



Journal of Service Management

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Sven Heidenreich Matthias Handrich , (2015), "Adoption of technology-based services: the role of customers' willingness to co-create", Journal of Service Management, Vol. 26 Iss 1 pp. 44 - 71

Permanent link to this document:

<http://dx.doi.org/10.1108/JOSM-03-2014-0079>

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Adoption of technology-based services: the role of customers' willingness to co-create

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Abstract

Purpose – The purpose of this paper is to develop and empirically evaluate an adoption model for technology-based services (TBS) that integrates a customer's willingness to co-create (WCC) as mediator complementing the well-known individual differences and innovation characteristics in predicting customer adoption of TBS.

Design/methodology/approach – The manuscript uses structural equation modeling to analyze survey data from two empirical studies ($n = 781$ and $n = 181$).

Findings – The empirical results show that WCC represents a key mediator between established antecedent predictors (innovation characteristics and individual differences) and the likelihood of TBS adoption. Additionally, the analysis reveals that WCC can even better explain and predict adoption intention of TBS than the commonly used individual differences and innovation characteristics. Finally, the results also suggest that a lack of customers' WCC may help to explain persuasion-decision discrepancies within TBS adoption.

Research limitations/implications – As the data of this manuscript pertains to the mobile apps market, future research might test the modified technology adoption model in other TBS contexts as well. While the studies used cross-sectional data, it would be interesting to assess the differential influence of WCC across the stages in the adoption process using longitudinal data.

Practical implications – The findings on WCC provide managers with a new set of factors (apart from known antecedent predictors like individual differences and innovation characteristics) to optimize TBS adoption.

Originality/value – This manuscript is the first to examine an adoption model for TBS that integrates a customer's WCC. Furthermore, the findings provide first empirical evidence that WCC can help to explain persuasion-decision discrepancies within TBS adoption.

Keywords Consumer behaviour, Service innovation, Service co-creation

Paper type Research paper

Introduction

Ever since the rise of mass-production in the twentieth century spurred the development of a consumer society (Ritzer and Jurgenson, 2010) a customer's role was the one of purchase and consumption (Prahalad and Ramaswamy, 2004; Xie *et al.*, 2008). However, with the emergence of the internet and mobile telecommunication, today's customers have the possibility to actively engage in the provision and consumption of various offerings wherever and whenever they like (Healy and McDonagh, 2013; Kleijnen *et al.*, 2007; Sawhney *et al.*, 2005). This active engagement of the customer is known in research and practice as customer co-creation of value or simply customer co-creation (Bolton and Saxena-Iyer, 2009; Witell *et al.*, 2011).



The customer's role of active value co-creator is especially important for technology-based services (TBS) because in contrast to many products, the engagement of the customer in the TBS provision is crucial for a successful service delivery (Chan *et al.*, 2010; Chua and Sweeney, 2003). Additionally, technological devices such as smartphones further facilitate a customer's engagement in the service provision (Ding and Ng, 2011; Kleijnen *et al.*, 2007). Considering the arguments above, it is not surprising that among the most prominent examples for customer co-creation are TBS like facebook, ebay, youtube or twitter (Gebauer *et al.*, 2013; Ramaswamy and Gouillard, 2011). Within all these examples of TBS, the customer's willingness to co-create (WCC) during service provision and consumption is crucial for a successful adoption and diffusion (Chan *et al.*, 2010; Chua and Sweeney, 2003). However, existent research has focussed on individual differences and innovation characteristics as the primary predictors of TBS adoption, thus largely neglecting the role of WCC (Chan *et al.*, 2010; Handrich and Heidenreich, 2013; Meuter *et al.*, 2005). Hence, little is known on what actually constitutes a customer's WCC and how it influences the adoption and diffusion of TBS (Ding and Ng, 2011; Handrich and Heidenreich, 2013; Ostrom *et al.*, 2010). Moreover, it still lacks explanations for why customers may evaluate a TBS positively, but may choose not to try it (Meuter *et al.*, 2005). Past literature on co-creation of TBS suggests that a lack of customers' WCC might help to explain these persuasion-decision discrepancies (Meuter *et al.*, 2005; Handrich and Heidenreich, 2013). Customers that, based on its characteristics, previously evaluated a TBS positively might still reject trial due to an unWCC the TBS. Hence, a customer's WCC might represent the missing link to explain the occurrence of discrepancies between value perceptions as an outcome of the persuasion stage, and the intention to adopt as an outcome of the decision stage. However, it still lacks empirical evidence for this theoretical proposition.

In order to close these research gaps, the purpose of this paper is to further examine the role of customers' WCC for TBS adoption. Study 1 strives to clarify how a customer's WCC influences the adoption of TBS and complements the well-known individual differences and innovation characteristics in predicting customer adoption of TBS. Study 2 strives to provide an explanation for the existence of persuasion-decision discrepancies within TBS adoption by examining the explanatory power of WCC for such behavior. The remainder of the paper is organized as follows. In the next section we will discuss relevant literature on TBS adoption and customer co-creation. Subsequently, we provide the conceptual development, methodology and data analyses of both studies. The last sections contain the discussion of the results as well as implications and suggestions for future research.

Conceptual development

Adoption of TBS

The adoption of innovations has been studied in many contexts and several constructs have received widespread attention (for a review see Rogers, 2003). However, most studies rely on two types of antecedents when trying to explain adoption behavior: innovation characteristics (Meuter *et al.*, 2005; Rogers, 2003) and individual differences (Dabholkar and Bagozzi, 2002; Meuter *et al.*, 2005). However, as a result of the predominant focus on innovation characteristics and individual differences as primary determinants of TBS adoption, past research has produced inconsistent results (Meuter *et al.*, 2005). While there is support in the literature for innovation characteristics influencing adoption behavior in general, a meta-analysis by Tornatzky and Klein (1982) showed that only three of ten innovation characteristics used in literature were consistently

related to adoption. Likewise, another meta-analysis by Arts *et al.* (2011) confirmed that socio demographics only show minor influence on innovation adoption while psychographics were found to be more consistently related to innovation adoption. However, several studies point out that the relationship between psychographics like consumer innovativeness and innovation adoption is rather weak (e.g. Manning *et al.*, 1995; Midgley and Dowling, 1978). Besides a constant need for constructs that are consistently related to innovation adoption in general across settings and technologies (Tornatzky and Klein, 1982), it is especially important to understand why certain innovation characteristics and individual differences vary in direction and significance when predicting TBS adoption (Meuter *et al.*, 2005). However, to date, this question has been left largely unexplored. Moreover, it still lacks explanations for why consumers may evaluate a TBS positively, but may choose not to try it. A way to clarify the inconsistencies and to provide an explanation for persuasion-decision discrepancies (Rogers, 2003) within TBS adoption, is the use of mediating variables that are included specifically to explain relationships between variables and to provide additional explanatory power (Meuter *et al.*, 2005). As TBS require the customer to co-create the service by actively engaging in the service provision and consumption, the use of a customer's WCC as mediating variable could be the missing link to successfully explain the adoption of TBS.

Customers' WCC

Customer co-creation describes the joint creation of value by the company and the customer, which occurs during service delivery and consumption (Prahalad and Ramaswamy, 2004). The concept of customer co-creation has received widespread attention among practitioners and academics (Bolton and Saxena-Iyer, 2009; Gebauer *et al.*, 2013; Sawhney *et al.*, 2005), especially when dealing with TBS (Hoyer *et al.*, 2010; Ostrom *et al.*, 2010). Still, literature on customer co-creation as well as on co-creation-related concepts like the willingness of a customer to co-create and TBS adoption is generally scarce (Dong, *et al.*, 2008; Handrich and Heidenreich, 2013). However, as the active engagement of the customer in the service provision and consumption is crucial for a successful TBS adoption, the implementation of a customer's WCC holds the potential to enhance explanatory power of existent TBS adoption models (Chan *et al.*, 2010; Handrich and Heidenreich, 2013). Nevertheless, no research has so far empirically examined this theoretical proposition.

