Switch to Your Own to Work with the Known:
An Empirical Study on Consumerization of IT

Completed Research Paper

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ABSTRACT

Driven by the pervasion of privately owned mobile devices, in recent years, we witness a trend of consumers rather than enterprises increasingly diffusing technology innovations into work environments. Today, owners of ubiquitous technologies (e.g., smartphones, social networks) not only use them privately but also apply them on business purposes, which is known as Bring Your Own Device (BYOD) or more generally coined as consumerization. While consumerization is heavily discussed in industry, nowadays only few research contributions exist. Applying a switching theory perspective in a post-adoption study, we investigated consumerization on an individual level. In so doing, we developed and operationalized a consumerization construct and empirically tested in addition the individual drivers of consumerization in a study among graduate students.

Keywords

Consumerization, Bring Your Own Device, Switching Theory

INTRODUCTION

In the past, the diffusion of technical innovations was basically driven by enterprises which brought up new information systems (IS) to sell or to be used by their employees (Baskerville, 2011). Subsequently, these innovations were bought by consumers for private use (Baskerville, 2011). Today, a shift in the computerization process can be observed where for example private mobile devices (e.g., smartphones, tablet computers) are used for business purposes (Baskerville, 2011; Weiß and Leimeister, 2012). As a consequence, innovation is no longer driven top-down by the enterprises to the consumers, but rather the other way around, appearing bottom-up on the consumer markets first (Nan, 2011). This phenomenon is referred to as 'consumerization' (Weiß and Leimeister, 2012). As one facet thereof, consumers not only use their own mobile devices for business purposes which is commonly known as bring your own device (BYOD), but also bring their own applications, such as social networks, into business (Gartner Inc., 2012).

While consumerization became a heavily discussed topic among practitioners already, research is comparatively sparse in this area. On a highly generalized level, a framework based on the complex adaptive systems theory was developed in prior research to understand the interrelations of agents, interactions, and environments in bottom-up information technology (IT) use processes (Nan, 2011). Niehaves, Köffer and Ortbach (2012) conducted a literature review to define consumerization as a new phenomenon as well as to derive major advantages and disadvantages of consumerization for employees and organizations. With regard to the impacts of consumerization on management of enterprise IT, Weiß and Leimeister (2012) argue that product life cycles will converge toward those of the consumer markets forced by the expectations of the employees to always own and use the latest technologies (Weiß and Leimeister, 2012).

As employees have already adopted the privately used technologies, research on consumerization in enterprises focuses on post-adoption use (Kim and Son, 2009; Ye and Potter, 2011). Although post-adoption use enjoys increasing attention in research (Kim and Son, 2009), the question how to specifically conceptualize and operationalize consumerization remains unclear. Moreover, the individual drivers behind consumerization behavior have not been explored yet. Essentially,

employees use their privately adopted technologies instead of the IS infrastructure provided by their employers to conduct their tasks. Such a changing or switching between technologies is theoretically explained by the switching theory (Bhattacherjee, Limayem and Cheung, 2012; Ye and Potter, 2011), which we deemed highly suitable to investigate consumerization on an individual level.

To follow the call for more research in this area (Niehaves et al., 2012), we operationalized consumerization in an empirical research model and tested the drivers behind consumerization behavior by conducting an empirical study among 71 graduate students of economics and business administration. In particular, our goal was to explore if they use their own technologies instead of the technologies provided by the university and what drives their consumerization behavior. Essentially, our research questions are:

RQ1: How can consumerization behavior be operationalized?

RQ2: Which (individual) drivers lead to consumerization behavior?

The remainder of the paper is organized as follows: First, we will guide the reader through the domain-specific background on consumerization and the underlying IT switching theory. Second, the research model and the related hypotheses are derived. Third, the outcomes of the data analysis are given. This paper concludes with a discussion of the findings, the limitations of our research, and an outline on future research.

