

# UNRAVELING THE EFFECT OF PERSONAL INNOVATIVENESS ON BRING-YOUR-OWN-DEVICE (BYOD) INTENTION – THE ROLE OF PERCEPTIONS TOWARDS ENTERPRISE-PROVIDED AND PRIVATELY-OWNED TECHNOLOGIES

*Complete Research*

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## Abstract

*Consumerization of information technology (IT) refers to consumer technologies finding their way into enterprises. In this context, bring-your-own-device (BYOD) describes the phenomenon of privately-owned mobile devices being brought into organizations. While research on the general topic is scarce, initial studies have identified personal innovativeness in IT as one important driver for this behavior. However, the reasons why innovative people are more likely to use their privately-owned devices for work remain largely undiscovered. This study argues that technology acceptance factors with respect to both the enterprise-provided as well as the privately-owned mobile devices are important mediators. Moreover, a model using perceived usefulness and perceived ease of use as mediators is derived. The model's underlying hypotheses are then tested using data from a quantitative survey in Germany. The results show that beliefs towards the ease of use of both the enterprise-provided as well as the privately owned mobile IT mediate the relationship between personal innovativeness in IT and BYOD intention. The findings are discussed with respect to implications for theory and practice and an outlook is given on potential future research.*

*Keywords: BYOD intention, Personal Innovativeness, IT Consumerization, Enterprise-Provided IT, Privately-Owned IT.*

## 1 Introduction

Consumerization of information technology (IT) refers to consumer technologies finding their way into enterprises (Ortbach, Köffer, Bode, et al., 2013). One sub-trend of IT consumerization is bring-your-own-device (BYOD), i.e. the phenomenon of employees using their privately-owned mobile devices for work. Both IT consumerization as well as BYOD are continuously evolving trends, and have been identified as highly important information systems (IS) topics (Gartner, 2013; LeHong and Fenn, 2012). In this context, market research shows that BYOD programs have already been implemented many organizations and that the trend is spreading further (Forrester, 2012). Gartner estimates that by 2020, only 15% of companies will not provide any BYOD option, 45% will force their employees into using their privately-owned device and 40% will let their workforce choose between company-provided and privately-owned devices (Willis, 2013). With respect to the latter case, the question arises what drives individuals to use their own devices instead of the company-provided ones – either with or without permission of the organization. While academic literature on the topic remains scarce some initial conference papers have targeted this BYOD behavior (e.g. Hopkins et al., 2013a; Lee et al., 2013; Loose et al., 2013a; Ortbach, Köffer, Bode, et al., 2013).

Innovativeness with respect to technology can be seen as a very important factor for choosing to use private devices for work. BYOD is driven by innovative employees that are technological early-adopters in their private life and know about the features of their private IT and how it may be utilized

for work purposes. For instance, Gartner states in a whitepaper that “the first candidates for BYO[D] programs will be technically knowledgeable users” (Jones and Wallin, 2011). This reasoning is also adopted by some of the first research on the topic showing a positive effect of personal innovativeness in IT on BYOD intention (Dernbecher et al., 2013; Weeger and Gewald, 2014),

However, the relationship has not yet been studied in detail. Are innovative people favorable towards BYOD because they are generally more risk-averse or is the relationship between innovativeness and BYOD intention mediated by other factors? Innovativeness in general was shown to impact perceptions with respect to technologies. For instance, research has shown that innovativeness influences technology acceptance factors like usefulness or ease of use (e.g. Lewis et al., 2003) which, in turn, were also identified as important factors determining the intention to use private devices for work (Hopkins et al., 2013). However, these relationships have not been evaluated in the context of BYOD.

This study aims to close this gap by deriving a theoretically founded model on the relationship between personal innovativeness and BYOD intention that focuses on concurrent evaluation of the mediating effects of perceptions towards both privately-owned and enterprise-provided mobile IT. The research question (RQ) for this study is as follows:

*RQ: What is the relationship between personal innovativeness in IT and bring-your-own-device (BYOD) intention of individuals?*

To address this research question, the remainder of this paper is structured as follows. Section two defines the major concepts used in this research and gives an overview on existing studies with respect to BYOD adoption and its effects. Section three then derives a model detailing the relationship between personal innovativeness in IT and BYOD behavior using established concepts from technology acceptance theory as mediators. Section four presents the measurement instrument as well as the research methodology while results from the quantitative analysis are described in section five. Section six discusses the findings as well as their implications for theory and practice and outlines both limitations and opportunities for future research in this area.

## 2 Related Work

### 2.1 Consumerization of IT and BYOD

Consumerization of IT refers to the use of consumer technologies in a business context (Ortbach, Köffer, Bode, et al., 2013). Literature has proposed three distinct perspectives on the phenomenon: 1) a market perspective, 2) an individual perspective and 3) an organizational perspective (Harris et al., 2012). From the market perspective, consumerization refers the fact that IT tools, originally developed for the consumer market, gradually find their way into organizations. This includes organizational adoption of these technologies as well as the use of privately owned tools for work – with or without permission of the enterprise. The other two perspectives are more detailed and focus on ownership of the tools (individual perspective) and the permission to use private IT for work (organizational perspective). In this study, consumerization of IT is seen as the general trend (market perspective)

Bring-your-own-device (BYOD) is commonly seen as a sub-trend of IT consumerization and both terms have often been used synonymously (Loose, Weeger, et al., 2013). There are two major viewpoints on what constitutes BYOD which resemble the individual and organizational perspective on IT consumerization as described earlier. On the one hand, some authors take the view that BYOD refers to the behavior of the user, i.e. the action of bringing a personally owned device to work. For instance, Dernbecher et al. (2013, p.1) state that “consumers [...] use their own mobile devices for business purposes which is commonly known as bring your own device (BYOD)”. This definition of the concept includes that devices may also be brought into the company without knowledge or permission of the enterprise. In practitioner studies on the topic, this is often seen as major issue (Avenade, 2012; Bradley et al., 2012; Dimensional Research, 2012). On the other hand, several authors see the term BYOD to be explicitly related to corporate policy (e.g. Yun et al., 2012). For example, Yun et al.

