understanding why customers intend to use a digital channel for retail banking services. Banks can leverage the research findings to increase the level of digitization in retail banking and thus, decrease the average transaction cost respectively.

## 2 Theoretical Background

### 2.1 Digital Process Use and the Information Processing View

This paper evaluates drivers that impact the intention to use digital retail banking services. A service refers to “an activity, benefit or satisfaction offered for sale that is essentially intangible” (Kotler et al. 2013, p. 238). Based on Rust and Kannan (2003), we consider a service that is provided over electronic networks as digital service. As every (digital) service can be considered as a process, we establish intended digital process use as dependent variable and use the process notion throughout the paper. A process describes the “collection of activities that takes one or more kinds of input and creates an out-

put that is of value to the customer” (Hammer and Champy 1993, p.38). A virtual process is conducted via channels where all “physical interaction between people and/or objects has been removed” (Overby 2008, p. 278). An example related to retail banking is contacting call center agents to conduct banking transactions (telephone banking). If the virtualization is primarily based on the Internet and enabled by information technology, the terminology of ‘digital process’ as a subset of ‘virtual process’ is used (Overby 2008).

Intended use refers to a widely adopted dependent variable in Information Systems literature that is seen as a predictor for use behavior (Venkatesh et al. 2003; Venkatesh et al. 2012). It refers to the intention to use processes that are conducted via the Internet and that are provided with the help of information technology. Intended digital process use is well-grounded in existing literature. Balci et al. (2013) and Balci (2014) assess the digitization of processes in empirical studies and adopt process use as dependent variable. Shu and Cheng (2012) investigate drivers of credit card usage in online environments. Barth and Veit (2011) evaluate which processes users do not want online and consider use items in their operationalization of the dependent variable. Related literature from the area of e-commerce considers use as dependent variable, too (Cenfetelli et al. 2008, Gefen et al. 2003).

From a theoretical perspective this paper is grounded in the Information Processing View (Daft and Lengel 1986; Galbraith 1973; Tushman and Nadler 1978). Information processing refers to the exchange of information – particularly for the accomplishment of tasks and the coordination of activities (Daft et al. 1987). The IPV states that media channels vary in their degree to which they match with the information requirements of the underlying activity (Daft et al. 1987). Based on Premkumar et al. (2005) information requirements are defined as the need for information during a distinct activity. The evaluation of media channels and its focus on information requirements makes the IPV an appropriate theoretical lens for our research objective. Extant research applies the IPV and examines the role of information requirements mostly in the domain of supply chain management and outsourcing relationships (Mani et al. 2010; Premkumar et al. 2005; Wang et al. 2013). To our best knowledge this is the first approach to transfer the IPV and associated information requirements to the domain of digital retail banking services. We complement existing theories by deriving a new nomological net to explain the dependent variable ‘intention to use’. While existing models related to technology acceptance include general constructs such as ‘perceived usefulness’ or ‘perceived ease of use’ (Davis et al. 1989), our paper focuses on information requirements and their underlying process-specific determinants.

To create a common understanding of the IPV, the following section disentangles factors that influence customers’ information requirements and their intended digital process use. We provide a detailed description for each of the identified factors and set them into a retail banking-specific perspective. Hypotheses are derived from a customer’s perspective and synthesized towards a research model.

## **2.2 Hypotheses Development**

### **2.2.1 Information Requirements and Underlying Drivers**

Customers’ information requirements are an important determinant for intended digital process use. However, existing literature lacks the assessment how customers’ information requirements relate towards intended digital process use in retail banking. This paper refers to information requirements as the amount of information that a customer needs about the respective process, its inherent steps and their sequence (Mani et al. 2010).

As indicated subsequently, research related to the IPV identifies the importance of information requirements. In particular, information requirements are evaluated for supply chain management (Premkumar et al. 2005; Wang et al. 2013) and business process outsourcing relationships (Mani et al. 2006; 2010). Furthermore, IPV-related literature addresses the role of information requirements in the context of digital business solutions (Chang et al. 2008, Li et al. 2009, Malhotra et al. 2007). Other research indicates that information requirements depend upon the attitude towards the underlying

product or service (Smith et al. 2011). Additionally, they can vary across customers (Reibstein 2002). Further research indicates that information requirements drive the choice of the appropriate communication channel: While individuals prefer face-to-face channels in case of high information requirements, electronic channels are amenable in case of low information requirements (Barth and Veit 2011; Ebbers et al. 2008). Considering our study's focus, we establish the following hypothesis:

**Hypothesis 1 (H1):** The greater the perceived information requirements for a particular process, the lower is the customers' intended digital process use.

