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Abstract

The boundary between hedonic and utilitarian information systems has become increasingly

blurred during recent years due to the rise of developments such as *gamification*. Therefore,

users may perceive the purpose of the same system differently, ranging from pure utility to pure

play. However, in literature that addresses why people adopt and use information systems, the

relationship between the users conception of the purpose of the system, and their experience and

use of it has not yet been investigated. Therefore, in this study we investigate the interaction

effects between users' utility-fun conceptions of the system and the perceived enjoyment and

usefulness from its use, on their post-adoption intentions (continued use, discontinued use, and

contribution). We employ survey data collected among users (N=562) of a gamified

crowdsourcing application that represents a system affording both utility and leisure use

potential. The results show that the more fun-oriented users conceive the system to be, the more

enjoyment affects continued and discontinued use intentions, and the less ease of use affects the

continued use intention. Therefore, users' conceptions of the system prove to be an influential

aspect of system use and should particularly be considered when designing modern multi-

purposed systems such as gamified information systems.

1. Introduction

Information system (IS) designers increasingly attempt to enhance the engagement and immersiveness of their systems by enriching them with game design. This novel development is known as *gamification* (Hamari & Koivisto, 2015; Hamari, Koivisto, & Sarsa, 2014; Liu, Santhanam, & Webster, 2016; Morschheuser, Hassan, Werder, & Hamari, 2017; Vesa, Hamari, Harviainen, & Warmelink, 2017). The rationale behind gamification stems from the notion that games are an acme of hedonic system design and are able to arouse autotelic, self-purposeful and highly motivated behaviors (Hamari & Koivisto, 2015; Malone, 1981; Ryan, Rigby, & Przybylski, 2006). Therefore, it is believed that the successful transfer of such designs may also evoke benefits in the context of utilitarian ISs. Several studies have revealed that the enrichment of utilitarian ISs with additional hedonic benefits through gamification can have positive effects on users' intrinsic motivations and behaviors (Eickhoff, Harris, de Vries, & Srinivasan, 2012; Hamari, 2013, 2017; Hamari et al., 2014; Jung, Schneider, & Valacich, 2010; Morschheuser, Hamari, Koivisto, & Maedche, 2017; Seaborn & Fels, 2015; Thom, Millen, & DiMicco, 2012). Gamification has thus become a growing trend in IS design (Hamari et al., 2014), and since gamified ISs converge *hedonic* and *utilitarian* purposes (Hamari & Koivisto, 2015; Liu et al., 2016), such systems may also be classified differently in the user's mind (Chesney, 2006; Wu & Lu, 2013). This duality of gamified systems enables them to be used purely as a game for enjoyment, as a tool for more serious benefit, or as both to varying degrees. Therefore, an interesting research gap exists in understanding the post-adoption of these systems that can be regarded either as games or tools.

Users may conceive gamified systems to have been primarily designed as either a useful instrument or as a game (i.e. a self-purposeful hedonic system designed merely for leisure

pursuits). Deterding, Dixon, Khaled, and Nacke (2011) also confirm the flexibility of gamified systems for situational interpretations as falling between instrumental and gameful. Moreover, differential use cases have also been discussed in previous studies on different types of dual systems (e.g., Köse, Semenov, & Tuunanen, 2018; Xu, Ryan, Prybutok, & Wen, 2012). Therefore, in this study we define a construct that we call the "*user's conception of the instrumental-hedonic purpose of the system*". Specifically, it refers to a user's conception or classification of the purpose of a system on an instrumentality-leisure continuum that is separate from the lived-experience of how much usefulness or enjoyment the user might actually derive from the use of the system. For example, a user may conceive an activity tracker as being a highly instrumentally-purposed system, but they might derive higher enjoyment from its use than practical utility. In essence, the user's conception may further affect the users' experience with the system because it forms the base for their expectations and may set their initial motivation for using the system.

The user's conception of a system along a utility-fun continuum therefore presents an important antecedent of user intentions in dual ISs, particularly in gamified dual ISs where gamification elements must match the user characteristics (Liu et al., 2016). This is because the person that views the system as being fun-oriented may abandon its use for a lack of enjoyment in his/her engagement; and, in comparison, it is also possible that the hedonic aspects of an IS may distract the user who views the system as being utility-oriented and prefers a leaner design. Hence, we study both continued and discontinued post-adoption use intentions with regards to user conceptions of the system, because users' experiences along with their expectations of the system may significantly influence their decision making in regard to their future use. In addition, gamification has been identified to be particularly useful for deriving and sustaining

user-generated content (Cavusoglu, Li, & Huang, 2015; Morschheuser, Hamari, et al., 2017). Particularly, crowdsourcing systems utilize the Internet to reach and coordinate large groups of people (the crowd) and involve them in distributed problem-solving (Doan, Ramakrishnan, & Halevy, 2011; Estellés-Arolas & González-Ladrón-de-Guevara, 2012; Kaufmann, Schulze, & Veit, 2011; Morschheuser, Hamari, et al., 2017). Therefore, the success of these systems depends on a reserve of people that are motivated to contribute. For these reasons, contribution intention also stands as an important post-adoption aspect for systems where input from users is necessary.

In the scope of this research, we investigate how users' conceptions of the system interact with the relationship between antecedents of use intentions (namely, perceived enjoyment, usefulness and ease of use), and post-adoption related intentions of continued use, discontinued use, and contribution. To this end, our research questions are: 1) How does the user's conception of a system on an instrumentality-leisure continuum moderate the effects of enjoyment, usefulness and ease of use on the post-adoption intentions of continued use, discontinued use and contribution?: 2) In light of the user's conception, how do enjoyment, usefulness and ease of use influence these post-adoption intentions? We investigate these research questions by way of a psychometric survey adapted to a *gamified crowdsourcing app.* The user conception of the system is measured using a self-developed semantic scale, and the remainder of the survey questions are adopted from previous research. Partial least squares structural equation modeling (PLS-SEM) has been used to estimate the research model and to test hypotheses. The data collected from 562 users of the gamified application revealed that user conception significantly interacted with the users' experience of the system in regard to its effect on continued and discontinued use intentions. These results draw attention to a user's conception of the purpose of a system as forming an important antecedent of use intention in the context of gamified systems.

This finding indicates the importance of targeting users in the design of gamified systems. In addition, the study shows that perceived enjoyment is a more prominent factor than perceived usefulness with respect to discontinued use intention in the context of gamified systems. These results can also offer potential insights for other types of dual ISs.

The remainder of this paper is organized into 5 sections. Section 2 provides the theoretical background: It starts with hedonic and utilitarian ISs, introduces the construct of user conception, and elaborates on post-adoption use intentions. In addition, it develops the research model together with the presented hypotheses. Section 3 describes the subject of gamified technology, the study data and the study methods. Section 4 presents the results of the study. In section 5, theoretical and managerial implications, limitations, and directions for future research are discussed. The paper conclusions are presented in section 6.

2. Theoretical Background

2.1 Hedonic and Utilitarian Information Systems

According to Hirschman and Holbrook (1982), hedonic benefits refer to the experiential characteristics of a service that evoke psychological aspects of the usage process by appealing to the emotive, multisensory and imaginative side of the consumer experience. They state that it may cause historic imagery through sensory reminders i.e., multisensory images that stem from past events, or may lead to the construction of fantasy imagery. Moreover, Hirschman and Holbrook (1982) render that hedonic value may involve social aspects of the consumer experience. Therefore the hedonic value may be more about what a service represents, rather than what it actually is. Babin, Darden, and Griffin (1994) claim that hedonic activity may

become an end in itself, and may serve therapeutic needs by elevating the mood resulting in spontaneous and immediate responses. As such, hedonic activity is subjective and difficult to measure (Hirschman & Holbrook, 1982; Tractinsky, Katz, & Ikar, 2000).

In turn, utilitarian benefits represent the intended outcomes of conscious pursuits; hence, the activity is not an end in itself (Babin et al., 1994). Consumers with a utilitarian orientation are rational, and focus on tasks and accomplishments (Sherry Jr, 1990). However, unlike hedonic activity, utilitarian value is quantifiable in terms of objective measures and sets efficiency and user performance as the most important goals (Tractinsky et al., 2000).