(2012, p.1) state that “[a]n increasing number of companies allow their employees to use their personal smartphones for job tasks (often referred to as ‘bring your own device’ [BYOD])”. Here, the company’s support decision is at the core of the definition. In this context, some authors also speak of BYOD service (Loose, Weeger, et al., 2013) or BYOD program (Lee et al., 2013), which both have to be considered more fitting terms. In this study, the term *BYOD behavior* is used to refer to the behavior of using private devices for work purposes and while *BYOD service* is used to refer to the support of this behavior on the side of the enterprise.

In 2012, Niehaves et al. (2012) concluded from their literature review that not much theory development had been conducted in the context of IT consumerization. Most existing studies on the subject were practitioner reports focusing on organizational issues with respect to e.g. security risks (Dimensional Research, 2012; ENISA, 2012; Miller et al., 2012) or possible benefits like increased motivation and performance of employees (Dell and Intel, 2012; Murdoch et al., 2010). Over the last years, however, studies have started to focus on both the effects of consumerization as well as the antecedents of the trend. For instance, regarding the effects, there has been research and theory development on the relationship between IT consumerization and job satisfaction (Giddens and Tripp, 2014), stress (Niehaves, Köffer, Ortbach, et al., 2013; Ortbach, Köffer, Müller, et al., 2013; Yun et al., 2012), work-life balance (Köffer, Junglas, et al., 2014) as well as performance (Giddens and Tripp, 2014; Köffer, Ortbach, et al., 2014; Niehaves, Köffer and Ortbach, 2013). With respect to antecedents, studies have utilized e.g. switching theory (Dernbecher et al., 2013), theory of reasoned action/ theory of planned behaviour (Hopkins et al., 2013; Lee et al., 2013; Ortbach, Köffer, Bode, et al., 2013), or perceived risk theory (Weeger and Gewald, 2014) to explain BYOD behaviour of individuals. In addition, IS research has also focused on organizational reactions to the trend, e.g. with respect to IT governance (Györy et al., 2012) or mobile device management (Ortbach et al., 2014). As this research seeks to contribute to the question of what drives people to use their private devices for work purposes, the following section will review existing studies on BYOD behavior in more detail.

## 2.2 BYOD Behavior

Several recent studies have focused on explaining what drives individual behavior in the context of BYOD. Here, mainly two streams can be identified which correspond to different conceptualizations of the dependent construct. First, studies have targeted the generic behavior of using private devices at work, disregarding whether or not it is supported by the organization (stream A) (e.g. Chen, 2014). In this stream, the behavior refers to “using other technologies than those provided by the individuals company” (Ortbach, Köffer, Bode, et al., 2013, p.6) or “intention to use [...] private mobile devices for working purposes” (Lebek et al., 2013, p.1). Second, research has also focused on explaining BYOD service adoption (stream B) (e.g. Lee et al., 2013). It is assumed that companies offer BYOD services which can be used by employees. Thus, the focus lies on explaining the “behavioural intention to participate in a corporate BYOD program” (Weeger and Gewald, 2014, p.4) or “BYOD service adoption by future employees” (Loose, Weeger, et al., 2013, p.4). In addition, a slightly different perspective is taken by (Putri and Hovav, 2014) who investigate the intention to comply with BYOD policies, i.e. to follow the rules and requirements of the organization when using a personal device for work. This is closely related to research on security violations in the workplace (Guo et al., 2011).

A comprehensive overview of existing studies in this context, with their dependent, independent constructs and their theoretical perspective is shown in Table 1 (‘N’ indicates number of participants). This study is positioned in stream A, i.e. it aims to provide evidence with respect to the intention to use private IT at work independent of the existence of a BYOD program. More particularly, it focuses on evaluating the effect of personal innovativeness on BYOD intention. As mandated BYOD is still uncommon in practice (Willis, 2013), BYOD behavior is seen as an employee choice in this study. Here, additional research is necessary mainly due to three reasons. First, results with respect to the effect of PIIT are mixed (Dernbecher et al., 2013; Ortbach, Bode and Niehaves, 2013; Weeger and Gewald, 2014). While some research has found that “people characterized by a high degree of person-

al innovativeness are more likely to use innovative IT devices for private and work-related activities and are therefore more likely to participate in a corporate BYOD program” (Weeger and Gewald, 2014, p.6), other studies showed no significant effect on the intention to use private IT for work (Ortbach, Bode and Niehaves, 2013). Second, related research on technology acceptance shows that a potential influence is not direct, but likely to be mediated by perceived usefulness and perceived ease of use (Agarwal and Prasad, 1998), which is not considered in any of the current BYOD models.