Financial institutions need to understand for which processes customers have high information requirements, as these processes are hypothesized to be associated with a low degree of intended digital process use. Thus, it is essential to better understand the underlying factors that drive information requirements. Based on the IPV various process-specific characteristics are introduced that determine customers' information requirements. Namely, they refer to the ambiguity, complexity, interdependence, and importance of the respective activity (Daft and Lengel 1986; Mani et al. 2006; 2010).

According to the IPV ambiguity impacts information requirements (Daft et al. 1987; Daft and Macintosh 1981). Ambiguity describes the existence of multiple and conflicting interpretations how to proceed within a specific process (Daft and Lengel 1986; Treviño et al. 2000). Higher levels of ambiguity increase the need for coordination mechanisms and information exchange (Daft and Lengel 1986). Literature suggests that confirmations for correct interpretation are a possibility to decrease ambiguity (Ebbers et al. 2008). Based on the findings, we establish the following hypothesis:

**Hypothesis 2 (H2):** The greater the perceived process ambiguity, the higher are the customers' information requirements for this process.

In addition, IPV-related literature describes that complexity influences the information requirements (Daft et al. 1987; Mani et al. 2010; Premkumar et al. 2005). Complexity describes the degree to which a process is perceived as relatively difficult to understand and to conduct (Hoehle et al. 2012; Thompson et al. 1991). While ambiguity is linked to the existence of various conflicting interpretations, complexity is related to the absence of information (Karimi et al. 2004). Thus, higher levels of complexity increase the need for information exchange (Daft and Lengel 1986). This paper sets the previous findings in a retail banking-specific perspective, which leads to the following hypothesis:

**Hypothesis 3 (H3):** The greater the perceived process complexity, the higher are the customers' information requirements for this process.

The IPV also describes interdependence between activities as a central element which influences the required degree of information (Tushman and Nadler 1978; Daft and Lengel 1986; Larsson and Bowen 1989). Interdependencies between activities increase the need for coordination and collaboration, which simultaneously require increased information exchange (Tushman and Nadler 1978). In addition, higher levels of interdependence lead to more unexpected and frequent changes within an activity, which in turn increases the need for information exchange (Mani et al. 2010). We transfer the existing findings to a retail banking-specific perspective and conclude the following:

**Hypothesis 4 (H4):** The greater the perceived process interdependence, the higher are the customers' information requirements for this process.

Finally, IPV-related studies indicate that the importance of an activity impacts the information requirements (Premkumar et al. 2005; Mani et al. 2006; Mani et al. 2010). It refers to the criticality of an activity and evaluates how threatening the prevalent uncertainty is (Premkumar et al. 2005). In retail banking importance is linked to the level of perceived salience that individuals accord to specific services (Hoehle et al. 2012). The need for information exchange and monitoring increases with higher levels of importance (Premkumar et al. 2005; Mani et al. 2006). Therefore, services with a high perceived importance are less amenable for digitization (Barth and Veit 2011; Black et al. 2002; Mayo et al. 2006). In the area of financial services studies describe that particular transactions are considered "too important or too difficult to be made unaided", which indicates a high need for information exchange (Kimball et al. 1997, p.4). Thus, we derive the following hypothesis:

**Hypothesis 5 (H5):** The greater the perceived process importance, the higher are the customers' information requirements for this process.

## 2.2.2 Process Risk and Process Experience

The previous section establishes a link between information requirements and the intention to use digital retail banking services. In addition to information requirements, IPV-related literature suggests two further factors that drive customers' intention to use distinct channels for service delivery: process risk and process experience. Both factors are grounded in IPV's overarching theme that stresses the role of uncertainty and equivocality for information processing and channel choice (Daft et al. 1987).

Uncertainty refers to "the difference between the amount of information required to perform the task and the amount of information already possessed" (Galbraith 1973, p. 5). Uncertainty is closely related to the concept of risk (Pavlou 2003; Pavlou et al. 2007). Risk is defined as "the subjective belief of suffering a loss in pursuit of a desired outcome" (Pavlou and Gefen 2005, p.378). In the context of Internet banking, risk includes threats related to security, privacy, and personal finances (Grabner-Kräuter and Faullant 2008; Tan and Teo 2000). To address the respective risk persons need to obtain information (Daft and Lengel 1986). This influences the channel choice, as channels with high information richness are preferred in uncertain environments. Studies identify a negative relation between perceived risk and the intention to conduct transactions online (Mallat 2007; Bélanger and Carter 2008; Aldás-Manzano et al. 2009; Lee 2009; Liao et al. 2011). This leads to the following hypothesis:

**Hypothesis 6 (H6):** The greater the perceived process risk, the lower is the customers' intended digital process use.

Equivocality describes that multiple and conflicting interpretations exist for an activity (Daft and Lengel 1986). According to IPV-related literature, the concept of equivocality is closely linked to experience, as persons preferably rely on their experience when dealing with equivocal activities (Daft and Lengel 1986; Daft and Macintosh 1981). Experience (also commonly referred to as familiarity) is identified as a driver for the use of online services in related areas: E-commerce literature shows that experience with an Internet service provider and its specific processes increases buyers' intention to purchase products and services online (Gefen 2000). Further research confirms the findings (Gefen et al. 2003; Pavlou and Gefen 2005) and identifies experience as a moderating factor for customers' perception of Internet banking (Mäenpää et al. 2008). To set the previous findings into the context of our study, the following hypothesis is derived:

**Hypothesis 7 (H7):** The greater the perceived process experience, the higher is the customers' intended digital process use.