Similarly, users derive hedonic and utilitarian benefits from ISs as well (Gerow, Ayyagari, Thatcher, & Roth, 2013; Kim & Han, 2011; van der Heijden, 2004; Venkatesh & Brown, 2001). According to their design purpose and/or consumers' motivations to use them, ISs may be classified as hedonic, utilitarian and dual systems (Chesney, 2006; Gerow et al., 2013; Sun & Zhang, 2006; Wu & Lu, 2013). Van der Heijden (2004) distinguishes hedonic ISs as pleasure oriented systems related to leisure and home activities designed for prolonged use without any external aim. In contrast, utilitarian ISs have a task-oriented nature and are mostly developed for business contexts. The value they provide is external to the user-system interaction and lies in its instrumentality and the ability to increase task performance and efficiency (van der Heijden, 2004).

Dual systems are those that may be used for both enjoyment and productivity, according to their context of use (Chesney, 2006; Gerow et al., 2013; Wu & Lu, 2013). In these systems, users' intentions are driven by both hedonic and utilitarian benefits, depending on the task being carried out (Sun & Zhang, 2006). Although theoretically not fully cultivated, the duality of information systems and services is not an entirely new idea, and for close to four decades the

role of computers in combining both work and play has been recognized (e.g. Gerow et al., 2013; Hamari & Koivisto, 2015; Malone, 1981; Starbuck & Webster, 1991). Video games (Malone, 1981) and metaphors (Carroll & Thomas, 1982) are the initial sources of inspiration for mixing fun and utility in this context, and this approach has been represented in different ways such as funology, ludic design, games with a purpose, serious games, and pervasive games (Deterding et al., 2011).

Likewise, gamified ISs are a growing type of dual IS that aim to improve user experience and engagement by converging hedonic and utilitarian benefits (Hamari & Koivisto, 2015; Liu et al., 2016). Gamification refers to design that attempt to evoke similar positive experiences as games, such as enjoyment, immersion, flow etc. (Huotari & Hamari, 2017; Vesa et al., 2017). This is commonly pursued by transforming systems and services to be more game-like by taking inspiration from games (Deterding, 2015; Huotari & Hamari, 2017). Deterding et al. (2011, p. 10) define gamification as "the use of game design elements in non-game contexts", therefore they differentiate gamification from close concepts such as serious games, games with a purpose, or pervasive games in a partial or whole dimension. However, Huotari and Hamari (2017, p. 25) take a service marketing point of view and define gamification as "a process of enhancing a service with affordances for gameful experiences in order to support users' overall value creation." This view brings together the concepts such as serious games, games with a purpose or pervasive games under the umbrella of gamification by forwarding the user experience as the defining element. The ultimate goal of gamification is to increase the instrumentality of systems and services through motivating and engaging user experience (Hamari & Koivisto, 2015; Suh, Cheung, Ahuja, & Wagner, 2017). Examples of gamified systems include enterprise software (Morschheuser, Henzi, & Alt, 2015; Schacht & Maedche, 2015; Thom et al., 2012), e-commerce

websites (Hamari, 2017; Harwood & Garry, 2015), crowdsourcing systems (Melenhorst, Novak, Micheel, Larson, & Boeckle, 2015; Morschheuser, Hamari, et al., 2017), innovation management (Morschheuser, Maedche, & Walter, 2017; Scheiner, 2015), and ISs used in education (Bonde et al., 2014; Domínguez et al., 2013).

Previous research on dual systems has mainly focused on four streams. The first stream concentrated on the acceptance of dual ISs from various theoretical perspectives with an evident dominance of the technology acceptance model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989, 1992). The analyzed ISs included, but were not limited to, online shopping services (e.g. Childers, Carr, Peck, & Carson, 2001; Lee, Fiore, & Kim, 2006), mobile data or Internet services (e.g. Wakefield & Whitten, 2006; Yang & Lee, 2010), social networking services (e.g. Cocosila & Igonor, 2015; Pillai & Mukherjee, 2011), gamified services (e.g. Adukaite, van Zyl, Er, & Cantoni, 2017; Herzig, Strahringer, & Ameling, 2012; Rodrigues, Oliveira, & Costa, 2016), and serious games (e.g. Laumer, Eckhardt, & Weitzel, 2012; Martínez-Pernía et al., 2017; Yusoff, Crowder, & Gilbert, 2010). The second stream studied the continued use intentions for these ISs through the use of TAM (e.g. Hamari & Koivisto, 2015; Xu, Lin, & Chan, 2012) and expectation confirmation theory (ECT: Bhattacherjee, 2001) (e.g. Deng, Turner, Gehling, & Prince, 2010; Hsu, Lin, & Tsai, 2014). Overall, these studies show that utilitarian benefits have a consistent positive effect on continued use intention (e.g. Barnes, 2011; Chang, Liu, & Chen, 2014; Deng et al., 2010; Hamari & Koivisto, 2015; Kim & Oh, 2011; Ozturk, Nusair, Okumus, & Hua, 2016; Zhou, Jin, & Fang, 2014), however, the influence of hedonic benefits on continued use intention has been seen to vary from negative (e.g. Deng et al., 2010) to positive (e.g. Barnes, 2011; Chang et al., 2014; Hamari & Koivisto, 2015; Kim & Oh, 2011; Ozturk et al., 2016; Zhou et al., 2014). The third stream conducted meta-analyses to study the

comparative effects of intrinsic and extrinsic motivation on use intention and actual usage across system types (Gerow et al., 2013; Wu & Lu, 2013), and how system type moderated the effect of particular antecedents (e.g. enjoyment, playfulness, usefulness) on system acceptance in the context of self-service technologies (Blut, Wang, & Schoefer, 2016). The fourth stream compared how the explanatory power of different antecedents changed between utilitarian and hedonic uses of the system (e.g. Childers et al., 2001; Lee, Ahn, Kim, & Lee, 2014; Oh & Yoon, 2014; Sánchez-Franco & Martín-Velicia, 2011; Wakefield & Whitten, 2006; Wang, Chou, & Chang, 2009; Xiang, Jing, Lee, & Choi, 2015). These studies show that enjoyment and usefulness have varying influence on attitude, intention to use and continued use intention, according to the utilitarian vs hedonic nature of the task and the hedonic vs utilitarian design of the system. For instance, Childers et al. (2001) showed that in the more utilitarian context of grocery shopping, usefulness and enjoyment have respectively stronger and weaker influences on attitude. Wakefield and Whitten (2006) compared the effects of cognitive absorption and playfulness on perceived usefulness, ease of use, enjoyment and intentions between Blackberry PDAs with functional and hedonic specifications. Their study found that the orientation of the Blackberry PDA had a significant effect on usefulness, but not on enjoyment or intentions. They also showed that the perceived playfulness of the interaction with the PDA positively affected perceived enjoyment, usefulness and intention to use the device; and that enjoyment and intentions were highest when the product was hedonically oriented and users perceived it to be playful. Other studies have compared the effects of different antecedents such as information quality (Koivumaki, Ristola, & Kesti, 2008), ego-involvement (Sánchez-Franco & Martín-Velicia, 2011), trust (Lee et al., 2014) between hedonic and utilitarian use. However, despite various perspectives being taken to analyze dual ISs, the interaction of the user's conception of

the system with hedonic and utilitarian antecedents and different post-adoption intentions remains unexplored.

2.2 User Conceptions of the Information System

Traditionally ISs have been classified as utilitarian or hedonic, irrespective of its users. However, the proliferation of dual ISs (e.g. through the gamification of essentially utilitarian systems) emphasizes the position of users as determiners of the type of these systems. In a dual IS, users can derive both fun and utility from use of the system. In some cases hedonic benefits surpass, and in others utilitarian (van der Heijden, 2004). This is particularly true for gamified systems with their openness for situational interpretations of being gameful or instrumental by their users (Deterding et al., 2011).

While individuals all have their particular views and tastes, their underlying conceptions of an IS may range between hedonic and utilitarian. In other words, some may see the hedonic aspects of a dual system, while others may enunciate utilitarian facets. We define the user's conception as the implicit classification that people attribute to a system, according to how they view and use it. In this respect, people may view a dual system within a spectrum of fun and utility. Therefore, the user conception is a continuum with hedonic and utilitarian classifications at either end. The *utilitarian classification* refers to the users' perspective that the system is a task-focused technology that is used to efficiently complete an undertaking, and the *hedonic classification* is the perspective that the system is a leisure-oriented technology that is used for pleasure, experiential satisfaction and without external pursuits. Yet, the indicator of this conception may move, depending on various factors. As an additional factor, an individual may have a hedonic view towards only those IS related activities that are inherently interesting to

him/her, and on the other hand, people may start enjoying activities that are in essence pursued for utility when, for instance, their psychological needs for relatedness, autonomy and competence are answered (Ryan & Deci, 2000).