In line with existent research (Prahalad and Ramaswamy, 2004; Handrich and Heidenreich, 2013), we define the willingness of a customer to co-create (WCC) as a condition or state in which a customer is prepared and likely to create value together with the company by actively engaging in the service provision and consumption of a TBS. A customer's WCC thereby depends on the overall evaluation of possible benefits compared to possible costs entailed to the TBS adoption (Hoyer *et al.*, 2010; Sánchez-Fernández and Iniesta-Bonillo, 2007). Consequently, a customer will only be motivated to engage in co-creation if the possible benefits outweigh possible costs. According to past literature, the willingness of a customer to co-create TBS is primary driven by customization as the key benefit of co-creation (e.g. Etgar, 2008; Franke *et al.*, 2009; Payne *et al.*, 2008), whereas effort (e.g. Bateson, 1985; Dong *et al.*, 2008; Hoyer *et al.*, 2010) and information provision (e.g. Bitner *et al.*, 1997; Etgar, 2008; Yi and Gong, 2013) represent the primary costs of co-creation. Following this conceptualization, customers are only willing to engage in co-creation if their participation yields a benefit reflected by a high degree of customization (Franke *et al.*, 2009; Miceli *et al.*, 2007) which

outweighs the amount of time, mental and physical effort which is needed to engage in co-creation as well as the uncomfortable feeling to use, store and distribute personal information, not exclusively but especially over the internet (Chua and Sweeney, 2003; Yi and Gong, 2013; Xie *et al.*, 2008).

Our study is designed to build on and combine these insights from existent literature on TBS adoption and customer co-creation we previously presented. We thereby strive to broaden our understanding of the antecedents of TBS adoption (study 1) and provide greater depth of knowledge with respect to persuasion-decision discrepancies (study 2).

Study 1

Model and hypotheses development

Model specification. Following procedures suggested by Meuter *et al.* (2005), we developed our conceptual model (see Figure 1) using a systematic review of literature on TBS or customer co-creation-related research streams and qualitative interviews. We first conducted an extensive review of top-refereed marketing and innovation journals. Based on this screening we came up with a wide range of constructs typically used within TBS adoption research when focussing on individual differences and innovation characteristics as antecedent predictors. We subsequently used qualitative interviews with innovation experts ($n = 6$) and consumers ($n = 12$) to both reduce the high number of identified constructs to those that are relevant and to ensure that key variables were not overlooked.

Within our conceptual model, we used Rogers' (2003) innovation decision process to illustrate that we capture TBS adoption by measuring customers' intention to adopt TBS as an outcome of the decision stage. Furthermore, we differentiate predictors of

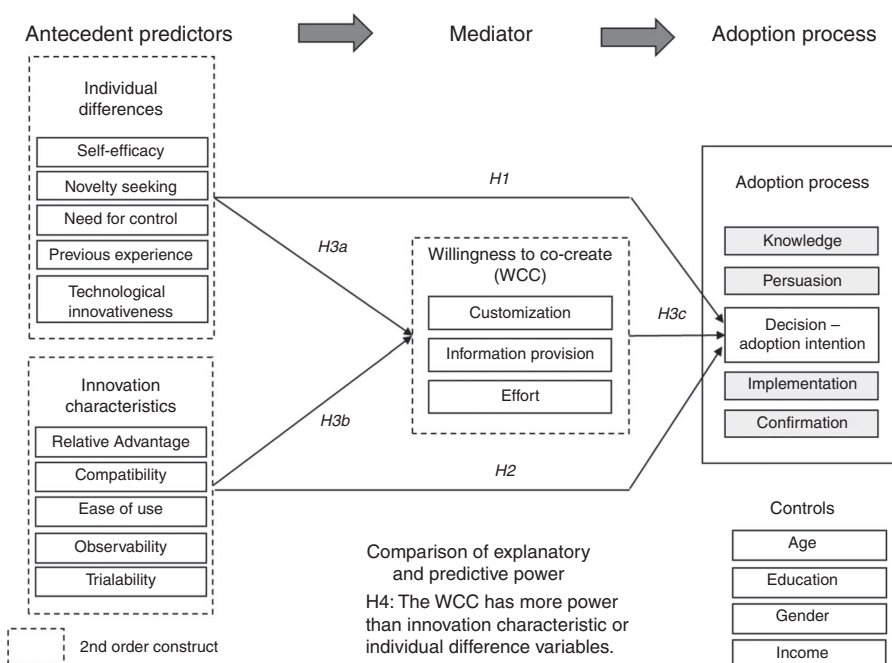


Figure 1. TBS adoption model

TBS adoption intention into a mediating variable (willingness of a customer to co-create) and antecedent predictors (innovation characteristics and individual differences). As individual differences and innovation characteristics are often mentioned as antecedent predictors of co-creation (Etgar, 2008; Hoyer *et al.*, 2010; Meuter *et al.*, 2005), and WCC represents an important prerequisite for the adoption of TBS (Chan *et al.*, 2010; Handrich and Heidenreich, 2013), the establishment of WCC as mediator between the antecedent variables and TBS adoption intention seems appropriate. The following section will elaborate and discuss the corresponding literature and theory for each of these relationships.

Individual differences as antecedent predictors of TBS adoption intention. Individual differences capture characteristics that describe the (potential) adopter of an innovation, which can be divided into socio demographics and psychographics (Arts *et al.*, 2011). As a result of our literature review and our qualitative interviews, we decided to only focus on psychographics as individual differences that are mediated by WCC as a result of the following considerations: both the literature review as well as the interviews did not indicate a consistent relationship between socio demographics and WCC based on which a mediation hypothesis would be reasonable; and socio demographics in general were only found to be minor predictors of TBS adoption compared to psychographics (Arts *et al.*, 2011). However, we included age, education, gender and income as controls to provide for a stronger test of our hypotheses. With respect to included individual differences, five psychographics turned out to be most consistently used within TBS adoption and co-creation literature. Furthermore, these five psychographics were also perceived as the most relevant within our interviews. Definitions for each individual difference construct, namely self-efficacy, inherent novelty seeking, need for control, previous experience and technological innovativeness (Bruner and Kumar, 2007; Dabholkar and Bagozzi, 2002; Meuter *et al.*, 2005), are depicted in Table I. Since relationships between individual differences and adoption intention have already been extensively examined, we only mention the justifications for each relationship in Table I. Consistent with previous research (e.g. Bitner *et al.*, 2000; Manning *et al.*, 1995; Meuter *et al.*, 2005) we propose that the included individual difference variables will positively affect TBS adoption intention:

H1. Individual differences are positively related to TBS adoption intention.

Innovation characteristics as antecedent predictors of TBS adoption intention. Based on our literature review and our qualitative interviews, we employed five innovation characteristics, which were both most consistently used within literature and also perceived as most relevant within our interviews. Descriptions for each innovation characteristic construct, namely relative advantage, compatibility, ease of use, observability and trialability (Arts *et al.*, 2011; Rogers, 2003; Tornatzky and Klein, 1982), are provided in Table I. Given that past research has already extensively examined relationships between innovation characteristics and adoption intention, we only mention the justifications for each relationship in Table I. In line with previous research (e.g. Meuter *et al.*, 2005; Plouffe *et al.*, 2001) we propose that the included innovation characteristic variables will positively affect TBS adoption intention:

H2. Innovation characteristics are positively related to TBS adoption intention.