All hypotheses explain the impact of information requirements and further IPV-related factors towards the intended digital process use. The hypothesized relations are grounded in the IPV, which was chosen as theoretical lens for our research. Further constructs that are not related to this theoretical lens (e.g. regulatory factors) are excluded from the scope of the study. In the following section all hypotheses are synthesized towards a research model.

## 2.2.3 Research Model

Based on the previous hypotheses, a research model is derived (Figure 1). It explains the impact of information requirements and process-specific characteristics towards the intended digital process use. Intended digital process use is driven by customers' information requirements for the respective process as well as by process risk and process experience. Furthermore, process ambiguity, process complexity, process interdependence, and process importance determine customers' information requirements. To ensure that the dependent variable is not influenced by participants' characteristics we take several control variables into account. Particularly, socio-demographic characteristics are included such as language, age, gender, and educational level. We also consider Internet usage and trust in bank as control variables.

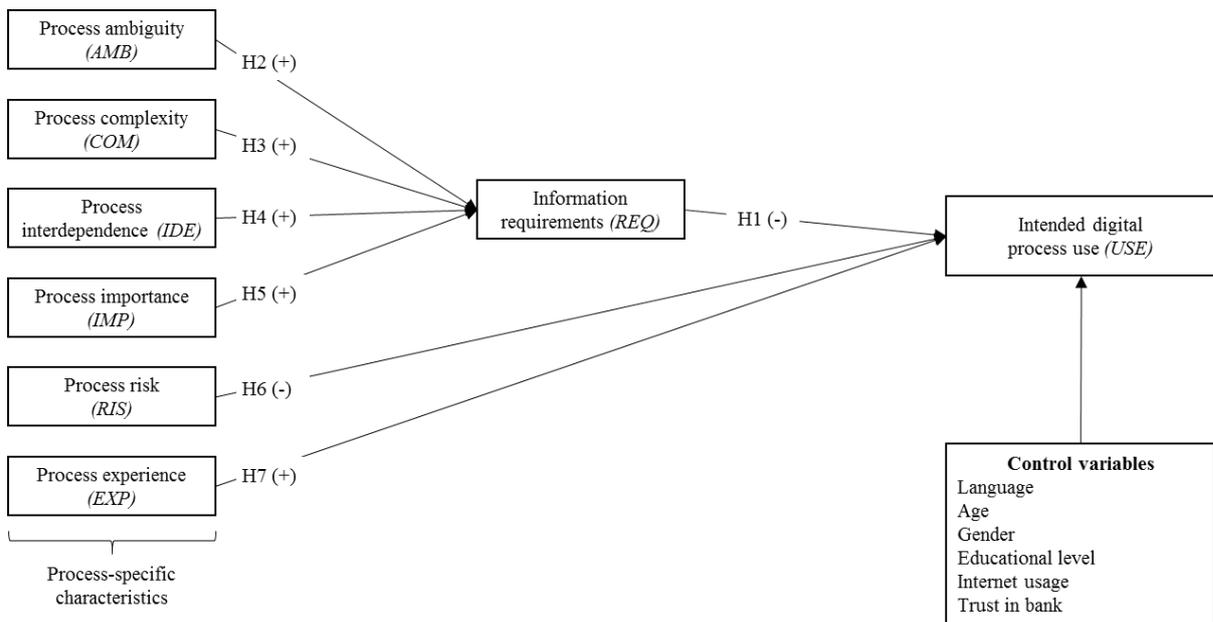


Figure 1. Research Model (with construct abbreviations and control variables)

### 3 Research Methodology

#### 3.1 Item Development and Instrument Pretesting

A quantitative study is conducted to empirically assess the research model. To retrieve relevant information, a web-based survey is used. The preparation of the questionnaire grounds on a comprehensive item development procedure. All measurement items of the constructs are based on existing literature that has been proven reliable. If necessary, a slight rewording is conducted to suit the study's retail banking context. All constructs are measured reflectively. A list of measurement items used and their source is provided in the appendix.