For these reasons, ISs are not perceived or used solely according to the designers' intentions, and people can attribute different meanings to the same system according to their own interests, experiences or contexts (Köse et al., 2018). Depending on these attributions (i.e. how they view the system), people can use the system with different motivations. As stated before, a hedonic use purpose can only be activated when the user is interested in using the system, whereas a utilitarian motivation is triggered by a salience of factors such as external rewards, punishments, approval from others, or ego involvement (Ryan & Deci, 2000).

Moreover, Babin et al. (1994) state that user mentality towards an activity may inhibit or distract one type of value in the face of another. That is, hedonic benefits may color utilitarian benefits and vice versa. Also, the emotive side of experience is more easily accessible and with shorter response times than utilitarian evaluations. However, when hedonic and utilitarian benefits hold ambivalence, the emotive side gains prominence (Ajzen & Fishbein, 2000). Ryan and Deci (2000) explain this eloquently:

A person might originally get exposed to an activity because of an external regulation (e.g., a reward), and (if the reward is not perceived as too controlling) such exposure might allow the person to experience the activity's intrinsically interesting properties, resulting in an orientation shift. (p. 63)

Several studies in the retail field have shown that shoppers' hedonic-utilitarian orientations have a moderating effect on their behavioral intentions such as shopping and re-visits (e.g. Kaltcheva & Weitz, 2006; Wang, Minor, & Wei, 2011). Also, in the context of online

retailing, it has been shown that a utilitarian shopping orientation positively affected perceived usefulness, and a hedonic shopping orientation positively influenced perceived enjoyment (Lee et al., 2006). Also, studies on mobile services have shown that users' hedonic or utilitarian behavioral goals influenced the importance of information quality dimensions regarding their effect on user satisfaction (Chae, Kim, Kim, & Ryu, 2002; Koivumaki et al., 2008). Therefore, as an antecedent of orientation and motivation, the user's conception of the system might have similar interactions with user experience within a dual system.

2.3 Post-Adoption Intentions

For gamified dual ISs where user-generated content is important (e.g. crowdsourcing systems), three types of post-adoption intention stand out: continued use, discontinued use and contribution. However, the user's conception of the system may affect these intentions differently. Previous research has shown the benefits of gamification for continued use intention (e.g. Hamari & Koivisto, 2015; Suh et al., 2017) and user behavior (e.g. Hamari, 2017), the influence of hedonic and utilitarian determinants on use intent towards dual systems (e.g. Gerow et al., 2013; Wu & Lu, 2013) and continued use intention (e.g. Chiu & Wang, 2008; Lin, Wu, & Tsai, 2005). Yet, discontinued use intention remains unstudied. This is an important perspective, as despite having utilitarian and hedonic benefit, the influence of gamification may be short-lived due to e.g. a fading of novelty (Koivisto & Hamari, 2014; Suh et al., 2017), and users may subsequently abandon using the system. Therefore, for the long-run viability and success of dual ISs, it is necessary to know how hedonic and utilitarian benefits influence different post adoption intentions when combined with the user's conception of the system.

Continued use intention is the mental predisposition about continuing to use an information system over a long-term period after its initial acceptance (Bhattacherjee, 2001). Discontinued use intention, on the other hand, is defined as being the intention to abandon a given information system. Continued use intention and discontinued use intention have been assumed to be two ends of the same continuum (Turel, 2015). However, multiple attitudes toward a psychological object may coexist implicitly or explicitly, or they may surface contextually (Ajzen, 2001). Increasing research on discontinued use intention shows that it has different antecedents compared to continued use intention (Turel, 2015). Therefore, a discontinued use intention may be caused by different IS dependent variants. For instance, the hedonic use of social networking services has been seen to be discontinued in cases of social overload (Maier, Laumer, Weinert, & Weitzel, 2015) or guilt feelings due to e.g. time spent on the service (Turel, 2015). Dissatisfaction arising due to an expectation-reality gap for example as a result of underutilization (Bhattacherjee, 2001) or an incompatibility with needs (Tully, 2015) have been some of the other reasons found for discontinuation of ISs.

The third behavior type user contribution has become an essential component of many ISs and their value offering as a progeny of Web 2.0. For instance, one of the functional building blocks of social media services is identified as shared content that may consist of texts, pictures, videos, links etc. (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). In the context of crowdsourcing services, user contribution is seen as the essence of the system, and the collaborated work may be classified variously as *crowdprocessing*, *crowdsolving*, *crowdrating* and *crowdcreating* (Morschheuser, Hamari, et al., 2017). Yet, the factors affecting contribution intention vary. Previous research on electronic knowledge repositories, online communities and various other social media sites has shown that a combination of intrinsic and extrinsic benefits

drive user contribution (e.g. Kankanhalli, Tan, & Wei, 2005; Nov, 2007; Tang, Gu, & Whinston, 2012; Wasko & Faraj, 2005). For example, reputation (Tang et al., 2012; Wasko & Faraj, 2005), organizational rewards (Kankanhalli et al., 2005), desire for exposure (Tang et al., 2012), and revenue sharing (Tang et al., 2012) are among the extrinsic motivations that drive user contribution; and enjoyment (Nov, 2007), enjoyment in helping others (Kankanhalli et al., 2005), and knowledge self-efficacy (Kankanhalli et al., 2005) are aspects that intrinsically motivate user contribution. Moreover, the gamification of crowdsourcing systems has been found to have positive effects on contribution intention both quantitatively (e.g. Eickhoff et al., 2012; Lee et al., 2013) and qualitatively (e.g. Eickhoff et al., 2012; Prestopnik & Tang, 2015).

2.4 Research Model and Hypotheses

This research studies the relationship between hedonic and utilitarian benefits, user conception of the system, and post-adoption intentions in a gamified dual IS. The theoretical model is a revision of van der Heijden's (2004) technology acceptance model that is used to reflect the interaction effects between a user's conception of a system and their perceived benefits of its use on their behavioral intentions in the post-adoption stage. Previous research has operationalized hedonic benefits in different ways including perceived enjoyment, playfulness, cognitive absorption and flow experience (Gerow et al., 2013). Most commonly, hedonic benefits have been operationalized as perceived enjoyment (Gerow et al., 2013), and utilitarian benefits with perceived usefulness, which is the most important measure of benefit for utilitarian ISs (e.g. Wu & Lu, 2013). Therefore, as antecedents of post-adoption intentions, the model includes perceived ease of use (EoU), and hedonic and utilitarian benefits that were operationalized with perceived enjoyment (ENJ) and perceived usefulness (USE) respectively. The investigated behavioral

intentions in the post-adoption stage are continued use intention (CUI), discontinued use intention (DUI) and contribution intention (CI). More importantly, the research model analyses the moderating effect of user conception (UC) between aspects of perceived enjoyment, perceived usefulness and perceived ease of use, and continued use intention, discontinued use intention and contribution intention. The introduction of the moderator role of user conception sheds light on how users' perceptions of a dual IS interact with their perceived benefits in affecting their post-adoption use intentions. The model is presented in Figure 1.

<<<< INSERT FIGURE 1 HERE >>>>

2.4.1 Perceived Ease of Use

Davis (1985, p. 26) defined perceived ease of use as "the degree to which an individual believes that using a particular system would be free of physical and mental effort". Ease of use increases utilitarian value by decreasing the effort spent using a system; and hence it enhances performance indirectly by saving time spent on using the system. The positive effect of perceived ease of use on perceived usefulness in the post-adoption stage has been shown in several studies (e.g. Davis et al., 1989; Ozturk et al., 2016). In addition, the negative association between effort of use and the utilitarian benefit of service use has also been demonstrated (Dai, Hu, & Zhang, 2014). On the other hand, the hedonic value of a system is dependent on the interaction process that takes place - the easier the system is to use, the more enjoyment the user gets. Besides this, ease of use may also mitigate negative user experiences such as the frustration caused by an arduous interface (Hamari & Koivisto, 2015). This is supported by Dai et al.'s study (2014) where they showed that effort for use was negatively associated with the hedonic benefits derived from mobile technology mediated services. Therefore, we propose that the positive

influence of perceived ease of use on perceived usefulness and perceived enjoyment carries on to the post-adoption stage.

H1a: Perceived ease of use positively affects perceived enjoyment.

H1b: Perceived ease of use positively affects perceived usefulness.