WCC as antecedent predictor of TBS adoption intention. Well-known research on attitude and behavior indicates that attitudes positively influence intentions

Construct	Antecedent predictor Definition	Relationship of antecedent predictor on adoption intention	
		Direction of effect	Supporting literature
Individual differences	Self-efficacy	Is an individual's assessment of his or her ability to perform a behavior (Dabholkar and Bagozzi, 2002)	+ Oyedele and Simpson (2007), van Beuningen <i>et al.</i> (2009)
	Inherent novelty seeking	Is the desire to seek out new stimuli (Dabholkar and Bagozzi, 2002)	+ Manning <i>et al.</i> (1995)
	Need for control	Is the inherent feeling of being able to dominate one's own environment (Etgar, 2008)	+ Bitner <i>et al.</i> (2000), Oyedele and Simpson (2007)
	Previous experience	Is the extent to which a customer is familiar with the use of technology-based goods and services (Meuter <i>et al.</i> , 2005)	+ Meuter <i>et al.</i> (2005), Rogers (2003)
	Technological innovativeness	Is the extent to which a customer is motivated to be the first to adopt new technology-based goods and services (Bruner and Kumar, 2007)	+ Bruner and Kumar (2007), Kim and Forsythe (2008), Lin and Hsieh (2006)
Innovation characteristics	Relative advantage	Is an innovation's perceived superiority (Rijsdijk <i>et al.</i> , 2007)	+ Meuter <i>et al.</i> (2005), Plouffe <i>et al.</i> (2001)
	Compatibility	Is the degree to which an innovation is perceived as being consistent with existing values (Rijsdijk <i>et al.</i> , 2007)	+ Meuter <i>et al.</i> (2005), Plouffe <i>et al.</i> (2001)
	Ease of use	Is the degree to which an innovation is perceived to be difficult to understand and use (Rijsdijk <i>et al.</i> , 2007)	+ Lin <i>et al.</i> (2007), Plouffe <i>et al.</i> (2001)
	Observability	Is the ease and effectiveness with which the results of an innovation can be disseminated to others (Moore and Benbasat, 1991; Meuter <i>et al.</i> , 2005)	+ Plouffe <i>et al.</i> (2001), Moore and Benbasat (1991)
	Triability	Is the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003)	+ Hoyer <i>et al.</i> (2010), Meuter <i>et al.</i> (2005), Plouffe <i>et al.</i> (2001)

Table I.
Hypotheses
justifications for the
relationship of the
antecedent variables
on adoption intention

(Ajzen, 1991). With respect to TBS, recent research has empirically confirmed the positive relationship between attitudes and behavioral intentions for TBS adoption (e.g. Curran *et al.*, 2003; Dabholkar and Bagozzi, 2002). As our WCC construct represents a condition or state which is akin to a mental attitude (Smith and Swinyard, 1983), we expect a similar relationship between WCC and adoption intention. More specifically, as TBS require the customer to co-create the service by actively engaging in the service provision and consumption, the willingness of a customer to engage in such co-creation of a TBS represents an important prerequisite for the adoption of TBS (Chan *et al.*, 2010;

Handrich and Heidenreich, 2013). The greater the willingness of a customer to co-create, the greater is the probability for TBS adoption.

Hence we propose, that WCC is positively related to TBS adoption intention.

Individual differences as antecedent predictor of WCC. As a customer's personality affects the co-creation process and especially customers' motivation to engage in co-creation (Prahalad and Ramaswamy, 2004), we also implemented the individual difference variables as antecedent predictors of WCC. In general, customers who are high on self-efficacy are more confident to try and perform complex tasks (Goodwin and Ross, 1990). As the participation in co-creation activities is a very complex task, especially when dealing with TBS (Dabholkar and Bagozzi, 2002; Xie *et al.*, 2008), we suspect that customers high on self-efficacy should be more willing to participate in the co-creation of TBS. Hence, we suspect that self-efficacy will be positively correlated with WCC. Inherent novelty seeking describes the innate need of an individual to seek variety and to change purchase behavior in an effort to attain stimulating consumption experiences (Baumgartner and Steenkamp, 1996). Consequently, novelty seeking is tied to the need for stimulation (Roehrich, 2004). As co-creating a service is a new way of using and experiencing a service we suspect that inherent novelty seeking will also positively influence WCC. Besides, it is commonly known that customers with a high need for control experience anxiety caused by uncertainties and risks that services involve (Hui and Bateson, 1991). A participation in the co-creation of a service reduces the anxiety by giving the customers direct control over the service process (Etgar, 2008). Consequently, we assume a positive effect of need for control on WCC. Furthermore, as previous use of related technology and services will increase perceptions of self-confidence and ability to use new TBS (Meuter *et al.*, 2005), we expect previous experience to increase customers' general motivation to engage in co-creation. Thus, we propose that previous experience is positively correlated with WCC. Technological innovativeness refers to the tendency to try new things and buy new services more often and quicker than others (Wood and Swait, 2002). Hence, technological innovativeness is tied to the need for uniqueness (Roehrich, 2004). Consumers high on technological innovativeness are more likely to consult and share various sources of information (Midgley and Dowling, 1978; Kim and Forsythe, 2008), to spend considerable time and effort to study the innovation (Bruner and Kumar, 2007) and to customize TBS (Lin and Hsieh, 2006). Hence, we expect a positive relation between WCC and technological innovativeness. Considering the arguments above we expect an overall positive relationship between the previously mentioned individual differences and WCC.

Innovation characteristics as antecedent predictor of WCC. Especially five innovation characteristics play a prominent role in the adoption of TBS (Meuter *et al.*, 2005; Weijters *et al.*, 2007) and thus were implemented as antecedent predictors of WCC. First, relative advantage is commonly known to motivate customers to engage in the co-creation process (Etgar, 2008). Consequently, we expect that a high perceived relative advantage will be positively related to WCC. Furthermore, in line with Kleijnen *et al.* (2007) we argue that greater perceived service compatibility of a TBS is associated with greater expected service value, which in turn drives customers' motivation to engage in co-creation. Hence, we propose that compatibility is positively related to WCC. With regard to the ease of using a TBS, empirical studies have found a general positive relationship between ease of use and perceived usefulness (Kim and Forsythe, 2008), which in turn was shown to increase the expected benefit for the customer (Weijters *et al.*, 2007). Since a customer is more inclined to co-create in case of high

perceived benefits (Hoyer *et al.*, 2010), we expect a positive relationship between ease of use and WCC. Observability refers to the ability of a customer to explain the advantages and disadvantages of using an innovation (Moore and Benbasat, 1991). If the advantages of a service can be easily communicated to a customer he/she will be more motivated to try it (Meuter *et al.*, 2005). Therefore, we suspect that an increase in observability will also raise a customer's motivation and willingness to engage in co-creation. Finally, trialability plays a crucial role in TBS adoption processes because it can reduce the risk associated with co-creating a new service thereby favouring the engagement in service provision and consumption (Hoyer *et al.*, 2010). Thus, we propose that trialability is positively related to WCC. Considering the arguments above we expect an overall positive relationship between the previously mentioned innovation characteristics and WCC.

Overall mediation hypothesis. The discussion of the relationships in the previous sections indicates that WCC mediates the positive effects of individual differences and innovation characteristics on TBS adoption intention. Thus based on the arguments presented above we hypothesize:

H3. WCC mediates the positive effects of individual differences and innovation characteristics on adoption intention.

H3a. Individual differences are positively related to WCC.

H3b. Innovation characteristics are positively related to WCC.

H3c. WCC is positively related to adoption intention.

Comparison of explanatory and predictive power. Apart from evaluating the mediating role of WCC within TBS adoption and its ability to explain why the direct effects of the antecedent predictors occur, it is also crucial to study the relative effectiveness of WCC in explaining and predicting adoption intention of TBS. As narrow and specific conditions may yield stronger relationships to adoption than those found with more general traits or innovation characteristics (Jones *et al.*, 2003), we suspect, that WCC as a condition to engage in co-creation can better explain and predict TBS adoption intention compared to individual differences and innovation characteristics. Thus, we propose the following hypothesis:

H4. WCC has more explanatory and predictive power with respect to TBS adoption intention than innovation characteristics or individual differences.

Methodology, procedure and analysis

Data. As customer co-creation is especially important in TBS environments (Hoyer *et al.*, 2010; Ostrom *et al.*, 2010) and mobile apps are widely seen as prime example for innovative TBS that are co-created by the customer (Ding and Ng, 2011), we chose mobile apps as research context for our study. To obtain the data for our study we used an online survey based on a representative consumer panel of a German market research institution. Prior to the launch, the survey instruments were reviewed by eight innovation experts and subsequently pretested with a convenience sample of 32 participants to refine the questions, thereby improving internal validity and reliability of the surveys. Within study 1 we got 782 participants to successfully complete our online survey. Descriptive statistics indicate that 51.4 percent of the participants were female with a mean age of 35.24 and 48.6 percent were male with a mean age of 39.15. The most common educational category was "university or some other graduate degree" (36.6 percent); however,

a significant percentage (28.89 percent) had a high-school diploma or a secondary school certificate (27.6 percent) without university education. Income was distributed normally as 64.91 percent of the respondents had an annual income of $\leq 35,000$ Euro.