THEORETICAL BACKGROUND

Consumerization

Today, consumers often use privately owned mobile devices in a non-work environment which are more powerful than the devices incumbent in their employer's environment (Ingalsbe, Shoemaker and Mead, 2011; Willis, 2012). Therefore, they have more experience in using these technologies, consider their own technologies to be superior to the corporate technologies and strive to consolidate private and corporate devices into a single device (Weiß and Leimeister, 2012). Enterprises have perceived these trends and increasingly technically enabled their employees to use their privately owned mobile devices for business purposes. This phenomenon is commonly known as Bring Your Own Device (BYOD) (Yun, Kettinger and Lee, 2012). Moreover, employees begin to use private applications such as instant messaging and social networks, for example on their own mobile devices, for business purposes (Erbes, Motahari Nezhad and Graupner, 2012; Willis, 2012). In this context, the business usage of privately owned devices on the one hand, and the usage of familiar consumer software on the other hand, are subsumed together with other consumer driven innovations as "consumerization" (Niehaves et al., 2012; Weiß and Leimeister, 2012).

Switching Theory

Essentially, the switching theory used to examine consumerization behavior builds upon the migration theory of humans physically changing their locations (Bansal, Taylor and James, 2005; Lewis, 1982). Adapted by marketing research, switching theory has a long tradition (Bhattacherjee et al., 2012) for understanding consumer switching behavior. The Push-Pull-Mooring (PPM) switching model predicts that negative factors at the origin push consumers away, positive factors at the destination will attract consumers and pull them towards a superior product. Moreover, mooring effects either inhibit or facilitate the migration of consumers towards superior services (Bansal et al., 2005). Examples for those influencing factors of switching behavior are social influence or switching costs (Bansal et al., 2005).

Prior research on switching behavior in IS post-adoption context applied the PPM model to elaborate on bloggers switching from blogs to social networks (Hsieh, Hsieh, Chiu and Feng, 2012). Building on this research, Ye and Potter (2011) as well as Bhattacherjee et al. (2012) amended the PPM model by including habit as moderating and as direct effect influencing switching behavior. They argue that when using an incumbent technology habitually, the user will less likely switch to a substitute product. Pertaining to the habitual usage of privately owned technologies as our phenomenon of interest, this indicates that the users will more likely stay with their own technologies and hence try to switch from the incumbent system of their employer towards their private technologies for business purposes.

RESEARCH MODEL AND HYPOTHESES

The developed research model in this study is primarily based on the switching theory of Bansal et al. (2005) and Bhattacherjee et al. (2012). Where possible, the measures were derived from prior empirical literature and adapted to the context of consumerization (see table 1 in the Appendix). To operationalize consumerization, we amended the IS use continuance intention construct (Bhattacherjee, 2001; Limayem, Hirt and Cheung, 2007) together with the behavioral

intention construct of Venkatesh, Thong and Xu (2012). In so doing, we enhanced the intended continuance of using given technologies by including the switching aspect of private technologies replacing enterprises' incumbent technologies. Subsequently, we tested the new construct using the Q-sorting technique (e.g., Thomas and Watson, 2002) among four researchers before the survey. For all constructs reflective indicators were used and measured on a fully anchored 7-point Likert scale. Figure 1 presents our developed model with the derived hypotheses which will be explained in the following subsections.
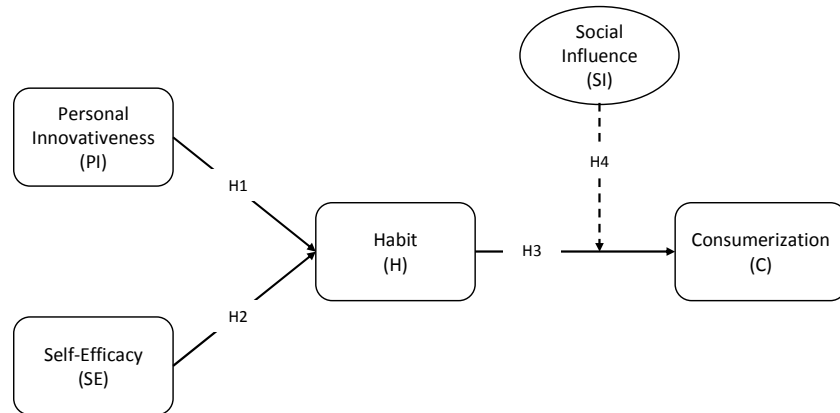

Figure 1: Structural Model

Influence of Personal Innovativeness to Habit

According to Agarwal and Prasad (1998), personal innovativeness (PI) characterizes an individual's willingness to try out and subsequently adopt innovations in IT in an early stage. Being a trait, PI's influence should not be different depending on the environment (Ahuja and Thatcher, 2005), i.e., whether the technology is used in private or for business purposes.