The effect of perceived ease of use has been widely studied in technology adoption literature and its positive affect on attitude formation and intention to use a technology is now unquestioned. Its effects also continue on to the post-adoption stage. For example, its positive direct effect on continued use intention has been shown in the context of online gamified exercise services (Hamari & Koivisto, 2015) and smartphone functions (Xu et al., 2012), in addition to its indirect positive influence in the context of smartphone applications (Choi, 2017) and social networking services (Kefi, Mlaiki, & Kalika, 2010). Also, Dai et al. (2014) have shown that effort for use was negatively associated with value assessment as an antecedent of continued use intention in the context of mobile technology services. As can be expected, a lack of perceived ease of use would increase discontinued use intention, and for instance, in the context of online assignment systems, it has been seen that a lack of ease of use caused students not to use the system (Geri & Naor-Elaiza, 2008). Also, system response time was found to be inversely related with user satisfaction, which may also lead to discontinued use (Hoxmeier & DiCesare, 2000). Therefore, we propose that perceived ease of use will have a positive effect on continued use intention (H2a) and a negative effect on users' discontinued use intention (H2b). The influence of perceived ease of use on contribution intention has also featured in several studies. For instance, Hsu and Lin (2008) showed that ease of use was positively related to antecedents of intention to blog (which is a form of knowledge sharing activity), and He and Wei (2009) showed a significant negative effect of perceived effort on contribution intention in the

context of knowledge management systems. Hence, we propose that perceived ease of use will

have a positive direct effect on contribution intention (H2c).

H2a: Perceived ease of use has a positive effect on continued use intention.

H2b: Perceived ease of use has a negative effect on discontinued use intention.

H2c: Perceived ease of use has a positive effect on contribution intention.

2.4.2 Perceived Enjoyment

Hedonic benefits stand for the inherent satisfaction and pleasure emanating from an activity

(Deci & Ryan, 2000). Hedonic benefits of an activity such as enjoyment, entertainment or self-

esteem can increase user performance and the quality of an experience (Ryan & Deci, 2000).

Likewise, in the context of ISs, hedonic benefits are derived from interactions with the system.

As the hedonic benefits increase during these interactions, the user's experience with the system

will get better and they will continue using the system. Previous research on dual systems has

shown the positive effects of hedonic benefits on continued use intention. For instance, Hamari

and Koivisto (2015) showed that perceived enjoyment positively affected continued use intention

in the context of an online gamified exercise service (Hamari & Koivisto, 2015), and Barnes'

study (2011) revealed that enjoyment positively influenced continued use intention both directly

and indirectly in the context of virtual worlds. Accordingly, we hypothesize that perceived

enjoyment will positively affect continued use intention (H3a). On the other hand, perceived

enjoyment will undermine the intention to discontinue using a system (H3b). This is because

hedonic benefits increase satisfaction with a system (e.g. Deng et al., 2010; Maier et al., 2015),

and enhanced satisfaction with the system will decrease the discontinuance intention

(Bhattacherjee, 2001). Previous research has studied how intrinsic benefits affect contribution

intention in various system types. For example, Shah (2006) found that a critical subset of open

source software developers participated because of the enjoyment they derived from the activity; Kankanhalli et al. (2005) showed that enjoyment in helping others positively affected knowledge contribution intention in the context of electronic knowledge repositories; and Nov (2007) indicated that enjoyment was the top motivator for contribution intention in the context of the Wikipedia online content community. Therefore, we hypothesize that perceived enjoyment will positively affect contribution intention (H3c).

H3a: Perceived enjoyment has a positive effect on continued use intention.

H3b: Perceived enjoyment has a negative effect on discontinued use intention.

H3c: Perceived enjoyment has a positive effect on contribution intention.

2.4.3 Perceived Usefulness

Utilitarian benefits refer to goal/task fulfillment that is external to the user-system interaction, and it manifests itself in terms of performance increase, functional use, time efficacy, etc. through the use of technology. Previous research has confirmed the importance of utilitarian benefits for users' continued use of a system and their contribution to it in different forms. For instance, Bhattacherjee's study (2001) of online banking users and Barnes' study (2011) on virtual worlds demonstrated the positive effect of perceived usefulness on continued use intention. Other research has also indicated the positive effect of utilitarian benefits on continued use intention in the context of online games (Chang et al., 2014), mobile hotel booking systems (Ozturk et al., 2016) and social virtual worlds (Zhou, Fang, Vogel, Jin, & Zhang, 2012). Therefore, we hypothesize that perceived usefulness will positively affect continued use intention (H4a). In contrast, in absence of relevant instrumental gains, users will be inclined to abandon using an IS as a result of low satisfaction with it (Bhattacherjee, 2001). Accordingly, incompatibility with needs has also been found to be an important reason for discontinuance

(Geri & Naor-Elaiza, 2008; Tully, 2015), and Kim, Lee, and Kim's study (2008) showed that usefulness was an important element for mobile data service users who discontinued using the system. Therefore, we hypothesize that perceived usefulness will negatively affect discontinued use intention (H4b). Prior research has shown that various extrinsic motivators positively influence contribution intention. For example reputation (as one type of utilitarian benefit) is a consistent determinant of contribution intention across contexts such as blogging (Hsu & Lin, 2008), online photo sharing communities (Nov, Naaman, & Ye, 2010), electronic networks of practice (Wasko & Faraj, 2005) and open source software projects (Fang & Neufeld, 2009); as well as other utilitarian benefits such as organizational rewards (Kankanhalli et al., 2005) and self-development (Nov et al., 2010). Additionally, Hung, Lai, and Chang (2011) found that perceived usefulness positively influenced knowledge sharing intention in the context of electronic knowledge repositories. Therefore, we hypothesize that perceived usefulness will positively affect contribution intention (H4c).

H4a: Perceived usefulness has a positive effect on continued use intention.

H4b: Perceived usefulness has a negative effect on discontinued use intention.

H4c: Perceived usefulness has a positive effect on contribution intention.

2.4.4 User's Utility/Fun Conception of the System

Gamified dual ISs attempt to offer both hedonic and utilitarian benefits to their users through gameful experiences. As a result, users may classify these ISs differently in the utility-fun continuum: Those users that view the system as utility-oriented may seek instrumentality ignoring the experiential characteristics of the system, while others may look for more emotive, multisensory reinforcements in their interactions. Therefore, these different conceptions may influence users' experiences with a system. Similar studies in the retail field have shown that a

task-oriented consumer tended to find high arousal retail environments unpleasant, as opposed to pleasure-oriented consumers who enjoyed these environments more (Kaltcheva & Weitz, 2006). In the context of online retailing, Lee et al. (2006) showed that a hedonic shopping orientation positively affected perceived enjoyment. Likewise, Wakefield and Whitten (2006) showed that when users found their interactions with a system to be more playful, their perceived enjoyment and perceived usefulness increased, and their perceived enjoyment and intention to use were highest when they felt the system was for hedonic use and their interaction with it was playful. On the other hand, it was also found that a utilitarian shopping orientation positively affected perceived usefulness (Lee et al., 2006). Similarly, the usefulness of mobile data services was also found to be a more important aspect for discontinuers than continuers (Kim et al., 2008). Therefore, we argue that for those users who regard use of the IS more as play, the influence of enjoyment will be stronger on their post-adoption intentions (H5[a-c]); and vice versa, for those users who regard the IS more as a utility, the influence of perceived usefulness will be stronger on their post-adoption intentions (H5[d-f]). Finally, it has been established by previous research that perceived ease of use is a more prominent factor for hedonic systems since a lack of perceived ease of use can lead to frustration that can be viewed as an antithesis of enjoyment (e.g. Gerow et al., 2013; van der Heijden, 2004); and regardless of a cumbersome interface, the information system may still prove relatively useful because of non-interface aspects of the system. Similarly, Choi's multi-group analysis (2017) showed that perceived ease of use positively affected the antecedents of continued use intention more for hedonic smartphone applications than for utilitarian ones in the post-adoption stage. Therefore, we hypothesize that perceived ease of use will be less important with regards to post-adoption intentions for users

that view the system as utility-oriented, than for those that view the system as fun-oriented

(H5[g-i]).

H5[a-c]: The more the user conceives the system to be fun-oriented, the more perceived

enjoyment will positively influence continued use intention (H5a), the more it will negatively

affect discontinued use intention (H5b), and the more it will positively affect contribution

intention (H5c).

H5[d-f]: The more the user conceives the system to be utility-oriented, the more perceived

usefulness will positively affect continued use intention (H5d), the more it will negatively affect

discontinued use intention (H5e), and the more it will positively influence contribution intention

(H5f).

H5[g-i]: The more the user conceives the system to be utility-oriented, the less perceived ease

of use will positively affect continued use intention (H5g), the less it will negatively affect

discontinued use intention (H5h), and the less it will positively influence contribution intention

(H5i).