Analysis approach

To evaluate our research model and to assess our hypotheses empirically, we followed a two-step analysis procedure, beginning with a simultaneous path analysis of our research model and hypotheses in step 1 and concluding with a detailed multistep mediation analysis of each antecedent predictor variable in step 2:

- (1) Simultaneous path analysis: given that one of our main objectives is to evaluate the explanatory and predictive power of WCC compared to individual differences and innovation characteristics, we need to sum up the single effects of all individual difference and innovation characteristic variables to calculate the total effect of both antecedent predictors. One possibility to derive the total effect across all variables of each antecedent predictor is to implement the individual difference and innovation characteristic variables as two multidimensional constructs. Following suggestions of recent service literature, we thus implement individual differences and innovation characteristics as second-order constructs (e.g. Xie *et al.*, 2008). We use structural equation modeling to assess their relationships simultaneously and evaluate our proposed hypotheses.
- (2) Multistep mediation analyses: In order to expand our current understanding of the relationships between individual differences, respectively innovation characteristics and TBS adoption intention, we need to explicitly analyse each proposed mediation effect separately, using a series of regressions. We thereby followed the four-step process suggested by Baron and Kenny (1986) which was also implemented in a more recent study on TBS by Meuter *et al.* (2005).

To test our hypotheses we decided to use Partial Least Squares (PLS) instead of the more commonly applied covariance-based methods (e.g. LISREL: linear structural relations) because higher order constructs of type 2, which are included in our research model, cannot be modeled with covariance-based structural equation modeling (Chin, 2010). However, PLS is capable of modeling such higher order constructs of type 2 (Chin, 2010). For the estimation of the outer and inner model parameters we thus applied PLS using non-parametric bootstrapping with 1,000 replications and individual-level preprocessing to calculate the standard errors (Tenenhaus *et al.*, 2005).

Measures

We implemented individual differences as a second-order construct of type 2 (Jarvis *et al.*, 2003). Consequently, the first-order-level constructs, representing several consumer psychographics (self-efficacy, inherent novelty seeking, need for control, previous experience and technological innovativeness), are modeled reflective while at second-order-level the individual difference construct is formed by the sum of the first-order psychographic constructs (Jarvis *et al.*, 2003). As modeling technique we used the repeated indicator approach as it yields the best results when every construct on the first-order-level consists of an equal number of indicators, which is given within our model (Chin, 2010). To operationalize the first-order constructs we only used established scales (see Table III).

In line with Chin and Gopal (1995) and analogous to the operationalization of individual differences, we also modeled the innovation characteristics (relative advantage, compatibility, ease of use, observability, trialability) as a second-order construct of type 2. We again applied the repeated indicator approach (Chin, 2010) and only used established scales to operationalize the first-order constructs (see Table III).

We used the measurement inventory of Handrich and Heidenreich (2013) to operationalize WCC as a second-order construct of type 1. The original measurement inventory consists of a 15-item scale with three factors as first-order constructs that represent costs and benefits of customer co-creation: customization; information provision; and effort (see Table III). In line with Matsuno *et al.* (2002) we use the two-stage approach to model our second-order construct WCC.

Adoption intention was measured by using the accumulated score of the participant's intention to adopt different apps from the eight most important categories for mobile apps. The relative importance of each category was determined based on a large-scale study of the Nielsen Company (2010) with 4,000 mobile app users. Within each category we selected the app which received the best rating in Apple's app store over the last six months.

As socio-demographic variables are known to influence adoption intention of TBS (Meuter *et al.*, 2003; Reinders *et al.*, 2008), we implemented age, education, gender and income as control variables in our research model to provide a stronger test for our hypotheses. Age was measured in years, education level was measured using 6 categories from low to higher education, gender as female/male and participants' income in euros earned per year.

Measurement validation

We specified a null model, with no structural relationships to assess the psychometric properties of the hierarchical measurement model of individual differences, innovation characteristics and WCC (Wetzels *et al.*, 2009). We started with the evaluation of the first-order constructs. As all first-order constructs are reflective we evaluated content validity, indicator and construct reliability as well as convergent and discriminant validity. We first performed a principal component analysis (PCA) with varimax rotation to evaluate the content validity. All loadings were above the recommended threshold value of 0.707[1]. Furthermore, unidimensionality can be assumed as the first eigenvalue for every construct is above 1 and the second eigenvalue below one (see Table II; Tenenhaus *et al.*, 2005).

Additionally, indicator reliability can be assumed if all indicator loadings are above the threshold value of 0.7 (Chin, 2010). As Table III shows, all indicator loadings satisfy the requirements.

In the next step we calculated the composite reliability and cronbach's α to evaluate the construct reliability. Table II indicates that the values for composite reliability and cronbach's α are all above the threshold value of 0.7 (Bagozzi and Yi, 1988; Nunally and Bernstein, 1994). In support of convergent validity of the first-order constructs, the AVE for all constructs exceeds the minimum recommended value of 0.5 (Fornell and Larcker, 1981). In order to conclude our evaluation of the first-order constructs, we tested for discriminant validity (Fornell and Larcker, 1981). All constructs passed the Fornell-Larcker-criterion. To provide further evidence that WCC and intention to adopt are two distinct concepts, procedures suggested by Bruner and Kumar (2007) were followed to examine the extent to which people who

Table II.
First-order
measurement
model results

Second-order construct	First-order Construct	First eigenvalue	Second eigenvalue	Cronbach's α (CA)	Composite reliability (CR)
Individual differences	Self-efficacy	2.768	0.127	0.959	0.974
	Inherent novelty seeking	2.465	0.290	0.896	0.935
	Need for control	2.195	0.672	0.733	0.850
	Previous experience	2.725	0.145	0.967	0.979
Innovation characteristics	Technological innovativeness	2.725	0.145	0.968	0.950
	Relative advantage	2.683	0.177	0.953	0.969
	Compatibility	2.773	0.143	0.965	0.977
	Ease of use	2.780	0.136	0.961	0.975
	Observability	2.839	0.104	0.975	0.983
	Trialability	2.581	0.248	0.915	0.946
WCC	Customization	2.810	0.105	0.979	0.984
	Information provision	2.820	0.096	0.970	0.977
	Effort	2.769	0.127	0.968	0.975

score high on the WCC scale within the sample also scored high on the adoption intention measure. The frequency distribution of the WCC scores in the data set revealed that 78 respondents scored at or above the 90th percentile on the WCC scale. Similarly, 78 respondents scored at or above the 90th percentile of the intention to adopt scores. The two groups differed ($\chi^2 = 17.88, p < 0.01$) but overlapped, such that 31 respondents appeared in both groups. That is, 39.7 percent of the respondents who scored high on WCC also scored high on the adoption intention measures. Even though a large portion of people with a high WCC also have a high intention to adopt TBS, it is too extreme to conclude that both groups are the same (Bruner and Kumar, 2007). Some customers with low levels of WCC might still adopt a TBS since they expect a high functional benefit from using the service. Other consumers with high levels of WCC might want to contribute without having a sincere interest in the adoption of the end product, as they are just seeking for engagement. Conclusively, WCC and intention to adopt are two related but distinct concepts. WCC represents a generic consumer tendency to engage in co-creation of TBS, while adoption intention captures a narrow consumer tendency to adopt a specific TBS that might get enhanced by high levels of WCC since it requires customer co-creation beforehand.

In a second step, we evaluated measures of each hierarchical construct model at the second-order level. As WCC is modeled reflective at the second-order level, we first assessed indicator loadings of each first-order construct (customization, information provision and effort) which were all above the threshold value of 0.70 (see Table IV; Chin, 2010). Furthermore, Table IV indicates that the values for Cronbach's α and composite reliability are all above the threshold value of 0.70 (Bagozzi and Yi, 1988; Nunally and Bernstein, 1994) and convergent validity is also given since the AVE was 0.61.

As the second-order constructs of individual differences and innovation characteristics are all modeled formative we test indicator relevance and multicollinearity to assess the goodness of the measures (Chin, 2010). To evaluate whether the formative indicator has an impact on the formative index, the significance of the second-order outer weight can be calculated with bootstrapping (Tenenhaus *et al.*, 2005).