Limayem et al. (2007) define habit in the context of continued IS usage as *"the extent to which people tend to perform behaviors (use IS) automatically because of learning"* (Limayem et al., 2007, p. 705). This kind of continuance refers to a form of post-adoption behavior in which users acclimatize to new technologies or phenomena (Limayem et al., 2007). After adopting a technology and using it automatically, people might learn to apply known features of that technology to new situations, environments, or even unconsciously generalize learned behaviors to the usage of new features (Ortiz de Guinea and Markus, 2009). Following the significantly, positively tested hypothesis of Elie-Dit-Cosaque, Pallud and Kalika (2011) that PI influences perceived behavioral control, we hypothesize:

Hypothesis 1: Personal innovativeness positively affects the habit of using private mobile devices / software.

Influence of Computer Self-Efficacy to Habit

According to the social cognitive theory (Bandura, 1977), self-efficacy is defined as people's judgment of what can be done with the skills they posses. Computer self-efficacy in turn can be understood as people's belief of their capability to use computers to perform a task (Compeau and Higgins, 1995). More thoroughly, it defines the ability to apply one's skills to broader tasks in using a computer like analyzing financial data (Compeau and Higgins, 1995). Compeau et al. (1999) found a positive significant influence of computer self-efficacy on IT use. Further, Ye, Seo, Desouza, Sangareddy and Jha (2008) argued that the level of computer self-efficacy influences the confidence in the users' ability to switch successfully to an alternative IT product. Thus, interpreting habit as automatically performed IT usage, we test:

Hypothesis 2: Computer self-efficacy positively affects the habit of using private mobile devices / software.

Influence of Habit on Consumerization

Habit is generally defined as automatically performed behaviors (Limayem et al., 2007). It plays an important role in IT usage continuance and hence IT post-adoption research (Ortiz de Guinea and Markus, 2009; Ye and Potter, 2011). In prior research, Limayem et al. (2007) found empirical evidence for the influence of habit on IT usage continuance. As explained

before, continuance of privately owned devices and software usage in a work environment is known as consumerization. In accordance with the switching theory (Bansal et al., 2005; Bhattacherjee et al., 2012), we anticipate that consumers' habit of using their technologies will lead to consumerization. Hence, we suggest:

Hypothesis 3: Habit positively influences the consumerization of private mobile devices / software.

Moderating Effect of Social Influence on the Relation between Habit and Consumerization

The individual intention to use a system is predicted by attitudes toward the system, social influence, and perceptions of behavioral control of the system (Athiyaman, 2002; Liao, Shiao, Wang and Chen, 1999; Lin, 2006; Shim, Eastlick, Lotz and Warrington, 2001). Thereof, we focus on social influence as most relevant in a collaborative environment, which is defined as the perceived believe of the consumer that valued, affiliated persons expect the consumer to use the technology (Venkatesh et al., 2012). Hence, social influence emerges from the social environment of the users. This social environment can have an impact on the decision to switch or not switch the technology. Especially today, the social (and peer) influence to use technologies equal to the ones of the social environment is of high importance (Eysenbach, 2008). Given that we anticipate an automatically instead of a cogitative behavior, we assume rather a moderating effect of social influence on the relation between habit and consumerization than a direct effect. Accordingly, the hypothesis is stated as follows:

Hypothesis 4: Social influence positively moderates the relation of habit and consumerization.

DATA ANALYSIS AND RESULTS

Data Collection and Sample Profile

In order to validate the research model, a questionnaire-based survey was conducted. In November 2012, 750 randomly selected graduate students were invited through an internal mailing list from a large business science department at a public European University. The participants were encouraged to consider different examples for BYOD when filling out an online questionnaire, such as using social media (Facebook, Twitter, etc.) to communicate instead of using their university mail account, or searching literature in relevant databases via their own notebook instead of using the desktop PCs provided in the university library. Overall, 118 responses were collected whereby 47 responses were not feasible because of missing values. Finally, 71 responses were completed and could be used as valid data points which depicts a response rate of 9.47 percentages.