In total, five further steps were incorporated to ensure the validity and reliability of the measures. First, five researchers participated in a card sorting procedure for the identified measurement items (Boudreau et al. 2001). As the items originate from different literature sources, the step ensured that the items of the various constructs are mutually exclusive. Second, the operationalization of all constructs was translated into German. The study focused on Internet banking customers who live in Germany. They had the choice to either participate in English or in German. Three researchers performed a back-translation (Brislin 1986) to ensure a correct and consistent understanding in both languages. Third, discussions with academic experts and practitioners from the financial services industry followed to examine the relevance of the survey, its comprehensibility and the consistency of the terminology used. Any ambiguity detected was resolved. Fourth, a draft questionnaire was prepared based on the established items. In this respect, all constructs were measured by closed-ended questions on a 7-point Likert scale. In terms of an ordinal-polytomous response scale, the answer options were ordered from fully disagree (1) to fully agree (7). Fifth and finally, 13 persons participated in a pre-test who provided 23 responses distributed across all processes. The pre-test sample consisted of German Internet banking customers in the age between 22 and 63. The gender was distributed almost equally. After the pre-test minor improvements regarding the questionnaire and its appearance were made.

### **3.2 Study Design**

A web-based survey is set up to empirically assess the research model. The approach is well-suited for the research at hand, as the Internet is a promising channel to reach a broad range of participants (Sills and Song 2002). Furthermore, it is appropriate for this study as the population focuses on Internet users with bank accounts. Individuals without access to the Internet are explicitly excluded from the population under investigation. Literature related to the digital divide (Wei et al. 2011) addresses how to include these persons into the digital society. The survey incorporates a respondent-friendly structure to increase the response rate: It starts with a short introduction with instructions, the retrieval of information for demographics and further control variables. Next, participants have to select those processes that they already have conducted before. Subsequently, the questionnaire provides a short description for the process under investigation and retrieves the answers for all items. All items retrieved are prompted in a format that is easy to respond to, clear, and non-offensive (Lynn 2008).

The study considers eight retail banking processes with varying process-specific characteristics in the investigation. The process selection for our study is based on a comprehensive review of retail banking-specific reports (Bain & Company 2012, Capgemini 2012, Deutsche Bank Research 2009, EY 2012, PWC 2012) and an evaluation by experts from the financial services industry. This ensures that the most common retail banking transactions are included. More precisely, the study investigates eight retail banking processes: (1) transferring funds to a savings account, (2) transferring funds for common purposes, (3) blocking a debit/credit card, (4) opening an account, (5) switching accounts, (6) buying securities, (7) signing a construction financing, and (8) signing a retirement provision. In this regard, our selection covers a wide range of different transactions including transactional, communicational as well as registration processes (Ebbers et al. 2008). All processes belong to the area of retail banking. Other areas (e.g. B2B banking services) may require a different collection of processes.

Each participant can take part in the survey once and with respect to only two of the eight previously outlined banking processes. To ensure response accuracy and integrity participants are only asked regarding processes that they have already conducted before. Additionally, the provision of a process description sets a common understanding of the process and its inherent steps for all participants. If participants select more than two processes, they go through evaluations for two randomly selected processes only. Participants who have never performed any or only one of the predefined processes are screened out. For each of the eight processes a separate survey version is set up. Items within the eight versions only differ by the specific name of the process (see Appendix).

### **3.3 Data Collection and Sample Characteristics**

The survey was conducted during a period of three weeks from November to December 2013. Participants could attend a lottery drawing with low-value prizes in return for survey completion. 566 persons started the completion of the online questionnaire. Participants with incomplete answers were removed from the sample leading to 178 completed surveys, each with answers for two specific processes. To include only participants who read the questionnaire carefully, 7 participants were excluded that needed less than half of the mean average survey duration. After this exclusion, the mean average time to finish the questionnaire was 16.5 minutes. To exclude further unreliable responses, the answers were screened for unlikely patterns, such as alternating between two values or all maximum values despite reverse-measured items (Bulgurcu et al. 2010). As a result, two further answers were removed leading to 169 valid answers that remain for analysis. This adds up to a response rate of 29.8% and 338 process evaluations in total, as every participant ran through evaluations for two processes. Response rates between 25 and 30% are common for online surveys (Kittleson 1997; Cook et al. 2000).

The socio-demographic statistics indicate a well distributed sample of Internet users. Of the 169 respondents in the final sample, 33.1 percent were female and 66.9 percent male. While 42.0 percent of the respondents were in the 18 to 24 age range, 40.2 percent assign to the 25 to 49 age range and 17.8 percent are above 50. All respondents were customers of banks. The average relation to the bank was

16.3 years and the average Internet usage was 5.5 hours per day. 76.9 percent of the participants state that they buy on the Internet at least once a month.