Second-order construct	First-order construct	Item label	Loading (λ_i)	Significance (t -value)
Individual differences	Self-efficacy (Meuter <i>et al.</i> , 2005)	I am fully capable of using the app	0.958	123.241
		I am confident in my ability to use the app	0.965	206.523
		Using the app is well within the scope of my abilities	0.962	179.775
	Inherent novelty seeking (Dabholkar and Bagozzi, 2002)	I like to continually change activities	0.916	98.178
		I like meeting consumers who have new ideas	0.900	95.141
		I like to experience novelty and change in my daily routine	0.913	112.360
	Need for control (Raju <i>et al.</i> , 1995)	Most of the time I don't like giving things out of hand	0.892	42.843
		I like to be in control over the things happening around me	0.850	59.794
		Sometimes I'm afraid to lose control	0.674	60.200
	Previous experience (Meuter <i>et al.</i> , 2005)	I commonly use many apps	0.973	164.194
		I have much experience using apps	0.970	211.856
		I use many services based on apps	0.966	182.178
	Technological innovativeness (Bruner and Kumar, 2007)	I get a kick out of using new high-tech services before most other people know they exist	0.955	164.194
		It is cool to be the first to own new high-tech services	0.953	211.856
Being the first to use new high-tech services is very important to me		0.952	182.178	
Innovation characteristics	Relative advantage (Rijsdijk <i>et al.</i> , 2007)	I believe using apps is advantageous compared to the traditional use of services	0.948	130.522
		Apps offer advantages compared to the traditional use of services	0.959	248.110
		In my eyes apps are superior to the traditional use of services.	0.960	242.626
	Compatibility (Meuter <i>et al.</i> , 2005)	Using apps is compatible with my lifestyle	0.970	320.307
		Using apps fits well with the way I like to get things done	0.970	325.479
		Using apps is completely compatible with my needs	0.960	204.521
	Ease of use (Moore and Benbasat, 1991)	Using apps does not require a lot of mental effort	0.956	159.881
		The functionality of apps is clear and understandable	0.962	264.425
	Observability (Moore and Benbasat, 1991)	Apps are easy to use	0.973	328.862
		I would be easy telling others the advantages and disadvantages of using apps	0.973	205.175

(continued)

Table III.
First-order
measurement
model fit

Second-order construct	First-order construct	Item label	Loading (λ_i)	Significance (t -value)	
Willingness to co-create (WCC)		I could communicate to others the good and bad consequences of using apps.	0.978	209.644	
		I would have no difficulty explaining why using apps may or may not be beneficial	0.978	214.749	
	Triability (Meuter <i>et al.</i> , 2005)	I can use apps on a trial basis to see what they can do	0.932	142.179	
		It is easy to try out apps without a big commitment	0.927	114.435	
		I have had opportunities to try out apps	0.914	101.254	
	Customization (Handrich and Heidenreich, 2013)	I would like to personalize apps in some way	0.944	215.544	
		To "set up" apps would allow me to use them the way I want to	0.946	191.339	
		I would like to adapt apps to meet my needs	0.943	183.223	
		It would be an advantage to fit apps to my personal preferences	0.923	200.901	
		I would like to configure apps based on my Ideas	0.953	221.737	
		Information sharing (Handrich and Heidenreich, 2013)	I would provide personal information to use apps	0.964	144.365
			If necessary I would give personal information to make apps work	0.958	164.411
			To make apps work I would be willing to release personal data	0.964	125.783
			In order to make apps work I would be willing to provide personal information, if necessary	0.960	189.347
		Effort (Handrich and Heidenreich, 2013)	To use all functions apps provide I would share personal information	0.963	236.718
			To learn how apps work, I would exert a lot of energy	0.930	127.399
			To learn how apps work, I would be very persistent	0.942	178.649
			To learn how apps work, I would spent much time	0.948	142.085
To learn how apps work, I would try very hard	0.952		113.823		
		To learn how apps work, I would put a lot of effort	0.957	198.237	

Table III.

Table V shows that the significances of the outer weights for the second-order constructs in our model exceed the critical threshold value of $t > 1.98$ (Chin and Newsted, 1999). Moreover, the highest variance inflation factor (VIF) was 4.184, confirming that no multicollinearity exists (Helm *et al.*, 2010).

Overall the results in the preceding paragraph confirm a good measurement model fit for each antecedent predictor as well as for the mediator and allow for a test of the structural relationships within our research model.

Results*Main effects*

To test our hypotheses we evaluated the path coefficients and their significance levels. All results are depicted in Figure 2.

Overall the model fit the data well as the R^2 for WCC and TBS adoption intention are 0.59 and 0.57, respectively (see Figure 2). To test the predictive power of our model we used a blindfolding approach to get the Q^2 -value of our endogenous reflective constructs WCC and TBS adoption intention. The Q^2 -value for WCC and TBS adoption intention are 0.38 and 0.56, respectively, confirming high predictive power of the model (Tenenhaus *et al.*, 2005). In line with *H1* individual differences positively influence TBS adoption intention ($\beta = 0.18$, $p < 0.01$). *H2* is also supported as innovation characteristics exert a positive effect on TBS adoption intention ($\beta = 0.31$, $p < 0.01$). Furthermore we found support for *H3* as WCC mediates the positive effects of individual differences and innovation characteristics on TBS adoption intention. More specifically, individual differences (*H3a*: $\beta = 0.20$, $p < 0.01$) and innovation characteristics (*H3b*: $\beta = 0.59$, $p < 0.01$) are positively related to WCC, and WCC positively affects TBS adoption intention (*H3c*: $\beta = 0.32$, $p < 0.01$).

To test for the overall mediation effect we used a simultaneous approach (Helm *et al.*, 2010) which is based on the recommendations for mediation by Baron and Kenny (1986). Accordingly, we applied the z -statistic to test the significance of the mediation (Sobel, 1982). The results of the sobel test show that WCC significantly mediates the positive effect of individual differences (z -value = 3.96, $p < 0.01$) and innovation

Second-order construct	First-order construct	Loading (λ_i)	Significance (Bootstr. $n = 1,000$)	CA	CR	AVE
WCC	Customization	0.781	49.152	0.955	0.959	0.613
	Information provision	0.870	75.930			
	Effort	0.826	52.559			

Table IV.
Second-order measurement model results for WCC

First order constructs	Second-order Measurement Model Results	
	Outer weights	Significance
	<i>Individual differences (VIF = 2.074)</i>	
Self-efficacy	0.302	43.612
Inherent novelty seeking	0.277	44.275
Need for control	0.171	58.673
Previous experience	0.289	40.674
Technological innovativeness	0.281	24.816
	<i>Innovation characteristics (VIF = 4.184)</i>	
Relative advantage	0.229	77.721
Compatibility	0.242	77.146
Ease of use	0.233	75.404
Observability	0.239	71.264
Trialability	0.195	59.681