Reference	Dependent (behavior) construct	Definition of dependent construct	Independent Variables, Mediators, and Moderators	Theoretical Lens	Stream	N
(Chen, 2014)	Continuance Intention of personal IT device (PITD) use	“intention that users plan to use the same PITD(s) to perform the similar tasks in the future given that the consistency of the portfolio available to them” (p. 5)	Flexibility of Multiple PITD Use, Task Complexity <sup>2</sup> , Affective Appraisals, Cognitive Appraisals, Satisfaction	Psychological Reactance Theory	A	n/a
(Ortbach, Köffer, Bode, et al., 2013)	Consumerization intention / consumerization behavior	“using other technologies than those provided by the individuals’ company to perform work tasks within the next two months” (p. 6)	Attitude towards IT Consumerization Behavior, Subjective Norms regarding IT Consumerization Behavior, Perceived Behavioral Control of IT Consumerization Behavior	Theory of planned behavior (+ belief analysis)	A	73
(Lebek et al., 2013)	Intention to Use (BYOD)	“intention to use [...] private mobile devices for working purposes” (p.1)	Security Concerns, Privacy Concerns, Legal Concerns, Perceived Uncertainty <sup>1</sup> , Attitude <sup>1</sup> , Perceived Benefits	Theory of Reasoned Action, Technology Acceptance Model	A	151
(Lee et al., 2013)	BYOD Adaption Behavioral Intention, BYOD Adoption	[intention to] “participate in a BYOD program” (p.5)	Tasks Measured, Frequency, Justification, Organizational Control, Mobile User’s Information Privacy Concerns, Job Performance Expectancy, Mobile Computing Self-Efficacy <sup>2</sup>	Theory of Planned Behavior	B	n/a
(Weeger and Gewald, 2014)	Behavioral intention (BYOD)	“behavioural intention to participate in a corporate BYOD program” (p. 4)	Financial Risk, Performance Risk, Privacy Risk, Psychosocial Risk, Safety Risk, Security Risk, Perceived Risk <sup>1</sup> , Perceived Benefit, Personal innovativeness with IT	Net-valence model and Perceived Risk Theory	B	71
(Loose, Weeger, et al., 2013)	Behavioral intention (BYOD)*	“BYOD service adoption by future employees” (p. 4)	Perceived Business Threats, Perceived Private Threats, Perceived Threats <sup>1</sup> , Social Influence, Effort Expectancy, Performance Expectancy	UTAUT	B	84
(Dernbecher et al., 2013)	Consumerization	“continuance of privately owned devices and software usage in a work environment” (p. 4)	Personal innovativeness, Self-efficacy, Habit <sup>1</sup>	Switching Theory	A	74
(Ortbach, Bode and Niehaves, 2013)	Consumerization intention	“intention to use other technologies than those provided by the company to perform work tasks within the next two months”	Expected Performance Improvement, Consumerization Behavior of Coworkers, Personal Innovativeness in IT	Theory of Reasoned Action	A	60
(Hopkins et al., 2013)	Behavioral Intention (BYOD)	“students’ behavioural intention to use their own device” (p. 3)	Compatibility, Perceived Ease of Use, Perceived Usefulness, Attitude <sup>1</sup> , Teacher Influence, Parental Influence, Peer Influence, Subjective Norm <sup>1</sup> , Self Efficacy, Learning Autonomy, Facilitating Conditions, Perceived Behavioural Control <sup>1</sup>	Theory of Planned Behavior	A	386

\* Final dependent construct of the study was employer attractiveness

<sup>1</sup> used as mediator

<sup>2</sup> used as moderator

*Table 1: Overview of Existing Studies on BYOD*

Third, current studies mostly focus on explaining private device use by means of beliefs towards these privately owned technologies, e.g. with respect to ease of use or usefulness (Hopkins et al., 2013). However, the decision to bring a personally owned device to work is considered to be also based on an evaluation of the provided IT (Harris et al., 2011). If an enterprise provides innovative and useful IT tools the adoption of technologies from the private realm will likely decrease. Most existing models solve this issue by measuring the delta, i.e. whether or not the use of private IT would improve their current situation with respect to IT. While this is accurate, it does not allow to determine how much of the effect can be attributed to an implicit satisfaction or dissatisfaction with the enterprise IT, and how much is governed by beliefs with respect to the private IT.

This study focuses on addressing these issues and aims to further the understanding of the relationship between personal innovativeness in IT and BYOD behavior. In selecting mediators for this relationship, the research is driven by the question if BYOD behavior is foremost driven by beliefs with respect to the private IT or if evaluations of the provided enterprise IT also play a role. To this end, measures of the technology acceptance model (TAM), i.e. perceived usefulness and perceived ease of use are used. This is done due to three reasons: 1) technology acceptance factors have been included in many models on BYOD intention and have found to be important predictors (Hopkins et al., 2013), 2) academic literature suggests that the TAM factors are influenced by personal innovativeness (e.g. Lewis et al., 2003) and 3) both constructs have been thoroughly validated in the literature. Thus, for the purpose of this study, the focus will be on perceived usefulness and perceived ease of use as potential mediators. Factors such as privacy and data security issues, while having some explanatory power with respect to BYOD intention as well (e.g. Lebek et al., 2013; Lee et al., 2013) are omitted as they are more relevant for organizational policy development than for individual choice.

### **3 Model Development**

#### **3.1 Personal innovativeness in IT**

The concept of personal innovativeness originates from innovation diffusion research (Rogers, 1983, 1995) and describes the personality trait of 'being innovative', i.e. being early at adopting innovations. The concept has been adopted by (Agarwal and Prasad, 1998) who argued that innovativeness must be domain specific rather than global and defined personal innovativeness in the domain of IT (PIIT) as "the willingness of an individual to try out any new information technology" (p. 206). In IS research the concept is seen as "key enabler of effective interactions with IT because it fosters positive beliefs about technology" (Elie-Dit-Cosaque et al., 2011, p.209). While the construct was initially modeled as a moderator, more recent studies have used PIIT as direct determinant for different technology acceptance factors (e.g. Lewis et al., 2003). This latter perspective is also taken within this study as it "recognizes that individual innovativeness is an innate propensity that exerts direct influence on the evaluation process" (Yi et al., 2006, p. 396). This is important as innovative individuals are associated with higher BYOD adoption (Jones and Wallin, 2011) and this study seeks to study this proposed direct relationship in more detail. In this context, related research has found that PIIT directly impacts ease of use of a technology (Lewis et al., 2003; Lu et al., 2005). This is quite logical due to two reasons. First, early adopters of innovative IT tools are commonly associated with higher technical competence and knowledge (Rogers, 1995). Thus, any given technology will appear easier to them than to people who are less innovative. Second, Lu et al. (2005, p.252) propose that "[s]heer boldness and curiosity in their characters may [...] heighten their confidence in their capabilities to handle the technology under adoption". Related studies have found that PIIT influences concepts like computer self-efficacy and computer anxiety (Bennett and Perrewé, 2002), which in turn have been shown to affect ease of use (Venkatesh, 2000). All of the described effects of PIIT on ease of use apply equally to the

technologies employees own privately as well as to the ones they are provided with by their enterprise. Thus, it is hypothesized:

*H1a: Personal innovativeness in IT will have a positive effect on perceived ease of use of privately owned mobile IT.*

*H1b: Personal innovativeness in IT will have a positive effect on perceived ease of use of enterprise provided mobile IT.*

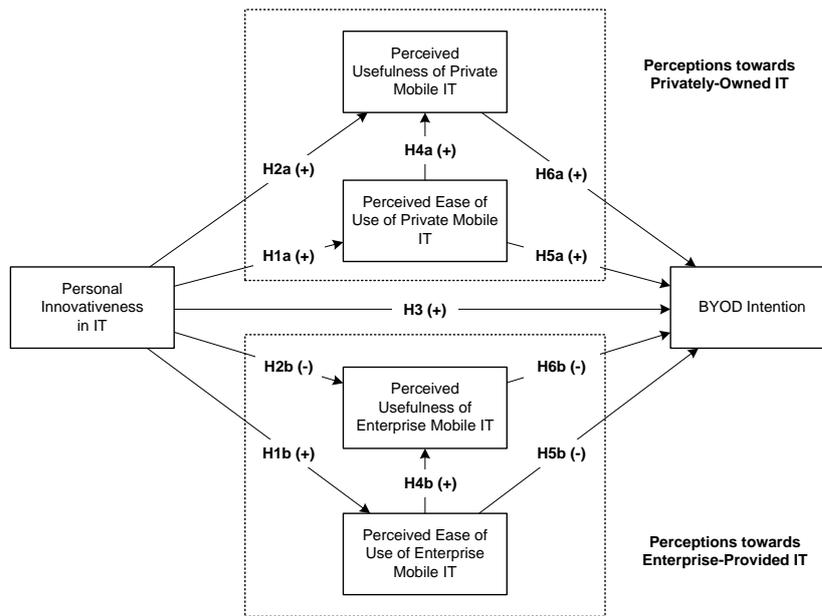


Figure 1: Proposed Research Model

Early adopters can more easily envision the potential benefits of an innovative technology and how they can use it to fulfill their needs (Rogers, 1995). Consequently, studies have found a positive relationship between personal innovativeness in IT and perceived usefulness of a technology (e.g. Yi et al., 2006). With respect to BYOD, this implies that people who are early adopters in their private life will likely evaluate the usefulness of both their private and their enterprise IT differently from a late adopter. PIIT as a construct is mostly situated in the private realm. In most cases, ‘trying out new technologies’ or ‘experimenting with IT’ will happen in a private context. Firms try to prevent employees from experimenting with consumer IT and rather offer standardized enterprise solutions they are able to support and control (Harris et al., 2012). With respect to private IT, PIIT is likely to positively affect perceived usefulness because early adopters are both more competent in selecting helpful technologies as well as equipped with more innovative tools. They have a high knowledge about available technologies and how they can use them productively (Rogers, 1995). However, this is likely to have a negative influence on the perceived usefulness of enterprise-provided IT which they are unable to select for themselves. It is reasonable to assume that innovative individuals, who own powerful mobile IT in their private life and can envision how this IT could help them with their daily tasks, will evaluate the enterprise IT more negatively in terms of its potential to increase productivity. Thus, the following hypothesizes are derived:

*H2a: Personal innovativeness in IT will have a positive effect on perceived usefulness of private mobile IT.*

*H2b: Personal innovativeness in IT will have a negative effect on perceived usefulness of enterprise mobile IT.*

In addition to this argumentation, innovative people have been found to be more risk-averse (Agarwal and Prasad, 1998). Risk plays an important role in the context of BYOD. In a related study, Loose, Weeger, et al. (2013) found that both threats with respect to private life like e.g. loss of private data or company surveillance as well as threats to business life like e.g. corrupting the company network with malware are important factors for BYOD decisions of individuals. Moreover, Weeger and Gewald (2014) found a significant relationship between perceived risk and BYOD intention. Thus, one could expect the existence of a direct influence of PIIT on BYOD intention that goes beyond what is mediated by perceptions towards the technologies. It is hypothesized:

*H3: Personal innovativeness in IT will have a direct positive effect on BYOD intention.*

### **3.2 Perceived Ease of Use and Perceived Usefulness**

According to the technology acceptance model (TAM) the main antecedents of the intention to use a particular technology are perceived usefulness and perceived ease of use. Perceived usefulness is defined by Davis (1989, p.320) as “the degree to which a person believes that using a particular system would enhance his or her job performance” while perceived ease of refers to “the degree to which a person believes that using a particular system would be free of effort”. While both factors have been found to significantly impact the intention to use novel IT tools (Adams et al., 1992; Bhattacharjee, 2001; Davis and Venkatesh, 1996), the TAM and its successors have been criticized for their lack of explanatory power with respect to competing technologies (Lee et al., 2003; Muthithcharoen et al., 2011). This critique is particularly relevant in the context of BYOD. Here, private technologies constantly compete with the ones offered by the enterprise, i.e. both the private tools as well as the enterprise tools are constantly evaluated with respect to their usefulness and ease of use. Junglas et al. (2014, p.1) state that in bypassing the IT department “employees seize the power to decide which IT tool best fits their job need”, particularly when they feel that the enterprise IT is insufficient (Ortbach, Köffer, Bode, et al., 2013). This relates to the behavior conflict between IT’s ability and user expectations as developed by (Koch et al., 2014). However, this implies that the opposite is the case if the enterprise IT is perceived to be sufficient. Thus, if an enterprise starts to hand out novel devices, the perceived usefulness and ease of use of private IT may not change, however, it will likely have an effect on the perceptions towards these constructs with respect to enterprise IT. Thus, in the context of BYOD, it is important to consider the TAM variables separately for the private and the enterprise realm.