## 4 Data Analysis and Results

This study uses structural equation modelling with partial least squares (PLS) regression to test the research model. PLS has various strengths which make it appropriate for this study. First, it is recommended for exploratory research and theory development (Hair et al. 2011). This paper focuses on the exploration of drivers for digital process use and takes an information processing perspective. Second, PLS is recommended for the analysis of complex structural models (Ringle et al. 2012). The research model at hand comprises eight constructs, which make the model complex. Third, PLS is recommended to deliver robust results for relatively small sample sizes (Urbach and Ahlemann 2010), making it appropriate for the data set at hand. For the data analysis SmartPLS 2.0 M3 was used (Ringle et al. 2005). As commonly recommended, the paper follows a two-step analysis for assessing the measurement model and the structural model (Anderson and Gerbing 1988; Gefen et al. 2000).

### 4.1 Measurement Model Validation

The measurement model is validated with various statistical tests (Table 1). First, the analysis assesses convergent validity of the constructs by calculating the average variance extracted (AVE) and the factor loadings of the individual measures. With a minimum of 0.61 all AVE values are comfortably higher than the acceptable threshold of 0.5 (Fornell and Larcker 1981). As indicated in the appendix, all factor loadings are larger than the recommended minimum of 0.7 (Hulland 1999). Furthermore, all items are significant on the  $p < 0.001$ -level. Next, the analysis validates the internal consistency and the scale reliability. Cronbach's alpha and the composite reliability (CR) are applied in this respect. For both, values above 0.7 are seen as acceptable (Nunnally and Bernstein 1994; Werts et al. 1974). All constructs range clearly above these thresholds. Finally, discriminant validity of the constructs is assessed. The square root of the AVE is calculated for each construct and compared to its correlations with other constructs. The results show that each indicator is the highest for its designated construct. Accordingly, the constructs in the model differ significantly from one another indicating that the discriminant validity holds for the paper at hand.

Con-struct	AVE [> 0.5]	Cron- bach's $\alpha$ [> 0.7]	CR [> 0.7]	REQ	AMB	COM	IMP	IDE	RIS	EXP	USE
REQ	0.71	0.79	0.88	<b>0.84</b>							
AMB	0.79	0.87	0.92	0.49	<b>0.89</b>						
COM	0.72	0.81	0.89	0.51	0.73	<b>0.85</b>					
IMP	0.61	0.71	0.82	0.24	0.04	0.09	<b>0.78</b>				
IDE	0.61	0.79	0.86	0.40	0.57	0.51	0.02	<b>0.78</b>			
RIS	0.81	0.92	0.94	0.32	0.50	0.40	0.03	0.41	<b>0.90</b>		
EXP	1.00	1.00	1.00	-0.26	-0.35	-0.44	0.13	-0.23	-0.14	<b>1.00</b>	
USE	0.86	0.94	0.96	-0.40	-0.56	-0.46	-0.02	-0.42	-0.71	0.34	<b>0.93</b>

Table 1. AVE, Cronbach's  $\alpha$ , CR and Inter-Construct Correlation Matrix (square root of AVE shown in bold)

## 4.2 Structural Model Validation

The analysis of the structural model evaluates the construct interrelationships. Figure 2 shows the research model with standardized path coefficients, significance of the paths, and the amount of variance explained ( $R^2$ ). The results are based on an application of the standard PLS algorithm as well as the bootstrapping procedure provided by SmartPLS with 300 maximum iterations, path weighting scheme, no sign changes, 338 cases, and 5000 samples. Examining individual path coefficients, all seven hypothesized paths in the model are significant. As outlined in the following, six out of seven paths are significant on the  $p < 0.001$ -level, which provides strong evidence for the hypothesized relations. Intended digital process use is predicted negatively by information requirements ( $\beta = -0.146$ ,  $p < 0.001$ ) and process risk ( $\beta = -0.628$ ,  $p < 0.001$ ) providing empirical support for hypothesis H1 and H6. Furthermore, process experience ( $\beta = 0.214$ ,  $p < 0.001$ ) has a significant positive effect on intended digital process use which supports hypothesis H7. The  $R^2$  value of the dependent variable 'Intended digital process use' is 0.574. Chin (1998) considers a value around 0.333 as average, indicating that our research model can explain a large amount of variance in the dependant variable by the information requirements of the customer, the risk associated to the process, and the experience with the process. Additionally, the analysis shows significant effects towards information requirements. As hypothesized in section 2, process ambiguity ( $\beta = 0.209$ ,  $p < 0.001$ ), process complexity ( $\beta = 0.263$ ,  $p < 0.001$ ), process interdependence ( $\beta = 0.145$ ,  $p < 0.01$ ), and process importance ( $\beta = 0.206$ ,  $p < 0.001$ ) have a significant positive impact on customers' information requirements for the process. The  $R^2$  value for information requirements is 0.345.