3. Methods and Data

3.1 MyDriveAssist – A Gamified Drive Assistant

The data for this study was gathered from users of the gamified crowdsourcing application

myDriveAssist. MyDriveAssist is a mobile app (iOS and Android) that uses the smartphone

camera and image recognition technology to read traffic signs while driving. The gathered

information is visualized for the user and shared with other users via a cloud, in order to generate

a comprehensive, aggregated map of speed limit information (Bosch Automotive Middle East,

2014). In the case where a driver has overlooked a traffic sign, he can look at the app to get an overview of his current speed limit and passing conditions, which is the main utility of the app. In addition, the app uses GPS to determine the current speed of the driver and warns if the applicable speed limit is being exceeded by way of a message in the app and an audio signal, which provides additional utilitarian benefits. The warnings can be configured to the individual needs of the user. However, drivers have the option to opt out of collecting street signs and sharing their data with the community. In other words, they could for example deny access to the phone camera from the application and use only the crowdsourced data.

Several gamification features such as a score and a badge system are integrated into the app to make the application more playful. The score system visualizes the number of street signs collected by the user and provides instant positive feedback on the user's performance (Jung et al., 2010). The various badges (Hamari, 2013, 2017) that are implemented can be unlocked by specific behaviors (e.g. collect a specific amount of traffic signs, drive according to the speed limit specified on the collected street signs, collect street signs at night, collect street signs while it is raining, collect successive patterns of road signs, use the app for a specific amount of time, etc.). There are two types of badges in myDriveAssist, badges where the behavior required to unlock the badge is communicated to the user as a clear goal (Hamari, 2017) and badges that can be unlocked as a positive surprise and reward for a specific behavior without informing the user about these hidden badges in advance. If the user chooses not to collect street signs, he would not be able to collect the scores or badges available for this specific behavior in the application.

MyDriveAssist was chosen for this research because previous research has indicated that such crowdsourcing applications are among the most gamified applications, and that points and badges are among the most frequently applied gamification design features (Hamari et al., 2014;

Morschheuser, Hamari, et al., 2017). Hedonic benefits such as need satisfaction, enjoyment, and playfulness are attributed to such gamification components in the literature (Hamari, 2013, 2017; Seaborn & Fels, 2015). In particular, hedonistic feelings such as competence satisfaction or a sense of accomplishment might be aroused when a badge is earned as a reward or experience of status and reputation when a user compares their own badges with those of others (Hamari, 2013). For these reasons, myDriveAssist represents an epitome of a gamified system. Furthermore, Deterding et al. (2011) state that gamified systems are uniquely suited for use in different instrumental or gameful modes. Therefore, this application provides a suitable setting in which to test our hypotheses, particularly those related to users' fun/utility conceptions of the system. Screenshots from the myDriveAssist application are presented in Figure 2 below.

<<<< INSERT FIGURE 2 HERE >>>>

3.2 Data Collection

The users of myDriveAssist were reached by implementing an announcement in the app that appeared when a user opened the app. We shared a short description of the study and a link to participate in the survey. The survey was only accessible by users of the service that clicked the link in the app. The survey was optimized for mobile use and was active for half a year. In total, 3262 users followed the link and viewed the survey, and 562 users provided a full and valid set of data. An incentive to complete the survey was offered in the form of a prize draw for the chance to win one of three electric screwdrivers and five 10€ Amazon vouchers.

Table 1 outlines the demographic details of the participants. 77% of the participants were from Germany, 6% from France, 4% from Switzerland and the rest from other European

countries. On average, the participants used the app for 101.7 days (SD = 191.4 days, Median = 10 days).

<center><<<< INSERT TABLE 1 HERE >>>></center>

3.3 Measurement

The constructs and measurement items of the study are presented in Appendix A. All items except for demographic variables and utility-fun conception of the system were measured on a 7-point Likert scale (strongly disagree – strongly agree). The items for ease of use were adopted from the previous study of van der Heijden (2004). Hedonic benefits were measured by an enjoyment variable and its construct was an amalgamation of items used by van der Heijden (2004) and Davis et al. (1992). Utilitarian benefits were measured by usefulness variable whose items were adopted from van der Heijden (2004). Users' conceptions of the system were measured using a semantic differential with three bipolar items, each on a 7-point scale with opposing adjectives on each side of the scale (serious-fun, instrumental-entertaining and work-related-leisure-related). The last item was omitted from the construct because the loading was rather low (0.453), although it was still higher than with any other construct. The measures of the dependent variables were all adopted from prior research: Continued and discontinued use intention (Turel, 2015), and contribution intention (Lin, 2007). The contribution intention items were adapted to the context of the crowdsourcing application used in this study.

3.4 Validity and Reliability

We evaluated the model via component-based PLS-SEM using SmartPLS 3 (Hair Jr, Hult, Ringle, & Sarstedt, 2016). Compared to covariance-based SEM, component-based PLS-SEM is recommended for prediction-oriented models such as the one featured in the present study

(Anderson & Gerbing, 1988; Chin, Marcolin, & Newsted, 2003). We identified one item with low factor loadings (UOR3) which was consequently removed from the analysis.

The measurement instruments were assessed by investigating their convergent and discriminant validity. The convergent validity (see Table 2) was assessed with three metrics: Cronbach's alpha (Alpha), average variance extracted (AVE) and composite reliability (CR). Convergent validity was seen as being met since all of these convergent validity metrics were clearly greater than the thresholds suggested by relevant literature (i.e. the Alpha of each construct should be greater than 0.7, AVE of each construct should be greater than 0.5, CR of each construct should be greater than 0.7 (Fornell & Larcker, 1981)). Discriminant validity was assessed with two approaches: Firstly, we checked whether the square root of the AVE of each construct was greater than the correlations between it and other constructs (see Chin, 1998; Fornell & Larcker, 1981; Jöreskog & Sörbom, 1996). Second, we assessed the discriminant validity by confirming that each item had the highest loading with its corresponding construct. The conducted tests indicated that the discriminant validity and reliability was acceptable.

Our sample size (N=562) also satisfies several different criteria for determining the lower bounds of sample size for PLS-SEM (Anderson & Gerbing, 1988; Chin, 1998), and is therefore seen as acceptable.

<<<< INSERT TABLE 2 HERE >>>>

4. Results

Figure 3 presents the results of the SEM analysis. The model explained 51.1% of the variance in continued use intention, 21% of the variance in discontinued use intention and 28.8% of the variance in contribution intention. As hypothesized, the results showed that enjoyment positively

affected continued use (H3a) (β = .289, p < 0.01) and contribution intention (H3c) (β = .238, p < 0.01), and negatively affected discontinued use intention (H3b) (β = -.222, p < 0.01). Notably, the effect size on continued use intention was stronger than contribution and discontinued use intentions. The results also indicated that, in line with H4a and H4c, usefulness positively affected continued use (β = .283, p < 0.01) and contribution intentions (β = .216, p < 0.01). However, contrary to the hypothesis (H4b), the negative association between usefulness and discontinued use intention was not significant (β = -.062). Furthermore, the results showed that ease of use positively affected enjoyment (β = .595, p < 0.01) and usefulness (β = .497, p < 0.01). Hence, hypotheses H1a and H1b were supported. Moreover, ease of use had a direct positive effect on continued use intention (β = .135, p < 0.01), which confirmed hypothesis H2a, and contribution intention (β = .131, p < 0.01), which confirmed hypothesis H2c. But, it had no significant direct effect on discontinued use intention, so H2b was not supported.

Considering the users' conceptions of the system, we found that user conception positively moderated the association between enjoyment and continued use intention (β = .221, p < 0.01), and negatively the association between enjoyment and discontinued use intention (β = -.161, p < 0.05). In other words, the more a person regards the activity as being fun-related, the more enjoyment increases the person's continued use intention (H5a), and the more enjoyment decreases the person's discontinued use intention (H5b). However, there was no significant moderation effect on the association between enjoyment and contribution intention. The interaction between ease of use and user conception was significant with regards to the dependent variable of continued use intention (β = -.142, p < 0.05). This implies that contrary to our hypothesis H5g, the more utility-oriented the user is, the more perceived ease of use will augment their continued use intention. Finally, the interaction between usefulness and user

conception was significant with regards to the dependent variable of discontinued use intention ($\beta = .081$, $p < 0.1$). Put differently, the more utility-oriented the user is, the more perceived usefulness will decrease their discontinued use intention. To sum up, three (H5a, H5b, H5e) of the nine hypotheses regarding user conception were supported, but the results showed the opposite to be true for hypothesis H5g. Table 4 presents a summary of the hypotheses tests together with their results.