Literature on technology acceptance and use has proposed an effect of perceived ease of use on perceived usefulness. For instance, Davis (1986, p. 26) states that "a system which is easier to use will result in increased job performance". This relationship has been validated by numerous studies. Thus, it can be expected that it will also exist for both the private as well as the enterprise realm, leading to the following hypotheses:

*H4a: Perceived ease of use of private mobile IT positively influences perceived usefulness of private mobile IT.*

*H4b: Perceived ease of use of enterprise mobile IT positively influences perceived usefulness of enterprise mobile IT.*

Practitioner studies have found that employees turn towards their privately-owned devices when they feel that these private tools are superior in terms of usability and intuitiveness (Harris et al., 2011; Murdoch et al., 2010). Thus, the expected effort to productively use a technology for work seems to be a primary driver of BYOD behavior. This is confirmed by (Ortbach, Köffer, Bode, et al., 2013) who identified ease of use as the most important behavioral belief in the context of BYOD. Similarly, Hopkins et al. (2013) also showed that ease of use influences the attitude towards using private IT. However, following the argumentation earlier, ease of use of enterprise IT is likely to have a negative impact on the decision to use privately-owned IT for work. This argumentation leads to the following hypotheses:

*H5a: Perceived ease of use of private mobile IT positively influences employees' intention to use their own mobile IT for work.*

*H5b: Perceived ease of use of enterprise mobile IT negatively influences employees' intention to use their own mobile IT for work.*

Similar to the findings with respect to ease of use, usefulness has been identified as primary driver for BYOD decisions. For instance, Loose, Gewald, et al. (2013, p.9) acknowledge that “expectancies regarding gains in job performance due to increased mobility and flexibility are the most important factors leading future employees to adopt BYOD services”. Also Ortbach, Bode and Niehaves (2013) found beliefs towards performance increase to be a strong predictor. However, similar to the argumentation given for ease of use, if the devices provided by the employer are suitable for the particular work to be carried out, employees will likely refrain from using their private tools. The following two hypotheses account for this argumentation while Figure 1 shows the entire research model in detail.

*H6a: Perceived usefulness of private mobile IT positively influences employees' intention to use their own mobile IT for work.*

*H6b: Perceived usefulness of enterprise mobile IT negatively influences employees' intention to use their own mobile IT for work.*

## 4 Research Methodology

### 4.1 Measurement Constructs and Items

For the dependent variable BYOD intention measure from Brown and Venkatesh (2005) was adopted. With respect to both ease of use and usefulness the measurement from Davis (1989) was adapted to fit the context of privately-owned as well as company-provided devices. Here, both constructs refer to work tasks to allow for comparison. Personal innovativeness in IT was measured using the instrument developed by Agarwal and Prasad (1998). For all items a 7-point Likert scale {completely agree...completely disagree} was used. Table 2 shows an overview of the measurement instrument used in this study.

Personal Innovativeness in IT	PIIT1: If I heard about a new information technology, I would look for ways to experiment with it. PIIT2: Among my peers, I am usually the first to try out new information technologies. PIIT3: In general, I am hesitant to try out new information technologies.* PIIT4: I like to experiment with new information technologies.	(Agarwal and Prasad, 1998)
Perceived Ease of Use [of provided devices/ private devices]	If I used [the provided mobile IT devices / my private mobile IT devices] for work... PEOU [P/E]1: ...learning to operate these devices would be easy for me. PEOU [P/E]2: ...I would find it easy to get these devices to do what I want them to do. PEOU [P/E]3: ...my interaction with these devices would be clear, effective and flexible. PEOU [P/E]4: ...it would be easy for me to become skilful at using these devices. PEOU [P/E]5: ...I would find these devices easy to use.	(Davis, 1989)
Perceived Usefulness [of provided devices / private devices]	Using [the provided mobile IT devices / my private mobile IT devices] for work... PU [E/P]1: ...would enable me to accomplish tasks more quickly. PU [E/P]2: ...would improve my job performance. PU [E/P]3: ...would increase my productivity. PU [E/P]4: ...would enhance my effectiveness. PU [E/P]5: ...would make it easier to do my job. PU [E/P]6: I would find my own mobile IT devices useful to do my work.	(Davis, 1989)
BYOD Intention	BYOD1: I intend to use my private mobile IT for work within the next two months. BYOD2: I predict that I will use my private mobile IT for work within the next two month. BYOD3: I expect to use my private mobile IT for work within the next two month.	(Brown and Venkatesh, 2005)

\* reverse coded

Table 2: Measurement Instrument

## 4.2 Data Sample and analysis

The survey was distributed in two ways. On the one hand, it was implemented using the online survey tool Limesurvey (Schmitz et al., 2003) and distributed among practitioners from different industries. On the other hand, questionnaires were printed and handed out to people in frequented public spots to limit exclusion bias (e.g. public administration office and vehicle registration office). A screening question with respect to the use or non-use of mobile IT for business tasks (“Do you use mobile IT for business tasks?”) was asked to ensure participants would be able to answer the following questions. In both scenarios, following Leeuw and Dillman (2008), a cover page with different information regarding the general setting of the research and definitions of terms used was provided. Due to the fact that all constructs are well established in the literature and have been validated intensively, no pilot test of the constructs was performed.

In total 151 people filled out the survey. To ensure quality of the responses, two mechanisms were applied. First, all datasets with more than 15% of missing data were deleted (Hair et al., 2013). Second, using standard deviation testing, the coherence of the PIIT construct was tested which led to the deletion of bad responders that failed the reversed trap question PIIT3. The resulting sample included 133 datasets (23% women) with people from different industries (e.g. IT: 14%, automotive: 12%, health: 10%, services: 5%, retail: 5%, education 5%, advertisement: 5%) and holding various positions (e.g. employee: 48%, temporal staff: 16%, head of department: 11%, general manager: 6%). The median age was 29 years (min=18, max=61, SD=11.51) and the median for professional experience was 5 years (min=0.5, max=42, SD=10.85).