Measurement Model

To support the measurement model from a statistically point of view, content validity, construct reliability, and construct validity have to be tested. Construct reliability depicts the internal consistency of the measurement model (Straub, Boudreau and Gefen, 2004). Therefore, the recommended minimum for the AVE is 0.5 representing the variance covered by the construct itself (Fornell and Larcker, 1981). The composite reliability indicates how reliable the construct is represented by the indicators (Chin, 1998) and should have a minimum of 0.7 (Hair, Anderson, Tatham and Black, 1998). Cronbach's alpha (Cronbach, 1951) measures the internal consistency among the construct's indicators and its recommended score should be a minimum of 0.7 (Nunnally, 1978). Every construct in our model is above the mentioned thresholds (see table 2 in the Appendix).

Construct validity evaluates the perspective of relationships between constructs as well as between constructs and their indicators (Straub et al., 2004). It can be subdivided into convergent validity and discriminant validity (Campbell and Fiske, 1959). To evaluate the convergent validity the recommended loading should be at least 0.707 (Chin, 1998) to indicate that the measurement items were used adequately for measuring each construct. Every loading in our model is above the mentioned thresholds, expect three indicators of self-efficacy. For discriminant validity the cross-loadings (Chin, 1998) between the constructs are analyzed. The indicator loading has to be higher on its assigned construct than on the other constructs (Henseler, Ringle and Sinkovics, 2009). The calculated square roots of the AVE score (see Appendix table 2) should be greater than the correlations between the construct and any other construct.

Structural Model

In this study, the results for the partial least square (PLS) estimation are calculated with SmartPLS (Version 2.0 M3) with a path weighting scheme for the inside approximation (Tenenhaus, Vinzi, Chatelin and Lauro, 2005). In addition, we used a bootstrapping procedure (Chin, 1998) by generating 500 bootstrap samples (Tenenhaus et al., 2005) to test the significance of the path estimates, factor loadings, and weights. In this context, we checked whether the relationship being moderated is less

significant or not by including the moderator (Baron and Kenny, 1986). We found that the moderator effect of social influence lessens the significant level of the relationship between habit and consumerization significantly. However, the moderator effect is not significant for itself.

To reduce multicollinearity, we standardized all indicators reflecting the predictor and moderator constructs to a mean of zero and variance of one (Chin, Marcolin and Newsted, 2003). The path coefficient now represents the effect expected at the mean value of the moderator variable. Using the standardized indicators of the predictor and moderator variables, product indicators were generated to reflect the latent interaction variables.

Figure 2 presents the results of our estimation and outlines that all path coefficients are above the minimum of 0.1 (Sellin and Keeves, 1994). The squared multiple correlations (R^2) depict the explanatory power of the structural model which should be above the minimum of 0.33 (Chin, 1998). Our model explains a moderate value of variance for the dependent latent variable consumerization with $R^2 = 0.51$. However, the dependent variable habit is just an intermediate step to explain the consumerization and therefore does not fulfill this threshold in detail. Three of our four hypotheses were supported. Personal innovativeness and self-efficacy had significant positive influence on habit and therewith supported hypotheses H1 and H2. Hypothesis H3 was also supported; habit had a positive significant influence on consumerization. However, we did not find significant support for the positive moderating effect of social influence on the influence of habit on consumerization (H4).
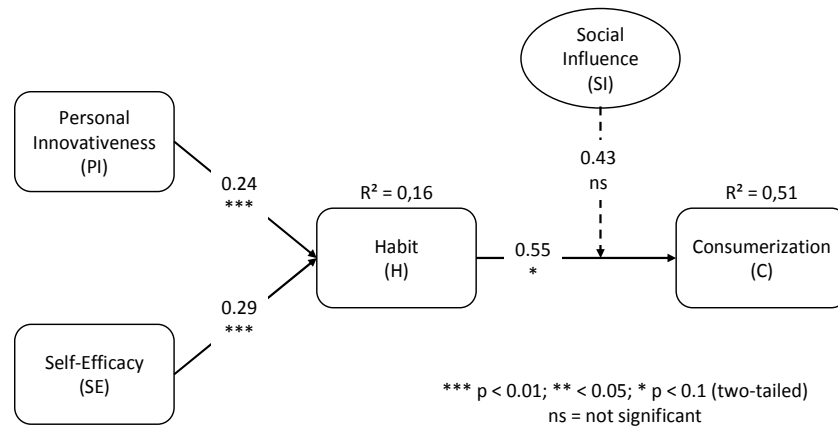