Table V.
Second-order measurement model results for antecedent predictors

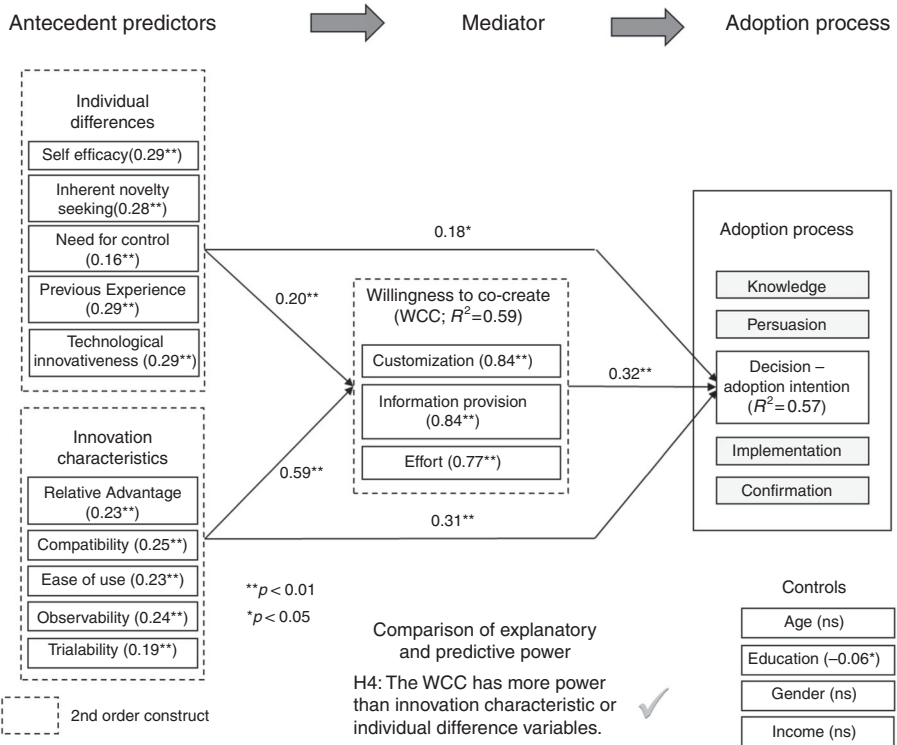


Figure 2.
Structural model
results of study 1

characteristics (z -value = 6.73, $p < 0.01$) on TBS adoption intention. In line with Helm *et al.* (2010) we additionally use the variance accounted for (VAF) to estimate the magnitude of the indirect effect. A VAF-value of 0.10 indicates that about 10 percent of the total effect of individual differences on adoption intention is explained by the indirect effect (Helm *et al.*, 2010). Additionally, more than one-third of the total effect of innovation characteristics on adoption intention is explained by the indirect effect (VAF = 0.37). Overall, these results provide first evidence of the important role of WCC as mediator and predictor within the adoption of TBS. However, a detailed examination of the explanatory and predictive power as well as the individual mediation effects remains to be conducted in the following.

Comparison of explanatory and predictive power. To evaluate the explanatory and predictive power of WCC, we initially examine the direct effects for each of our included constructs on TBS adoption intention (see Figure 2). The results show that WCC exerted the strongest individual effect on TBS adoption intention ($\beta = 0.32$, $p < 0.01$). The effect is slightly stronger as the corresponding direct effect of innovation characteristics ($\beta = 0.31$, $p < 0.01$) and by far stronger than that of individual differences ($\beta = 0.18$, $p < 0.01$).

For a more detailed analysis, we employed a stepwise PLS analysis to explain and predict TBS adoption intention (Bruner and Kumar, 2007). Therefore, we entered the demographic variables, along with individual differences and innovation characteristics, as predictors of TBS adoption intention in step 1. In step 2 we added

WCC, to determine WCC's ability to explain TBS adoption intention beyond the contributions made by socio demographics and both antecedent predictors (individual differences and innovation characteristics).

As we show in Table VI, we found that after controlling for the effects of the antecedent predictors and socio demographics in step 2, WCC still had a significant effect on TBS adoption intention ($\beta = 0.32$, $p < 0.01$). Furthermore, as the results in Table VI show 52.7 percent of the variance in the dependent variable TBS adoption intention was explained in step 1. When we added WCC as a predictor in step 2, an additional 4.1 percent of the variance in TBS adoption intention was explained. Thus, WCC explains TBS adoption intention beyond the point achieved with socio demographics, and typically used antecedent predictors.

Finally, we calculated the effect size f^2 to approximate the constructs' predictive power with regard to the endogenous variable. In line with our preceding results, WCC yielded a much greater effect size for TBS adoption intention than any of the other variables ($f^2 = 0.095$). Thus WCC possesses more explanatory and predictive power with regard to TBS adoption intention than all other implemented variables, confirming *H4*.

Multistep mediation analysis. Following Meuter *et al.* (2005), the first step of our mediation analysis determines whether the proposed mediator WCC has a significant, direct effect on TBS adoption intention. According to our results, WCC significantly affected TBS adoption intention ($\beta = 0.66$, t -value = 30.301). Hence, the establishment of a direct effect was confirmed within step 1. To evaluate the mediating power of WCC, we completed the remaining three steps in the test for mediation (Baron and Kenny, 1986). Due to space limitations, it is impractical to discuss in detail the results from all multistep tests for mediation. However, we provide a summary of the findings for all multistep tests in Table VII. As every antecedent predictor had a significant impact on WCC within step 3, we only provide the key differences between step 2 and step 4 to determine the establishment of a mediation effect. For example, in the first test with WCC as mediator between the individual difference variables and TBS adoption intention, all variables had a significant, direct effect in step 2. However, in step 4, when the individual difference variables were modeled with WCC as mediator, each effect was lessened and changed from highly significant to a much less powerful influence. The results indicate that WCC partially mediates all the relationships between individual difference variables and TBS adoption intention. In case of the innovation characteristics, a similar pattern was confirmed. Each innovation characteristic

Independent variables	Dependent variable TBS adoption intention				
	Step 1 ($R^2 = 0.527$)		Step 2 ($R^2 = 0.568$)		f^2
	B	t	β	t	
WCC	–	–	0.321	8.660	0.095
Individual differences	0.248	5.017	0.179	4.299	0.021
Innovation characteristics	0.514	10.440	0.315	6.399	0.053
Age	0.009	0.591	–0.019	1.035	0.000
Education	–0.085	3.313	–0.059	2.216	0.001
Gender	–0.013	0.425	–0.007	0.487	0.000
Income	–0.006	0.756	–0.015	0.886	0.000

Table VI.
Explanatory and
predictive power of
WCC in study 1

Table VII.
Results of the
multistep mediation
analysis of study 1

Description of test	Significance of mediator: Step 1	Change in Effects of Antecedent Predictors Between Steps 2 and 4			Conclusion
		Antecedent predictor	Step 2 $\beta(t\text{-value})$	Step 4 $\beta(t\text{-value})$	
WCC as a mediator of the relationship between individual difference variables and TBS adoption intention	0.66 (24.701)	Self-efficacy	0.49 (15.690)	0.18 (5.104)	Partial mediation
		Inherent novelty seeking	0.50 (18.710)	0.17 (4.484)	Partial mediation
		Need for control	0.29 (7.802)	0.06 (2.407)	Partial mediation
		Previous experience	0.52 (18.536)	0.23 (6.710)	Partial mediation
		Technological innovativeness	0.54 (21.142)	0.23 (8.100)	Partial mediation
		Relative advantage	0.67 (29.004)	0.38 (10.305)	Partial mediation
WCC as a mediator of the relationship between innovation characteristic variables and TBS adoption intention	0.66 (24.701)	Compatibility	0.69 (31.578)	0.39 (9.948)	Partial mediation
		Ease of use	0.58 (19.620)	0.25 (6.721)	Partial mediation
		Observability	0.57 (19.586)	0.22 (5.782)	Partial mediation
		Trialability	0.54 (17.588)	0.19 (5.809)	Partial mediation

variable was partially mediated by WCC, as its effect in step 2 was lessened when modeled with WCC as mediator in step 4. Hence, the overall pattern of the results also provides further support for *H3*, that WCC represents an important mediator for both antecedent predictors. Overall, the results of study 1 support the important role of WCC as mediator and confirmed strong explanatory and predictive power for TBS adoption intention. However, an empirical evaluation of the explanatory power of WCC for persuasion-decision discrepancies still remains to be conducted. Study 2 addresses this concern.

Study 2

Conceptual development

Past research on innovation adoption in general (Arts *et al.*, 2011; Rogers, 2003) suggests the existence of persuasion-decision discrepancies, indicating that a positive or negative attitude toward an innovation can, though does not always, lead to aligned behavior (Rogers, 2003). Likewise, past research on TBS adoption shows that customers often evaluate a TBS positively yet may choose not to try it (Meuter *et al.*, 2005). Hence, the perceived value of a TBS as an outcome of the persuasion stage often differs from the intention to adopt a TBS as an outcome of the decision stage (Nabih *et al.*, 1997; Rogers, 2003). Prior research has called for empirical investigations into the underlying reasons for such persuasion-decision discrepancies to further enhance the current knowledge of consumer adoption behavior (Meuter *et al.*, 2005; Rogers, 2003). From a managerial perspective, knowing the reasons for persuasion-decision discrepancies is also important as this would provide managers with a concise and actionable set of factors to prevent TBS rejection behavior after positive evaluation

(Meuter *et al.*, 2005). However, existent research was not yet able to provide an explanation for such persuasion-decision discrepancies within TBS adoption while focussing on individual differences and innovation characteristics as explanatory variables (Meuter *et al.*, 2005).