The dataset was analyzed using partial least squares (PLS) structural equation modeling (Ringle et al., 2012). To this end, SmartPLS 2.0 (M3) (Ringle et al., 2005) was used for model calculation and testing. The PLS algorithm was deployed using the centroid weighting scheme, to account for possible overestimation effects which are associated with the factor weighting scheme (Wilson and Henseler, 2007). As the dataset included less than 5% missing values, mean replacement was chosen as missing value algorithm (Hair et al., 2013).

## 5 Results

### 5.1 Measurement Model Assessment

The outer model consists of reflective constructs only, thus, requiring analyses with respect to construct validity and reliability (Ringle et al., 2012). As can be seen in table 2, all items show loadings above .7, so indicator reliability is given. Significances were calculated using bootstrapping (5000 iterations) and all indicators turned out to be highly significant ( $p < 0.0001$ ). Table 2 shows an overview of the calculated item loadings and cross-loadings.

	Personal Innovativeness in IT (PIIT)	Perceived Ease of Use of Enterprise mobile IT (PEOUE)	Perceived Usefulness of Enterprise mobile IT (PUE)	Perceived Ease of Use of Private mobile IT (PEOUP)	Perceived Usefulness of Private mobile IT (PUP)	BYOD Intention (BYOD)
PIIT1	0.8953	0.2379	0.0843	0.2876	0.1318	0.1240
PIIT2	0.7909	0.1830	-0.0339	0.2144	-0.0306	-0.0057
PIIT3	0.8631	0.2992	0.0411	0.3323	0.0374	0.0258
PIIT4	0.9143	0.3201	0.0523	0.2401	0.0301	0.0616
PEOUE1	0.2928	0.8753	0.4021	0.3138	0.1149	-0.0621
PEOUE2	0.2727	0.9232	0.4182	0.3036	0.0827	-0.0772
PEOUE3	0.2174	0.8639	0.4280	0.2769	0.1118	-0.0574
PEOUE4	0.3187	0.9297	0.3994	0.3545	0.1185	-0.1283
PEOUE5	0.2670	0.8810	0.4173	0.3560	0.1540	-0.0572

PUE1	-0.0539	0.3799	0.8700	0.1187	0.4713	0.0432
PUE2	0.0457	0.3788	0.8727	0.1301	0.5060	0.0780
PUE3	0.0344	0.3981	0.9266	0.1525	0.4745	0.0503
PUE4	0.0368	0.3864	0.9076	0.1981	0.4802	0.0862
PUE5	0.1384	0.4672	0.9021	0.1337	0.4149	-0.0210
PUE6	0.0516	0.4138	0.8314	0.1952	0.3726	0.1301
PEOUP1	0.2980	0.3707	0.1898	0.9226	0.4769	0.2967
PEOUP2	0.2822	0.3432	0.1443	0.9431	0.4985	0.3010
PEOUP3	0.2246	0.2912	0.1281	0.9088	0.4499	0.3017
PEOUP4	0.3466	0.3644	0.2213	0.9415	0.5285	0.2744
PEOUP5	0.2978	0.2832	0.1294	0.8889	0.4379	0.3951
PUP1	0.0196	0.1245	0.4448	0.4853	0.9109	0.3861
PUP2	0.0614	0.1201	0.4660	0.4944	0.9409	0.3963
PUP3	0.0586	0.1357	0.5140	0.4838	0.9589	0.3425
PUP4	0.0899	0.1619	0.5253	0.5084	0.9532	0.3687
PUP5	0.0578	0.1130	0.5091	0.4318	0.9354	0.2900
PUP6	0.0777	0.0725	0.3928	0.4973	0.9008	0.4238
BYOD1	0.1115	-0.0604	0.1174	0.3386	0.3956	0.9427
BYOD2	0.0235	-0.0788	0.0501	0.3295	0.3915	0.9478
BYOD3	0.0645	-0.1139	0.0219	0.3013	0.3421	0.9620

Table 3: *Calculated Item Loadings and Cross-Loadings*

To evaluate construct validity, internal consistency reliability (ICR, Cronbach's Alpha) is used. According to Hinton et al. (2005) constructs with an ICR above .5 can be accepted, which is the case for all the constructs (see Table 4). With regard to convergent and discriminant validity, the test described by Fornell and Larcker (1981) was applied. They state that the square root of the average variance extracted (diagonal elements in Table 4) should be higher than the correlations between the constructs (off-diagonal elements in Table 4). As this is given for all constructs it can be concluded that they are valid and work as intended.

	R <sup>2</sup>	Q <sup>2</sup>	ICR	CR	Mean	SD	PIIT	PEOUE	PUE	PEOUP	PUP	BYOD
PIIT	-	-	0.8937	0.9236	4.77	1.54	0.87					
PEOUEnt	0.095	0.077	0.9377	0.9526	5.57	1.35	0.31	0.90				
PUEnt	0.220	0.171	0.9450	0.9561	5.20	1.67	0.06	0.46	0.89			
PEOUPriv	0.101	0.083	0.9553	0.9655	5.27	1.79	0.32	0.36	0.18	0.92		
PUPriv	0.278	0.239	0.9705	0.9760	4.50	2.08	0.07	0.13	0.51	0.52	0.93	
BYOD	0.228	0.191	0.9472	0.9659	4.05	2.48	0.07	-0.09	0.07	0.34	0.40	0.95