<<<< INSERT FIGURE 3 HERE >>>>

<<<< INSERT TABLE 3 HERE >>>>

<<<< INSERT TABLE 4 HERE >>>>

5. Discussion

Commonly, a system's purpose as either hedonic or utilitarian has been deemed to be the decisive determinant of why users interact with an IS (Gerow et al., 2013; van der Heijden, 2004). The use of hedonic ISs was accepted to be driven mainly by intrinsic motivations (e.g. perceived enjoyment, playfulness, flow), and it was established that utilitarian ISs were used primarily for meeting extrinsic motivations (e.g. performance, productivity). Yet, the emergence of dual ISs through novel applications such as gamification has blurred the reasons for engagement with these systems. This is because many of these gamified systems can be used either purely as an instrumental system, purely as a game, or as a combination of both where work and play take turns or merge into one. Therefore, users may perceive these ISs as either utility or fun oriented. Thus, these differing perceptions of the system may interact with users' experiences with it to ultimately influence their use intentions (e.g. post-adoption intentions) either negatively or positively. Therefore, the technology continuance area in the IS realm has

thus far suffered a blind spot stemming from the increased gamification of ISs and the way in which an information system can play differential roles for different people in terms of how they are employed in their daily lives and work environments. This study examined the interaction effects between users' conceptions of a dual system and the established antecedents of IS use (perceived enjoyment, usefulness and ease of use) on technology post-adoption intentions (use continuance, discontinuance and contribution) in a dual IS. The dual information system chosen for the study was a gamified crowdsourcing system, which provided a suitable setting for the research aims. The theoretical and managerial implications and limitations of the study are discussed below, together with possible directions for future research.

5.1 Theoretical Implications

The study has a number of implications for research. First, we introduced a revised way of understanding technology continuance; namely, the investigation of whether users perceive the system to be more utility or leisure oriented (outside the actual derived benefits of its use). The results revealed significant moderating effects of user conception between perceived enjoyment, perceived ease of use and perceived usefulness, and post-adoption intentions, namely continued and discontinued use. User conception moderated perceived enjoyment's relation with continued and discontinued use intention. The first moderating effect implies that the more fun-oriented/less utility-oriented the person thinks the system is, the more enjoyment positively affects continued use intention. The second interaction implies that the more fun-oriented/less utility-oriented the user thinks the system is, the stronger the negative effect of enjoyment on discontinued use intention. In other words, a lack of enjoyment for a person who views the system as fun-oriented would increase their discontinued use intention. Another interaction was

seen between user conception and perceived usefulness on their effect on discontinued use intention. The path coefficient between perceived usefulness and discontinued use intention across the entire data was non-significantly negative. However, we found that for users that view the system as utility-oriented, there is much clearer negative association between perceived usefulness and discontinued use intention. The result of the moderation analysis implies that as user conception shifts from utility to fun, the negative impact of usefulness on discontinued use intention diminishes, and eventually for users that view the system as extremely fun-oriented, it loses its entire significance as a determinant of discontinuance intention. These effects denote that while perceived enjoyment and usefulness are prominent antecedents of IS continued use, their effects are influenced by users' utility/fun conceptions of the system. Furthermore, in contrast to e.g. van der Heijden's (2004) conclusions, they shift the focus from merely considering the hedonic vs utilitarian nature of systems to also considering the users' conception of the system as the determinant of continued use of ISs, particularly dual ISs. The last significant interaction was observed between user conception and perceived ease of use regarding continued use intention: The more fun-oriented the person thinks the system is, the less perceived ease of use affects his/her continued use intention. In other words, perceived ease of use is a more prominent factor for users who view the system as an instrumental tool. This result lies contrary to previous research that has established perceived ease of use as being more important for hedonic systems (e.g. Gerow et al., 2013; van der Heijden, 2004). This effect could result from different reasons, one of which might be that in a gamified dual IS, fun-oriented users may be more open towards challenges and the complexity of the interface (e.g. Malone, 1981) and thus more tolerant towards any lack in perceived ease of use of the application, compared to utility-oriented users who want to get their job done as efficiently as possible. However, future

research is needed which explicitly focuses on this aspect to achieve further clarity. User conception showed no significant interactions for contribution intention, however, future research to check for possible interactions with other antecedents such as organizational rewards, reputation and enjoyment in helping others might be interesting.

A second implication of the study was that the results showed that both enjoyment and usefulness were prominent determinants of post-adoption intentions, both in regard to continued use and contribution intentions. For all of the three behavioral intentions, enjoyment had a more significant effect than usefulness, and in fact, perceived usefulness did not have a significant effect on discontinued use intention. These results support the view that gamified ISs are dual systems (Hamari & Koivisto, 2015), and highlight the importance of both enjoyment and usefulness in continued use of dual ISs. Particularly, the role of enjoyment in mitigating users' discontinued use intentions is remarkable. This might be explained by several reasons. Firstly, the attained badges and positive feedback provided by gamification aspects might cause users to internalize the use of the system; hence, even if they do not gain any more utilitarian benefits they may continue using the gamified IS. Other reasons for the role of enjoyment in mitigating users' discontinued use intentions might be that the same gamification elements cause a loyalty effect and therefore prevent users from e.g. switching behavior, or that enjoyment may cause habit formation (Turel & Serenko, 2012).

In summary, the most important theoretical implication of this study is the theorization of users' fun/utility conceptions of a dual IS and providing new empirical evidence for its interaction with user experience (i.e. perceived enjoyment, usefulness and ease of use) on affecting post-adoption intentions. The findings confirm that user conception is an important antecedent of users' post-adoption intentions. Therefore, it potentially draws the focus away

from the mere nature of ISs as the determinant of continued use intention, and shifts it towards

an understanding that today's ISs are in fact multifaceted systems that may be used in mixed use

cases according to their users' perceptions. Another contribution of the study is the analysis of

discontinued use intention in the context of a gamified dual IS, showing how it is primarily

affected by enjoyment as opposed to usefulness. Therefore, scholars should keep in mind that

omitting considerations of hedonic benefits (e.g. enjoyment) in research may result in potential

misinterpretations related to the discontinued use of dual ISs. In addition, the results strengthen

the view that gamified ISs are dual systems. Previous research has viewed search engines, instant

messaging, mobile Internet, Web use, personal computers, mobile services and blogs as dual ISs

(Gerow et al., 2013; Wu & Lu, 2013). This study adds one more type of IS, the gamified IS, to

this group of dual systems.

5.2 Managerial Implications

The findings of this study also provide implications for managers and designers involved in the

development of multipurpose ISs. An overall practical implication stemming from this research

as well as from the general lines of developments of ISs towards multipurpose ISs, is that

designers should be aware that users may increasingly demand that all systems be both utilitarian

and hedonic. Work-related systems should be increasingly able to satisfy the intrinsic needs of

users, whereas at the same time, playing games (hedonic ISs) should increasingly seek to provide

utility (e.g. gamification or games-with-a-purpose). It is evident that the degree of expectations

of both utility and fun from IS use differs from user to user, and that users may primarily regard

the same systems as either utility- or fun-oriented, or something in between. Hence, it becomes

increasingly important for practitioners to consider how and to what degree they will cater for

this expectation space. Therefore, users' conceptions of the system should be considered in the context of contemporary ISs because these systems can in practice serve several purposes simultaneously, but also separately, depending on user needs and perceptions. Based on the empirical evidence presented in this study, system designers should take into account that enjoyment might be more influential on continued and discontinued use intentions of users that view the system as fun-oriented, when compared to those who view the system as more utility-oriented. Moreover, users that view the system as fun-oriented are probably more likely to benefit from hedonic facets of the system (such as gamification) and be more inclined to continue using it as a consequence. Therefore, practitioners should consider adding hedonic elements such as gamification features into their systems, if their target users are likely to be more fun-oriented. Considering the previous research related to age (e.g. Bittner & Schipper, 2014; Koivisto & Hamari, 2014) and gender (e.g. Koivisto & Hamari, 2014; Venkatesh & Morris, 2000; Yang & Lee, 2010) regarding the effects of hedonic and utilitarian benefits, an action point for practitioners might be to consider age and gender as surrogate variables by which to gauge their target population's hedonic and utilitarian view of a system or to provide tailorable interfaces that can balance hedonic and utilitarian elements according to users' conceptions and/or preferences. Through use of these tailorable interfaces, users may customize the system with regards to what features (either utilitarian or hedonic) are enabled or disabled in accordance with their preferences for system use. Furthermore, the finding that perceived ease of use interacts with user conception suggests that designers should highlight perceived ease of use more if their target users may view the system as utility-oriented. Finally, enjoyment showed a strong positive effect on continued use intention and a strong negative effect on discontinued use intention. Thus, enriching ISs via gamification (employing attributes such as goal-setting,

feedback structures, narrative, roleplay (Hamari et al., 2014)), appealing visual layouts that combine elements like colors, sounds and animated images (Childers et al., 2001; van der Heijden, 2004), image interactivity (Lee et al., 2006), and flexibility in navigation (Childers et al., 2001) can have long-term benefits for user retention and the further profitability of information systems. Tellingly, accumulated research shows that intrinsic motivation tends to affect the quality of experience and performance better than extrinsic motivation (Ryan & Deci, 2000).