As we will outline in the following, the willingness of a customer to co-create could be the missing link to successfully explain such persuasion-decision discrepancies in TBS adoption. In general, past literature has confirmed, that based on the interplay of individual differences and innovation characteristics, a perception of the service value is formed within persuasion stage (Meuter *et al.*, 2005; Sánchez-Fernández and Iniesta-Bonillo, 2007; Sweeney and Soutar, 2001). In case of non-TBS this value perception most often leads to aligned behavior and thus persuasion-decision discrepancies represent the exception rather than the rule. However, in case of TBS the engagement of the customer in the TBS provision is a prerequisite for TBS adoption (Chan *et al.*, 2010; Chua and Sweeney, 2003). Hence, the decision to adopt a TBS might not solely be constituted by a customer's value perception, but also by his/her willingness to engage in such co-creation. In case of a positive value perception and a high WCC, the value perception most probably translates in aligned behavioral intentions (i.e. intention to adopt the TBS). However, in case of a positive value perception and a low WCC, customers may evaluate a TBS positively and still reject adoption due to a low willingness to engage in co-creation. Consequently, persuasion-decision discrepancies arise as customers are principally interested in the TBS but may: be uncomfortable to use, store and distribute personal information (information provision); be not willing to spent a considerable amount of time, mental and physical effort to engage in co-creation (effort); or perceive no benefit in customizing a service offering (customization). Hence, an examination of the explanatory power of WCC for persuasion-decision discrepancies might offer first insights into causes of such behavior within TBS adoption.

Data

For our study 2 we used a scenario-based online-experiment to test our hypotheses (e.g. Xie *et al.*, 2008). We again chose mobile apps as research context and especially focussed on ticketing mobile apps, as these apps are used worldwide by 230 million people today and are expected to be used by over 750 million people by the year 2015 (Juniper Research, 2011). Based on rankings of the commonly used app-stores (apple, android, OVI, blackberry) we selected the ten most popular ticketing apps and developed a product and usage descriptions for each app in line with their original descriptions. Subsequently, we used expert judges to rate the descriptions with respect to wording, sequence, format and layout as well as difficulty. We then chose the two best rated app descriptions, one describing an app to book a flight and one to buy a train ticket, as research objects. At the beginning of each scenario we described the respective mobile ticketing app and how it is used in detail. Subsequently, we asked the participants to imagine themselves using one of the previously described ticketing apps.

We again administered our online scenario experiment using a representative consumer panel of a German market research institution. For our statistical analysis we combined the subsamples of the two different mobile app scenarios into one sample because the Box's *M*-test was not significant ($p = 0.160$), and thus no evidence was found to suggest that the two subsamples (flight and train booking app) differ. Consequently our sample consisted of 181 individuals who participated in our online scenario

experiment. Our descriptive analysis shows that 48.5 percent of the participants were female with a mean age of 35.08 and 51.5 percent were male with a mean age of 36.76. The most common educational category was “university or some other graduate degree” (40.3 percent); however, a significant percentage (29.8 percent) had a high-school diploma or a secondary school certificate (12.3 percent) without university education. Income was distributed normally as 53.21 percent of the respondents had an annual income of < 35,000 Euro.

Methodology, analysis and results

We used the same measurements for our independent variables, namely individual differences, innovation characteristics as well as WCC that were already employed in study 1. Furthermore, we again implemented age, education, gender and income as controls. Additionally, we created a difference score as dependent variable to assess persuasion-decision discrepancies (Tisak and Smith, 1994). We therefore measured both TBS perceived value as an outcome of the persuasion stage using the inventory of Sweeney and Soutar (2001) and TBS adoption intention as an outcome of the decision stage using the inventory of Kulviwat *et al.* (2007). We subsequently used the unstandardized latent variable scores of each multi-item construct (TBS perceived value and TBS adoption intention) and calculated their difference score for each scenario evaluation. The resulting absolute values of each difference score were finally used as measure to assess persuasion-decision discrepancies as dependent variable. In doing so, our dependent variable measured the degree to which the reported intention to adopt the TBS deviates from the perceived value of the TBS.

In order to evaluate the explanatory power of individual differences, innovation characteristics and WCC for persuasion-decision discrepancies individually, we employed three separate PLS analyses, each with one construct as antecedent predictor of persuasion-decision discrepancies. According to our results, both individual differences ($\beta = 0.09$, ns) and innovation characteristics ($\beta = -0.04$, ns) did not exhibit a significant effect and thus were not able to explain persuasion-decision discrepancies. However, the effect of WCC was significant ($\beta = -0.13$, $p < 0.05$). Hence, contrary to individual differences and innovation characteristics, WCC was able to explain a reasonable amount of variance in the independent variable persuasion-decision discrepancies ($R^2 = 0.06$).

General discussion

Overall our findings from study 1 support the proposed TBS adoption model and the mediating role of WCC. Both antecedent predictors, namely individual differences and innovation characteristics, exhibited significant positive effects on TBS adoption intention. Hence, *H1* and *H2* were confirmed. Moreover and most important, the mediating effects of WCC proposed in *H3* were also supported by our empirical results. The consolidated effect of each second-order construct, namely individual differences and innovation characteristics, was mediated by WCC. However, while more than one-third of the total effect of innovation characteristics on TBS adoption intention was explained by the indirect effect, only about 10 percent of the total effect of individual differences on TBS adoption intention was explained by the direct effect. Therefore, WCC possesses more mediating power with respect to innovation characteristics than with regard to individual differences. Additionally, the strong mediating power of WCC was also confirmed on first-order construct level within the multistep mediation analyses. All ten antecedent predictors were partially mediated by WCC.

In addition to the mediating power of WCC, we also evaluated its explanatory and predictive power compared to individual differences and innovation characteristics. With respect to WCC's individual effect on TBS adoption intention, both the effect of individual differences and innovation characteristics turned out to be smaller. Accordingly the explanatory power of WCC was by far greater than that of individual differences and innovation characteristics. Furthermore, WCC was even able to explain TBS adoption intention beyond the level provided by individual differences and innovation characteristics. With respect to predictive power, WCC exhibited by far greater effect sizes than individual differences and innovation characteristics. Considering these results, we can conclude that WCC possesses more explanatory and predictive power with regard to TBS adoption intention than individual differences and innovation characteristics. Thus *H4* can be confirmed.

The results from study 2 further substantiate the importance of a customer's WCC for TBS adoption. While both individual difference and innovation characteristics were not able to significantly explain variance in persuasion-decision discrepancies, WCC explained a rather small but significant amount of 6 percent. Hence, these results provide first empirical evidence for the theoretical proposition that a lack of customers' WCC might help to explain persuasion-decision discrepancies in TBS adoption.

Theoretical implications

The theoretical contribution of our paper is threefold. First, our TBS adoption model and corresponding findings significantly amend existing knowledge on TBS adoption behavior. More specifically, our findings contribute to adoption and diffusion theory (Rogers, 2003; Nabih *et al.*, 1997; Tornatzky and Klein, 1982) by introducing and evaluating a new antecedent predictor of TBS adoption, namely WCC. The traditional antecedent predictors of TBS adoption, i.e. individual difference and innovation characteristic variables, explored in previous research (Arts *et al.*, 2011; Dabholkar and Bagozzi, 2002; Meuter *et al.*, 2005) are not disputed. However, the results conclusively support the added explanatory power of WCC and its central role as a variable with strong mediating properties. The WCC is thus not only an additional predictor to the commonly used individual differences and innovation characteristics, but also a key variable to better understand how and why individual differences and innovation characteristics affect TBS adoption intention. These results provide a partial answer to the question why commonly used innovation characteristics and individual difference variables influence TBS adoption (Meuter *et al.*, 2005). For instance, various studies show that technological innovativeness increases the probability of adopting a TBS (Im *et al.*, 2003; Roehrich, 2004). WCC as a mediator helps to explain why this relationship exists: consumers high on technological innovativeness are more likely to consult and share various sources of information (Midgley and Dowling, 1978; Kim and Forsythe, 2008), to spend considerable time and effort to study the innovation (Bruner and Kumar, 2007) and to customize TBS (Lin and Hsieh, 2006). Hence, for these customers the uncomfortable feeling of information provision and a high effort entailed to TBS provision and consumption is perceived as less negative. Furthermore, the possibility to customize TBS is even more important for these customers. Consequently, perceived costs of co-creation are reduced while perceived benefits are enhanced, leading to a high WCC and subsequently to a high probability to adopt the TBS.