Table 4: *Validity Figures and Correlation Matrix*

## 5.2 Common method bias

The data used in this study is purely self-reported and, thus, needs to be tested with respect to common method bias (CMB). Although all participants were assured that their responses would be treated anonymously, answers could still be biased due to social desirability or consistency motives (Liang et al., 2007; Podsakoff and Organ, 1986). In order to test for CMB, three distinct tests were applied. First, following Harman's one-factor test (Cenfetelli et al., 2008; Podsakoff and Organ, 1986) all 29 variables were entered into a factor analysis. The Kaiser criterion (Eigenvalues greater 1) suggested the extraction of 6 factors with the first factor accounting for around 42% of the variance. The fact that no single factor occurred provides evidence that CMB is not an issue in this study. Second, the correlation matrix (see Table 3) was examined as proposed by Pavlou, Liang, & Xue (2007). The authors suggest that CMB is unlikely if correlations between the constructs are below .9, which is the case for all of the constructs within this study. Third, the common factor test according to (Podsakoff et al., 2003) was conducted. Here, I followed the PLS approach proposed by (Liang et al., 2007). Results

show that the influence of the method factor is between 0% and 1.4% and insignificant for all but one indicator. In turn percentages of indicator variance caused by substantive constructs lay between 72.3% and 97.1% and were all highly significant. Only the PUE4 item showed a high significant influence of the method factor (63%). However, as deleting the item resulted in similar results with respect to the model calculation, I conclude that CMB is not a major issue within this study.

### 5.3 Structural Model Assessment

Model results show a significant and comparable influence of PIIT on PEOU of both enterprise IT (.308,  $p < 0.01$ ) and private IT (.311,  $p < 0.05$ ), thereby confirming hypotheses H1a and H1b. Effects of PIIT on PU was found to be insignificant for both contexts, thus, leading to rejection of hypotheses H2a and H2b. PEOU was found to have a significant effect on PU for both enterprise-provided (.489,  $p < 0.001$ ) and privately-owned (.555,  $p < 0.001$ ) mobile IT. Thus, hypotheses H4a and H4b were confirmed. With respect to the dependent construct BYOD intention, PEOU of enterprise IT had a significant negative impact while both PU and PEOU of private IT were found to have a significant positive effect, confirming hypotheses H5a, H5b, and H6a. Here the influence of PU of private IT was highest (.311,  $p < 0.001$ ) followed by PU of private IT (.249,  $p < 0.01$ ) and the (negative) effect of PEOU of enterprise IT (-.213,  $p < 0.05$ ). However, the results neither showed a significant influence of PEOU of enterprise IT on BYOD intention, nor did they provide evidence with respect to the direct effect of PIIT on BYOD intention. Thus, both hypotheses H6b and H3 have to be rejected. Figure 2 gives an overview on the structural model results.

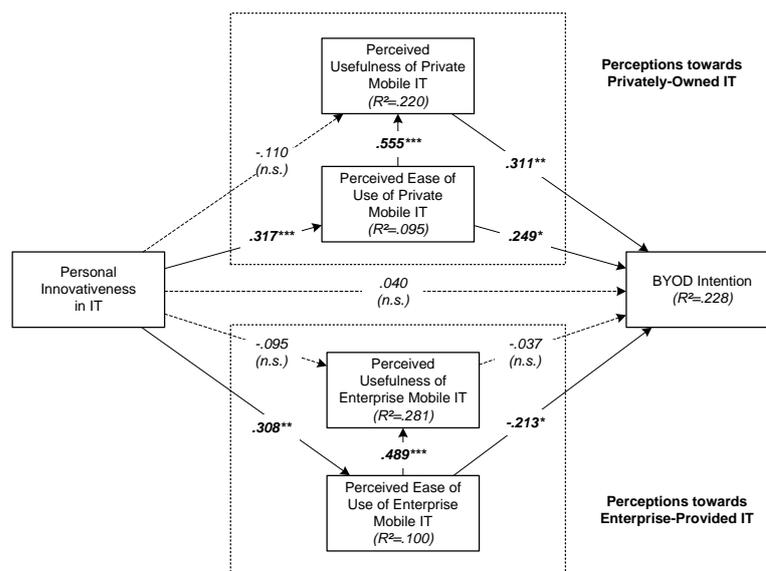


Figure 2: Structural Model Results from the PLS Analysis

Using the path comparison statistic proposed by Cohen et al. (2003) differences between paths were significant when comparing the paths from PEOU of enterprise IT to BYOD with both the effects of PEOU ( $p < 0.001$ ) and PU ( $p < 0.001$ ) of private IT on BYOD. Differences between the effects of PEOU and PU of private IT on BYOD turned out to be insignificant ( $p = 0.386$ ). The coefficients of determination in the model are low (Chin, 1998). With respect to the final dependent variable BYOD intention, the model is able to explain 22.8% of the variance (see Table 4). The model has also been calculated with a ‘delta’ approach, i.e. variables measuring the differences between the perceptions towards enterprise and private IT. The competing model only explained 19.0% of the variance in BYOD intention, which shows that splitting up PEOU and PU measures for the private and the business realm adds explanatory power. To test for predictive relevance, Stone-Geissers  $Q^2$  was calculated using the cross-validated redundancy approach. The common omission distance of 7 was used to ensure the dataset

was not a multiple integer number of the distance. For all the reflective constructs, the total redundancy was above 0, with the lowest one being 0.077 (PEOU<sub>priv</sub>, see Table 4). Thus, following Chin (1998) the model has predictive relevance.

## 6 Discussion and Outlook

### 6.1 Findings

The model analysis shows, that PIIT has a positive influence on enterprise and private PEOU measures. This result could be expected as individuals who are innovative with respect to IT are likely to have a greater skillset due to their experience with new technologies and, thus, will on average perceive given technologies as easier to use than people with low innovativeness. Interestingly, path coefficients were almost identical for the sample used in this study which implies that PIIT is equally important for the ease of use perception in both realms. This is surprising as it could have been expected that the influence would be higher in the private context – primarily due to the ‘freedom of choice’ individuals have with respect to their privately-owned technologies. The results suggest that – for the sample used in this study – the influence of PIIT on PEOU is mainly governed by a generally more positive attitude towards technologies, rather than an increased desire or competence to select easier mobile IT. Another potential explanation relates to the focus of the ease of use concept on work use. Brown and Palvia (2014) differentiate between utilitarian and social work use as well as utilitarian, social and hedonic non-work use of mobile IT. The presented results indicate that perceptions towards benefits with respect to the three types of private use are likely to be more important for the selection process of private IT than those with respect to ease of use for work tasks. The same also applies for PU. The model calculations showed no significant influence of PIIT on PU of both private and enterprise IT. For the private side, the likely explanation is the above mentioned selection of private IT for other reasons than an increased usefulness for work tasks. For the enterprise side, this suggests that PIIT is not related to a more critical evaluation of enterprise mobile IT with respect to its usefulness.