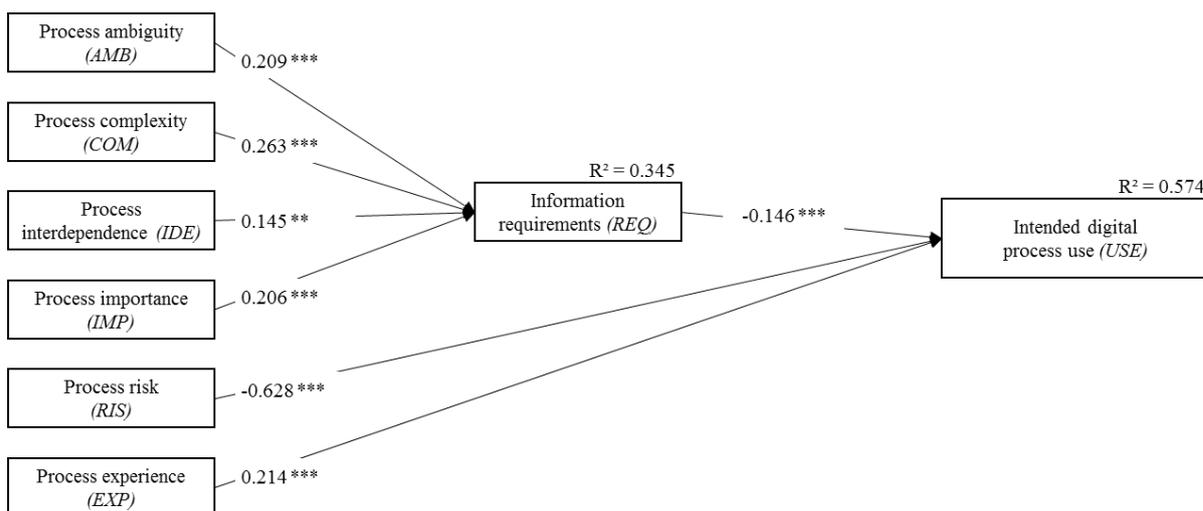


Figure 2. Research Model with Results of PLS Analysis (\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ )

An application of the blindfolding algorithm provided by SmartPLS revealed a cross-validated redundancy of  $Q^2 = 0.488$  for intended digital process use and  $Q^2 = 0.242$  for information requirements. All values range clearly above the Stone-Geisser criterion of  $Q^2 > 0$  (Fornell and Cha 1994; Geisser 1974; Stone 1974) and thus ensure the predictive relevance of both constructs (Ringle et al. 2012). Additionally, the Goodness of Fit (GoF) measure was incorporated to assess the conformity between experimental result and theoretical expectations. The measure was calculated as the geometric mean of the average communality and the average  $R^2$  of endogenous constructs (Tenenhaus et al. 2005). The model reaches a GoF-value of 0.59 which comfortably exceeds the cut-off value of 0.36 for large effect sizes of  $R^2$  (Tenenhaus et al. 2009).

In a next step, the research model is extended by the presented set of control variables and retested. The same PLS algorithm and bootstrapping settings as mentioned earlier were used in this regard. No significant influence of language, age, gender, educational level, and trust in bank on the intended digital process use is found. Only the control variable ‘internet usage’ ( $\beta = -0.121$ ,  $p < 0.001$ ) is positively associated with intended digital process use. The significance of all hypothesized paths in the research model does not change in an evaluation with control variables. The  $R^2$  of the dependent variable ‘Intended digital process use’ amounts to 0.613 for an assessment of the research model with control variables. Accordingly,  $R^2$  does not increase extensively in comparison to an assessment without control variables. These results emphasize the quality of our findings.

## **5 Discussion**

The results confirm all of the initially introduced hypotheses. Given the wide spectrum of influencing factors adopted from the IPV, the findings are well suited to draw a comprehensive picture of the determinants of intended digital process use from a customer’s perspective. In terms of a directly influencing relation customers’ information requirements, process risk, and process experience impact customers’ intention to use digital processes. These findings help to understand why customers intend to use digital retail banking transactions and how the use of digital services can be increased.

The research results reveal that information requirements negatively impact intended digital process use. This finding takes the existing literature related to the IPV as a basis and sets it into a customer and retail banking-specific context. The IPV-specific perspective and the respective focus on information requirements has not been considered in this research area so far and thus extends the explanations of existing theories. Practitioners can use our findings for building appropriate online services. They can conclude that processes with high information requirements are generally less suited to be offered purely in an online environment. This is in line with existing literature indicating that customers switch between channels within transactions (Kuruzovich et al. 2008; Verhoef et al. 2007; Chiu et al 2011). In terms of a multi-channel strategy, financial institutions may rather fulfill the specific information needs in the branch in a first step, while customers should be enabled to proceed with the service via a digital channel or vice versa. Such a closely-coupled interaction between multiple channels can enable cost benefits for the bank due to the increased usage of the online channel where appropriate. Customers benefit from a more convenient process execution, as they can complete parts of process over the Internet whenever and wherever they want.