Second, WCC represents a more concise and even better explanatory and predictive construct for TBS adoption intention compared to commonly used antecedent

predictors. Several meta-analyses (e.g. Tornatzky and Klein, 1982; Arts *et al.*, 2011) showed that only few innovation characteristics used in literature were consistently related to adoption. Likewise empirical studies confirmed that the relationship between individual differences and innovation adoption is rather weak (e.g. Manning *et al.*, 1995; Midgley and Dowling, 1978). As a response Meuter *et al.* (2005) suggested to include mediating variables in TBS adoption models to enhance their explanatory power. By including WCC in the presented TBS adoption model we respond to that call. Furthermore, as the results confirmed that WCC showed higher explanatory and predictive power than do commonly used individual difference and innovation characteristic variables, the WCC construct may additionally be used in future studies to explain and predict adoption intention. More specifically, TBS adoption models using individual differences and innovation characteristics may be complemented with WCC to enhance their explanatory and predictive power for the adoption of technology-based and other co-created services.

Third, the use of WCC as antecedent predictor has the potential to help explain why consumers that evaluated a TBS positively yet may choose not to adopt it. While literature has acknowledged the importance of finding explanations for such persuasion-decision discrepancies, it still lacks respective theoretical rationales (Meuter *et al.*, 2005; Rogers, 2003). By evaluating the explanatory power of individual differences, innovation characteristics and WCC for persuasion-discrepancies, we not only provide a possible explanation for the lack of theoretical rationales but also provide a first possible explanation. Our results conclusively show that neither individual differences nor innovation characteristics were able to significantly explain variance in persuasion-decision discrepancies. Hence, the lack of theoretical explanations for such behavior might be due the predominant focus on individual differences and innovation characteristics (Arts *et al.*, 2011; Rogers, 2003) as explanatory variables in this respect. Furthermore, our results suggest that a lack of customers' WCC on the contrary can help to explain these persuasion-decision discrepancies within TBS adoption. That is, even customers who have a positive evaluation of a TBS may choose not to use it if: they are reluctant to provide personal information; are not willing to spend a considerable amount of effort to engage in co-creation (effort); or perceive no benefit in customizing a service offering. Hence, including WCC in future research on TBS adoption behavior might also help explain persuasion-decision discrepancies. Still, the small amount of variance explained suggests that the psychological processes that underlie persuasion-decision discrepancies in TBS adoption are more complex and additional factors besides WCC have to be taken into account to further enhance the explanatory power.

Managerial implications

Knowing the drivers of TBS adoption is important for a company's success (Meuter *et al.*, 2005). Especially for TBS, which require customers to co-create the service by actively engaging in the service provision and consumption, the WCC construct provides managers with a new set of factors (apart from known antecedent predictors like individual differences and innovation characteristics) to optimize TBS adoption.

The TBS adoption triangle which is depicted in Figure 3 illustrates possible starting points for the managerial optimization of TBS adoption. WCC is placed on the apex of the triangle because it is the most important driver for a successful adoption of TBS and it is also being affected by individual differences and innovation characteristics. Consequently, managers can directly influence TBS adoption intention by developing

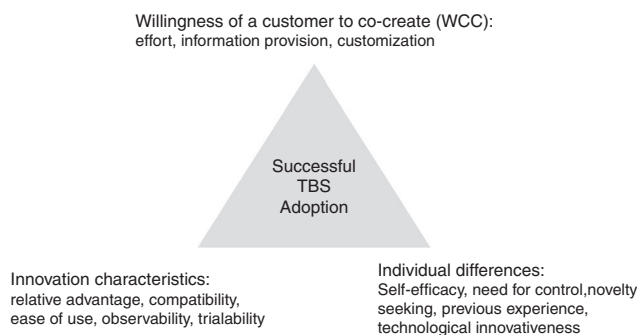


Figure 3.
TBS adoption
triangle

strategies which address the three WCC dimensions effort, information provision and customization. For example, managers may reduce the effort involved in understanding mobile apps by simplifying the navigation of the apps or providing customer-friendly instructions or aids. Furthermore a better privacy protection of personal online data, e.g. via SSL-encoding, could also help to decrease a customer's reluctance to share information. Both should enable companies to reduce a customer's perceived costs of co-creation. Finally, managers may increase the benefits from customizing apps by providing automatically generated recommendations based on personal data or interfaces to already installed applications.

Besides directly addressing information provision and effort to reduce costs of co-creation, service providers should also strive to enhance customer experience as a part of co-creation activities to increase satisfaction with the overall engagement in service provision. Ensuring an exciting co-creation experience could mitigate negative perceptions of high levels of information provision and effort. Affective cues might thereby emphasize the actual co-creation experience and, as an additional judgment criterion to the mere degree of information provision, effort and customization, prevent purely cost-benefit-driven customer judgments. In other words, designing a joyful co-creation experience might be an effective approach to put the decision to adopt a TBS on a broader foundation and as such facilitate adoption intention (Heidenreich *et al.*, 2014).

Furthermore, managers can affect adoption intention both directly and indirectly via WCC by influencing innovation characteristics and individual differences. For example, managers may expend resources on new product development and communication to enhance the relative advantage over existing TBS or make the benefits of a TBS apparent through initiatives such as advertisements. One possibility to develop TBS that customers perceive as more useful and favorable is to make TBS designers mentally visualize potential customers during the design process of new TBS (Dahl *et al.*, 1999). Moreover, marketing communications may use the instrument of benefit comparison in order to enhance the perceived relative advantage of a new TBS in comparison to a non-comparative advertisement (Ziamou and Ratneshwar, 2003). Additionally, managers can also influence TBS adoption via individual differences. For example, to reduce negative effects of low self-efficacy, companies may use mental simulation (e.g. Hoeffler, 2003) or self-visualization (Dahl and Hoeffler, 2004) in advertisements. Such instruments are supposed to help customers imagine themselves in the usage situation and may thus help enhancing an individual's assessment of his or her ability to use a TBS.

Limitations and directions for future research

As with any other research our studies contain some limitations. First, although we used a set of mobile apps instead of a single app for both our analysis the results are still limited to the mobile apps market. Thus, to enhance the generalizability of our findings we suggest that our modified technology adoption model should be tested in other TBS contexts as well.

Second, our study used cross-sectional data. However, adoption of TBS represents a dynamic process that happens over time and thus it would be interesting to assess the differential influence of WCC across the stages in the adoption process using longitudinal data. For example, the critical factors that influence continuous or discontinuous usage in stages beyond adoption intention could be developed and tested alongside with WCC.

Third, our participants were customers from a single country (i.e. Germany), which might somewhat limit the results to customers in that country. Thus, a cross-cultural study would be a worthwhile research objective, as customer co-creation behavior could also depend on customers' cultural value orientations such as individualisms, collectivism and power distance (Chan *et al.*, 2010).

Fourth, the variance in persuasion-decision discrepancies that was explained by WCC turned out to be rather small ($R^2 = 0.06$). This finding points out that the psychological processes that underlie persuasion-decision discrepancies in TBS adoption are more complex and additional factors besides WCC have to be taken into account to fully understand this phenomenon. Hence, future research might take up this issue and investigate other explanatory variables for persuasion-decision discrepancies.

Apart from these limitations we subsequently suggest some avenues for future research. For example, Dabholkar and Bagozzi (2002) found out that perceived waiting time and social anxiety moderate the relationship of attitude toward technology-based self-services and adoption intention. Thus, future research might incorporate such situational variables in our modified technology adoption model. More specifically, it could be tested whether these variables also influence the effect of WCC on adoption intention thereby providing further insight in customer's co-creation behavior.

Finally, future research may investigate the ramifications of service failures for co-created services (Dong *et al.*, 2008). It could be especially worth studying how customers with different levels of WCC react to an already adopted service innovation when suddenly experiencing a service failure. These results could provide academics and managers with valuable information on the topic of service failures in co-creation contexts and could shed some light on the dark side of customer co-creation.

Note

1. The item-level PCA results are available from the author upon request.

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