With respect to the effect of PEOU on PU for private and enterprise IT, this study found a strong positive and comparable effect for both contexts. This is not surprising and has been found in several related (Venkatesh and Davis, 2000; Venkatesh, 2000). However, the comparable size of path coefficients suggests that existing theories with respect to this relationship are likely to equally hold in both the enterprise and the private context. Thus, this study contributes to the call of Baskerville (2011) towards testing of existing IS theories in the private context.

Regarding the direct effects on BYOD intention, this study identified perceived usefulness of private IT as most important predictor. Thus, if private IT is seen as useful for work tasks, BYOD intention increases. However, PU of enterprise IT was not found to have the hypothesized negative effect on BYOD intention, meaning that people in the used sample did not regard usefulness of the enterprise tools as an important factor for their decision to use private IT. This is interesting as PU of private IT had the highest influence of all factors. One possible explanation would be that for many cases, private IT is no suitable alternative to the provided IT e.g. because policies restrict access to company data or even because mobile IT in general is not regarded as useful. Thus, when perceiving enterprise mobile IT as rather useless for their work, people might refrain from using mobile IT in general rather than to bring their private devices to work. This is different for PEOU. Here, this study revealed a significant positive effect on BYOD intention for private IT and a significant negative effect for enterprise IT. Thus, individuals that perceive their enterprise IT as complex are more likely to use their own IT for work. Similarly, if individuals perceive their private IT as easy to use, BYOD intention increases. Last, the hypothesized direct effect of PIIT on BYOD intention was found to be insignificant. This is in line with related studies (Lu et al., 2005). Thus, for the sample used in this study, the effect of PIIT on the intention to use private IT for work is completely mediated by the perceptions towards PU and PEOU of private devices as well as the beliefs with respect to PEOU of enterprise mobile IT.

## 6.2 Contribution

This study contributes to theory in several ways. First, it details the relationship between PIIT and BYOD intention. While many existing studies found a significant relationship between the two constructs, this research presents and empirically validates a theoretically founded model using PU and PEOU as mediating factors. Second, it contributes to theory in separating perceptions towards privately-owned mobile IT from those related to enterprise-provided mobile devices. Many existing studies on BYOD adoption have integrated PEOU and PU in their model and identified these constructs to be main antecedents of BYOD intention or behavior (e.g. Hopkins et al., 2013; Ortbach, Köffer, Bode, et al., 2013). However, these studies only focused on beliefs towards the private technologies and did not include an enterprise perspective. This study explicitly addresses the relationship and evaluates its impact on the BYOD decision in comparison to the effects related to perceptions towards the private IT. Thus, it provides empirical evidence with respect to the importance of perceptions towards competing mobile technologies for the adoption decision. Third, it validates the effect of PEOU on PU in the context of mobile devices and shows that this effect is present and comparable for both the private as well as the enterprise realm. The presented findings also have several implications for practitioners. First, as many organizations are looking for ways to limit shadow IT (Behrens, 2009), focusing on providing easy to use enterprise IT seems to be an important approach. This is especially important in the IT field and other sectors where personal innovativeness of employees is likely to be high. Second, the results of this study suggest that usefulness of the enterprise mobile IT does not have an effect on BYOD intention. Thus, BYOD seems to happen independent from the evaluation of the provided mobile IT with respect to its suitability for work. This is important for practitioners as it implies that strategies targeted towards introducing more powerful mobile IT may actually defy the purpose or at least not yield the desired effect. Third, as perceptions towards the private IT can be considered a stronger predictor, enterprises trying to follow technological trends in hope of preventing shadow IT are likely to fail over time.

## 6.3 Limitations and Future Research

The above mentioned findings are beset with certain limitations that need to be addressed. First the used sample was rather small ( $n=132$ ). However, it fulfils the criterion of Barclay et al. (1995), who suggested that the sample size should be at least ten times the maximum number of arrowheads pointing towards a latent construct in the model (5 for this study). Second, due to the non-probability sampling process, the used sample may be subject to selection bias and cannot be regarded as representative for the population this study is trying to address (Boxill et al., 1997). Third, the presented study did not differentiate between individuals that are allowed to use private IT and those who intend to bring in their own IT despite existing non-use policies in the organization. Thus, results should only be seen as first indicators with respect to the relationship between innovativeness and BYOD. While the findings regarding the impact of PIIT on the mediators are likely to hold in both settings, the effect of these mediators on intention needs to be evaluated further in future studies. Fourth, the presented model only focuses on perceptions with respect to the privately-owned and enterprise-provided IT mediating the relationship between innovativeness and BYOD. As stated above, factors such as e.g. privacy or data security issues have been omitted.

The findings as well as the limitations of this study open up several avenues for future research. On the one hand, future studies could identify differences in BYOD intention with respect to types of work and private use as suggested by Brown and Palvia (2014). On the other hand, a differentiation with respect to company policies could lead to a better understanding of the presented effects. Also, while it is important to understand the phenomenon, future research should also include studies on the effects of BYOD. Are employees really getting more productive or does the dual-use lead to more disruptions during work? Hopkins et al. (2013, p. 9) state that “BYOD is still at an early stage of adoption”. However, in the light of shorter release cycles for mobile IT as well as wearable technologies and other innovations entering the consumer market, the trend is likely to evolve.

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