This study also investigates the drivers of information requirements. Our results reveal that customers’ information requirements increase, if certain process-specific characteristics become more present. All factors that have been initially hypothesized have a significant relation towards customers’ information requirements. Process ambiguity, process complexity, and process importance show the strongest positive impact on customers’ information requirements. Hence, these factors need to be considered when designing convenient online services: To ultimately increase the intended digital process use, banks should decrease process ambiguity by confirmations whether or not a customer has understood the instructions correctly and has provided the right input. Furthermore, the level of complexity in banking services should be minimized to the extent that is possible within the regulatory requirements. In this regard, simplification and gamification can be two distinct design principles to reduce complexity and ambiguity in retail banking and ultimately increase the digital process use. Banks, comparison portals, and innovative start-ups provide various examples for digital applications that consider these design principles. Applications include personal finance management systems, mobile payment systems, and remote deposit capturing. In addition, banks should identify transactions that are highly important for customers and address the respective information requirements appropriately. Process interdependence marks a fourth determinant for customers’ information requirements. The factor originates from IPV-related literature in the business-to-business area. In contrast, this study focuses on business-to-consumer environments. The interdependencies in private contexts may be less demanding and developed, which could explain the moderate strength of the relationship.

In addition, this study reveals that process risk and process experience directly impact digital process use. A significant negative path between process risk and intended digital process use is found. The results support and strengthen findings from prior research. Barth and Veit (2011) assessed the resistance towards conducting specific public services online, which they generally interpret as a reverse measure of use. In comparison to their work, an even stronger relationship between risk and customers' intended digital process use is found within this study. This seems comprehensible, as banking services can have a higher impact on an individual's life compared to public services. Also the loss involved in banking-specific transactions may be higher and more immediate. Lee (2009) also finds an impact of risk facets on the behavioural intention to use Internet banking. Thus, practitioners should identify processes with high perceived risk by customers and implement risk mitigating measures to assure successful digitization of the respective process.

Furthermore, this study finds that retail banking customers who are experienced with certain processes are more likely to conduct these in a digital environment. Literature from the area of e-commerce indicates support for our finding (cf. Gefen 2000). However, the finding is also contrary to existing research. The empirical evaluation of Barth and Veit (2011) finds no significant relation between process experience and resistance towards conducting the process online. Another study by Liao et al. (2011) identifies experience as a negative moderator towards the intention to conduct a transaction online. In this regard, future research needs to investigate if the contradictory findings may relate to the different areas of investigation. The strong positive impact of customers' perceived process experience on intended digital process use in our study has also implications for practice. Banks should differentiate between experienced and unexperienced clients in their provision of digital services. To increase the use of digital services, measures that foster process experience should be implemented for unexperienced customers. Such measures can include online tutorials with guided tours, or "playground environments" to exercise transactions without any impact on the real financial situation.

The structural model validation shows the significance of one control variable, namely Internet usage ( $\beta = 0.157$ ,  $p < 0.001$ ). The intended digital process use increases with higher levels of Internet usage. This result is comprehensible, because specific communication channel skills can impact the intended use. Accordingly, persons who use the Internet in general also seem to be more likely to use the Internet for banking services. This finding is included only as a control variable, as our developed research model focuses on characteristics that are associated to the underlying banking transaction. Nevertheless, a more detailed assessment of personality-related characteristics and their impact towards intended digital process use is promising for future research. For instance, the application of the Big Five Personality Index (Rammstedt and John 2007) may lead to further complementary insights.

## **6 Conclusion**

Modern retail banking is characterized by an increasing shift from physical to digital service delivery. This paper takes this circumstance as a motivation to investigate which factors determine the intended use of digital banking services from a customer's point of view. In particular, the paper focuses on the impact of information requirements and further IPV-related factors towards intended digital process use. Based on IPV-related literature a research model is derived. It proposes that information requirements, process risk, and process experience impact intended digital process use. The empirical validation shows that customers' information requirements and process risk are negatively associated to intended digital process use, while process experience positively impacts intended digital process use. To better understand the underlying drivers for information requirements the paper adopts four process-specific characteristics that are theoretically grounded in the IPV. Namely, they refer to process ambiguity, process complexity, process interdependence, and process importance. The empirical results reveal that all four process characteristics positively impact customers' information requirements.