Figure 2: Estimated Structural Model

DISCUSSION AND CONCLUSION

In this paper, we were interested in consumerization on an individual level. Thus, to elaborate on our research questions *how* consumerization can be operationalized and *which* drivers influence consumerization, we derived a research model and tested it amongst graduate students.

With regard to the theoretical contribution and to answer our first research question, we operationalized consumerization as individual intention to continue usage (Bhattacherjee, 2001; Limayem et al., 2007; Venkatesh et al., 2012) of privately owned technologies in a work environment. To derive the research model and investigate our second research question, we considered the switching theory (Bhattacherjee et al., 2012) as theoretical lens to predict the effects influencing the intention to switch (Bhattacherjee et al., 2012). For our research model, we adapted this line of argumentation in that we focus on post-adoption IS usage where the users habitually use their private technologies (Limayem et al., 2007) and hence intend to continue this usage in a work environment.

In our estimated model, we found a significant positive influence of self-efficacy and personal innovativeness on the habit of using private technologies for daily studies at university. This result indicates that habit is basically driven by the individual's belief to perform a task with one's capabilities (Compeau and Higgins, 1995) as well as to try out and adopt innovations in an early stage (Agarwal and Prasad, 1998). Moreover, the hypothesis that habit positively affects consumerization is supported by the survey data. This outcome is consistent with the literature, where habit is defined as automatically performed behaviors (Limayem et al., 2007) which might have an impact on the continuance of IT usage (Ortiz de Guinea and Markus, 2009; Ye and Potter, 2011). However, the moderating effect of social influence on the relationship between habit and

consumerization was not supported by the survey results. One reason for that might be that social influence already has a high influence on adoption (Venkatesh et al., 2012) and hence at a stage before usage becomes habit (Limayem et al., 2007). Therefore, social influence might be less relevant in the post-adoption phase. Another explanation could be the small sample size not allowing detecting moderating effects.

These findings on consumerization are also supported by the descriptive statistics which give interesting insights on a regular usage of privately owned mobile devices and privately used software in a graduate work environment (see Appendix figure 3). As depicted in the left chart of figure 3 in the Appendix, students use their privately owned notebooks and smartphones every day in course of their studies. The right chart of figure 3 in the Appendix indicates a high usage of private webmail, social networks, and data storage services to complete their tasks at university. Moreover, these findings are in line with Bhattacherjee et al. (2012) who argue that switching intention has a positive influence on switching behavior, i.e. use of the technology the user has switched to.

For practitioners, our survey results provide a basis to support managers' decisions whether to include BYOD into the IT strategy of an enterprise or not. This in turn, could increase employee satisfaction and performance. Moreover, one implication of the findings of the survey is that enterprises which are hiring students could provide their employees the possibility to use their own mobile devices in the business context (Yun et al., 2012). For example, this might also increase attractiveness of an enterprise toward young professionals.

The research presented in this paper also faces some limitations directing to paths for future research. Firstly, the size of the data set was comparatively small. Consequently, deeper insights are limited compared to the results a more comprehensive dataset would have produced. Secondly, the research model only covers a selection of individual factors leading to consumerization. In combination with an increase in the data sample adding further facilitating constructs might give deeper insights. Thirdly, the model does not depict on inhibitors of consumerization, such as inertia to stay with the incumbent enterprise systems. Fourthly, BYOD and consumerization are used synonymously neglecting potential further facets of consumerization as consumer driven innovations. Finally, the survey was conducted amongst students only. Hence, the generalizability of our findings to employees is not guaranteed. In order to support the model with additional data of more experienced persons in future research, the survey will be conducted amongst employees in a financial institution where using own devices is encouraged.