5.3 Limitations and Future Research

As with all research, this study has some limitations that provide avenues for future research. First, even though there is no *a priori* reason to assume that the context of this study has influenced the results, the findings might be somewhat context-dependent to the dual IS we selected. So, in order to increase the generalizability and robustness of the study findings, future research should try to replicate the study in other contexts and compare the results with samples of other dual ISs.

As a second consideration, the fact that majority of the survey respondents were male restricts the generalizability of results to larger populations where female users also constitute a significant portion of the users. The large number of male survey respondents may also have an effect on the results of the user conception construct, and previous research has found that females tend to be more receptive towards hedonic benefits in ISs (e.g. Venkatesh & Morris, 2000). Therefore, we predict that the interaction effects of user conception would have been stronger had there been more female respondents in the survey. However, the survey respondents in this study mirror the users of the system because the considered gamified IS was designed for

technology-savvy motorists and appeals to a majority of male users. Thus, the fact that a larger part of our survey respondents were male can be seen as a result of the self-selection process of the surveyed population. However, future research may look to analyze systems where there is a more balanced number of male and female users.

As a third consideration, the data for this study was gathered by way of a survey and thus reflects users' perceptions instead of their actual behaviors. Future studies which include measurements of actual user behavior based on usage data, could further increase the robustness of the results.

Finally, we encourage researchers to deepen the line of investigation regarding how hedonic value may prevent users from discontinuing their use of a system. This is due to the inverse relationship found between perceived enjoyment and the discontinued use intention constructs used in this study. In addition, IS discontinuation may have several forms, e.g. replacement (Parthasarathy & Bhattacherjee, 1998) or quitting (Turel, 2015). Therefore, researchers may look into how gamification affordances could prevent users from discontinuing their use of an IS in these different contexts. Another line for future work might be the analysis of the effect of user conception on satisfaction, based on expectation confirmation theory (Bhattacherjee, 2001), or on contribution intention by way of other antecedents such as reputation or enjoyment in helping others.

6. Conclusion

Today, a growing number of ISs combine features stemming from both utilitarian and hedonic systems, and technological developments such as gamification have been increasingly imbued into utilitarian systems. As a result of this convergence in contemporary ISs, it is no longer so

that users use systems that are primarily utilitarian and designed solely for instrumental purposes, or hedonic systems designed solely for hedonic gratification. Therefore, users today can view gamified dual ISs with varying degrees of hedonic and utilitarian perception. In this paper, we investigated to what extent a user's utility/fun conception of a gamified dual system interacts with their experience of system use (enjoyment, usefulness and ease of use) to affect their technology use intentions (continued use, discontinued use and contribution intentions). We conclude from the findings that a user's utility/fun conception has a significant role in the continued use of a gamified system, especially with respect to the enjoyment derived from its use. Hence, we suggest that system designers should create adaptable interfaces that can appeal to users' varying utility-fun perceptions of dual systems such as gamified ISs.

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Figure 1. Research model for investigating the moderating effects of users' utility-fun conception of a system on the relationship between their perceived enjoyment and usefulness of the system, and their post-adoption intentions
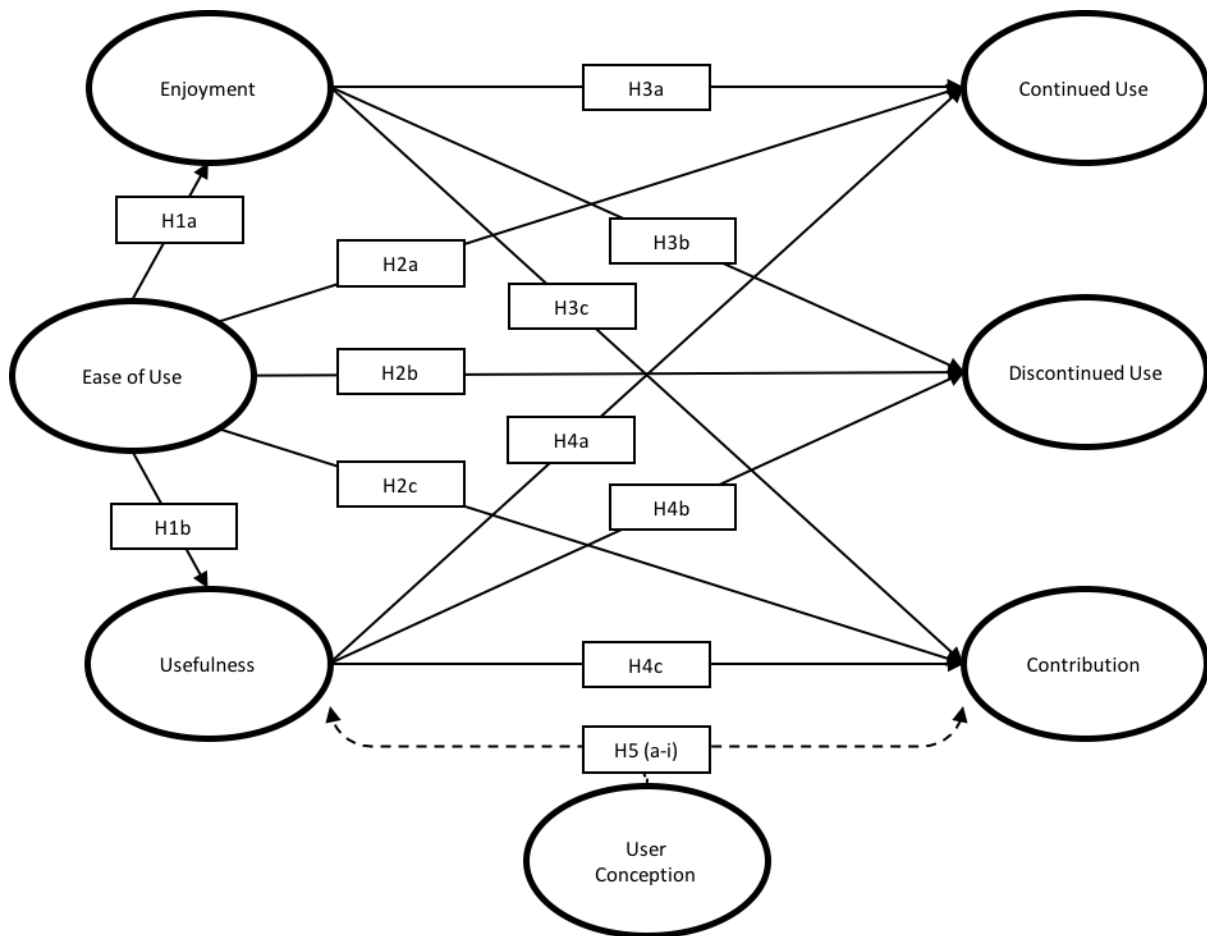
Figure 2. Screenshots from myDriveAssist application
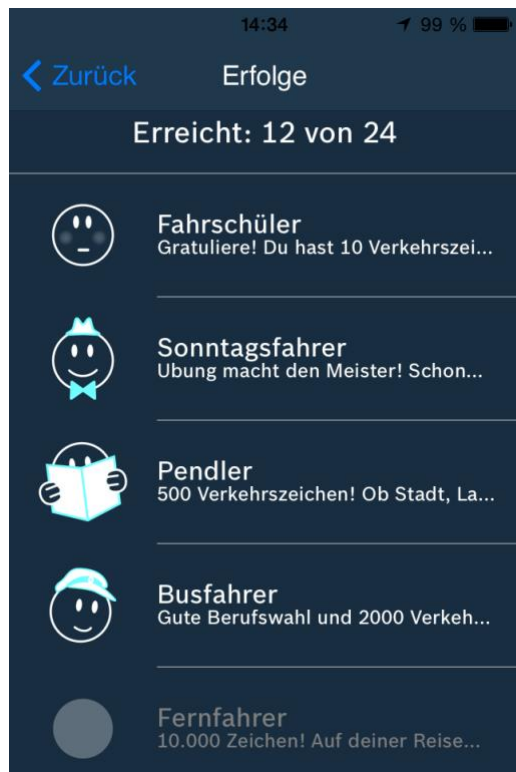
Figure 3. Parameter estimates and explained variance of the structural equation model