Although the results originate from a carefully prepared quantitative study, there are specific limitations to this work. First, the survey focuses on bank customers with Internet access in Germany. Accordingly, the results may not be generalizable for other countries and customers without Internet ac-

cess. Future research can resolve these limitations and test the findings for other nations and persons without Internet access or skills. Second, all conclusions are associated to the domain of retail banking as one of the most widely used online activities. Future research has to assess if the results are also significant in a context with less standardized banking services, for instance in the area of wealth management. Additionally, participants of our study are only asked regarding processes that they have already conducted before. Although this approach was taken by purpose to ensure sufficient knowledge about the respective retail banking transactions, future research can remove this threshold and assess potential differences between both groups. The use of Finite Mixture Partial Least Squares (PLS-FIMIX) is a promising method to test for any unobserved heterogeneity (Ringle et al. 2012). Finally, this study takes an information processing perspective and concentrates on the impact of information requirements and process-specific characteristics on intended digital process use. Future empirical research can apply complementary theoretical lenses. As indicated in the discussion, the investigation of factors that relate to a customer's personality, the consideration of regulatory aspects as well as the exploration of switching behaviour between online and offline channels are promising in this regard.

This paper provides important theoretical contributions to the emerging body of knowledge regarding the intended use of digital services. In particular, our paper takes the trend towards digitization as motivation and builds domain-specific knowledge in the area of retail banking. To our best knowledge, this is the first research that takes an information processing perspective to evaluate the determinants of intended digital process use in retail banking. With its grounding in the IPV the paper complements existing theoretical lenses which have largely excluded the role of information requirements. In this regard, we also contribute to a deeper understanding of process-specific characteristics that determine customers' information requirements in retail banking. Based on our theoretical lens we validate four specific drivers that determine customers' information requirements. In addition, we show that certain process-specific characteristics can impact intended digital process use directly.

This study also offers important implications for practitioners in the banking industry. They learn why customers intend to use distinct banking services online. In this regard, our research model informs how IPV-related constructs in general and information requirements in particular impact intended digital process use. On the one hand, a selection scheme can be established to identify processes that are less amenable for online conduction. On the other hand, the research model provides an appropriate basis for banks to identify where and how adjustments in online channels can eventually increase customers' digital process use. The implementation of measures that decrease risk and customers' information requirements as well as measures that increase experience are important in this regard. As a result, increased usage of digital retail banking services can add value to both financial institutions and their customers: An increase in the share of online transactions improves the operational efficiency of banks and offers enhanced availability, mobility, and convenience for customers.

## 7 Appendix: Measurement Items of Questionnaire

Constr.	Item	Loadings	Source
USE	If possible in the future, I would use the online version of [the process].	0.956***	Barth and Veit (2011)
	I prefer to continue the personal handling of [the process] on-site. (reverse)	0.946***	
	I would not use the online version of [the process]. (reverse)	0.867***	
	If I had the choice, I would prefer conducting [the process] on-site (in the branch). (reverse)	0.936***	
<i>continued on next page</i>			

Constr.	Item	Loadings	Source
REQ	Where do you see your information requirements on the given continuum? (Low/high)	0.891***	Mani et al. (2006),
	When conducting [the process], tools allowing effective communication are important to me.	0.718***	Klotz et al. (2008),
	How much information do you feel you need about the process? (little/a lot)	0.899***	Isaacs (1996)
AMB	While [the process], I will probably need the confirmation of the employees that I have understood the forms, the necessary procedure or the technical terms correctly.	0.878***	Barth and Veit (2011),
	The necessary procedures, forms or technical terms of [the process], are difficult to understand on my own.	0.900***	Treviño et al. (2000)
	The way I see it, the necessary procedures, forms or technical terms involved in [the process], are easy to understand on my own. (reverse)	0.892***	
COM	In general, [the process] is complex.	0.877***	Hoehle et al. (2012)
	Overall, [the process] is a complicated banking transaction.	0.878***	
	[The process] is an ordinary banking transaction to me. (reverse)	0.797***	
IDE	[The process] can be conducted fairly independently of others or other activities I perform. (reverse)	0.827***	Sharma and Yetton (2007), Mani et al. (2006)
	[The process] requires frequent coordination with other activities I perform.	0.817***	
	[The process] can be conducted with little need to coordinate with others or other activities I perform.	0.706***	
	[The process] maintains a high number of links with other personal activities I perform.	0.778***	
IMP	[The process] is a serious banking transaction for me.	0.830***	Hoehle et al. (2012), Pavlou et al. (2007)
	[The process] is important to me.	0.726***	
	For me, [the process] does not matter. (reverse)	0.784***	
RIS	The decision of whether to conduct [the process] online is risky.	0.828***	Bélanger and Carter (2008), Pavlou and Gefen (2005)
	In general, I believe conducting [the process] online is risky.	0.931***	
	There is a considerable risk in [the process] online.	0.917***	
	There is a high potential risk involved in [the process] online.	0.916***	
EXP	Reflecting your personal view; how often have you conducted [the process] either physically or virtually altogether?	1.000***	Pavlou and Gefen (2005)
<i>[the process]</i> : Instead of this placeholder the specific process name was shown in the survey			
Significance for Loadings: *** p < 0.001			

Table 2. Measurement Items

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