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APPENDIX

Consumerization (C)	Bhattacherjee (2001), Limayem et al. (2007), Venkatesh et al. (2012)
I intend to continue using [*] in the future for my studies.	
I will always try to use [*] in my daily university life.	
I plan to continue to use [*] frequently for my studies.	
Habit (H)	Limayem et al. (2007), Venkatesh et al. (2012)
Using [*] has become automatic to me.	
Using [*] is natural to me.	
When faced with a particular learning task, using [*] is an obvious choice for me.	
The use of my [*] has become a habit for me.	
Personal Innovativeness (PI)	Agarwal and Prasad (1998)
If I heard about a new information technology, I would look for ways to experiment with it.	
Among my peers, I am usually the first to try out new information technologies.	
In general, I am hesitant to try out new information technologies.	
I like to experiment with new information technologies.	
Self Efficacy (SE)	Compeau and Higgins (1995)
I could complete my studies using [*] (iPhone, Facebook, etc.) if…	
... there was no one around to tell me how to do it.	
... I had never used these devices/software for learning tasks before.	
... I had only the manuals for reference.	
... I had seen someone else using it before trying it myself.	
... I could call someone for help if I got stuck.	
... someone else had helped me get started.	
... I had enough time to learn how to do it.	
... I had just the built-in help facility for assistance.	
... someone showed me how to do it first.	
... I had used similar packages before this one to do the same learning task.	
Social Influence (SI)	Venkatesh et al. (2012)
People who are important to me think that I should use [*].	
People who influence my behavior think that I should use [*].	
People whose opinions I value prefer that I use [*].	
[*] = my private devices or my familiar software.	

Table 1: Survey items

	Mean	SD	AVE	CR	Alpha	C	H	PI	SE	SI
C	6,27	0,97	0,80	0,92	0,87	**0,89**				
H	6,21	0,79	0,64	0,88	0,82	0,70	**0,80**			
PI	4,91	1,36	0,69	0,90	0,86	0,26	0,29	**0,83**		
SE	5,43	1,29	0,56	0,93	0,91	0,28	0,33	0,19	**0,75**	
SI	4,28	1,37	0,79	0,92	0,87	0,23	0,21	0,24	0,08	**0,89**

Table 2: Descriptive statistics, and validity and reliability criteria
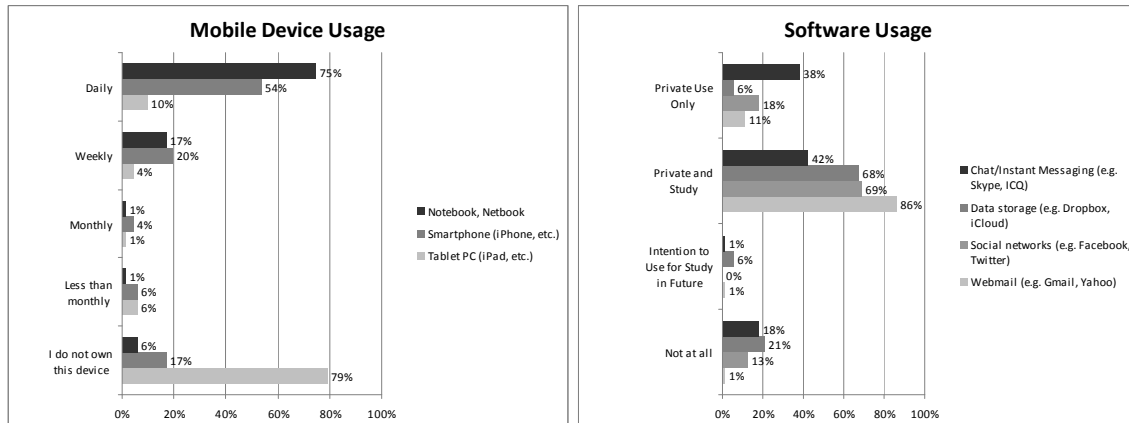

Figure 3: Descriptive Statistics On Consumerization Usage of Mobile Devices and Software of Graduate Students (n=71)