* = p < 0.1, ** = p < 0.05, *** = p < 0.01.
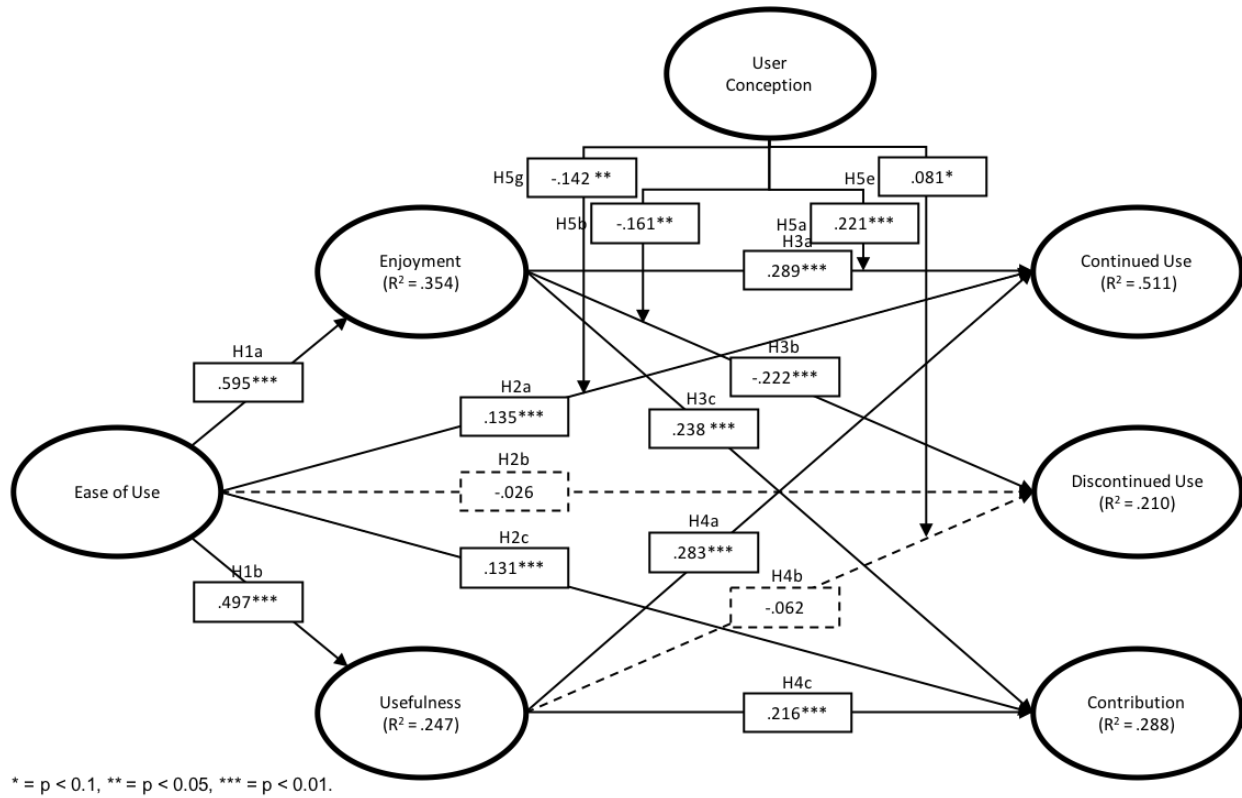
Table 1. Demographic details of the respondents: gender, age and frequency of using the application

	Frequency	Percent		Frequency	Percent
Gender			**Frequency of use**		
Female	20	4%	rarely	156	27.8%
Male	542	96%	monthly	72	12.8%
			once a week or less	73	13.0%
Age (mean=41.47; SD=12.94)			a few times a week	152	27.0%
<25	54	9.6%	once a day	42	7.5%

25-35	127	22.6%		multiple times a day	67	11.9%		
35-45	155	27.6%						
45-55	142	25.3%						
55-65	58	10.3%						
>65	26	4.6%						

Table 2. Convergent validity and discriminant validity measures of the measurement instruments

	Alpha	AVE	CR	CUI	DUI	ENJ	EoU	CI	USE	UC
CUI	0.880	0.806	0.926	**0.898**						
DUI	0.880	0.806	0.926	-0.587	**0.898**					
ENJ	0.800	0.625	0.869	0.611	-0.359	**0.790**				
EoU	0.767	0.587	0.850	0.501	-0.274	0.595	**0.766**			
CI	0.891	0.822	0.933	0.416	-0.179	0.476	0.399	**0.907**		
USE	0.808	0.722	0.886	0.621	-0.322	0.643	0.497	0.470	**0.850**	
UC	0.803	0.835	0.910	0.374	-0.351	0.279	0.295	0.255	0.397	**0.914**

Table 3. Parameter estimates and explained variance for the structural equation model

Independent variable	Beta	CI95 low	CI95 high	p
Continued use intention ($R_2 = .511$)				
ENJ	.289***	.189	.396	.000
USE	.283***	.154	.399	.000
EoU	.135***	.045	.232	.004
EoU (total effect)	*.448****	*.365*	*.534*	*.000*
ENJ x UC	.221***	.083	.350	.001
USE x UC	-.014	-.131	.083	.810
EoU x UC	-.142**	-.263	-.006	.029
Discontinued use intention ($R_2 = .210$)				

ENJ	-.222***	-.327	-.114	.000
USE	-.062	-.168	.057	.282
EoU	-.026	-.129	.065	.595
EoU (total effect)	*-.189****	*-.294*	*-.086*	*.000*
ENJ x UC	-.161**	-.284	-.021	.014
USE x UC	.081*	-.006	.175	.082
EoU x UC	.055	-.063	.154	.342
Contributions (R$_2$ = .288)				
ENJ	.238***	.141	.340	.000
USE	.216***	.105	.320	.000
EoU	.131***	.042	.221	.004
EoU (total effect)	*.380****	*.304*	*.460*	*.000*
ENJ x UC	.014	-.107	.143	.825
USE x UC	.031	-.062	.157	.576
EoU x UC	-.036	-.140	.060	.480

* = p < 0.1, ** = p < 0.05, *** = p < 0.01 | Total effect of EoU should not be directly considered as part of the same regression model at the same time

Table 4. Summary of the hypotheses tests

H#	Relationships	Result	Support
H1a	Perceived ease of use → Perceived enjoyment	.595***	Yes
H1b	Perceived ease of use → Perceived usefulness	.497***	Yes
H2a	Perceived ease of use → Continued use intention	.135***	Yes
H2b	Perceived ease of use → Discontinued use intention	-.026	No
H2c	Perceived ease of use → Contribution intention	.131***	Yes
H3a	Perceived enjoyment → Continued use intention	.289***	Yes
H3b	Perceived enjoyment → Discontinued use intention	.222***	Yes
H3c	Perceived enjoyment → Contribution intention	.238***	Yes
H4a	Perceived usefulness → Continued use intention	.283***	Yes
H4b	Perceived usefulness → Discontinued use intention	-.062	No
H4c	Perceived usefulness → Contribution intention	.216***	Yes
H5a	User conception X Perceived enjoyment → Continued use intention	.221***	Yes
H5b	User conception X Perceived enjoyment → Discontinued use intention	-.161***	Yes
H5c	User conception X Perceived enjoyment → Contribution intention	.014	No
H5d	User conception X Perceived usefulness → Continued use intention	-.014	No
H5e	User conception X Perceived usefulness → Discontinued use intention	.081*	Yes
H5f	User conception X Perceived usefulness → Contribution intention	.031	No
H5g	User conception X Perceived ease of use → Continued use intention	-.142**	No
H5h	User conception X Perceived ease of use → Discontinued use intention	.055	No
H5i	User conception X Perceived ease of use → Contribution intention	-.036	No
* = p < 0.1, ** = p < 0.05, *** = p < 0.01			

Appendixes

A. Overview of the constructs, measurement items, scales and sources

Construct	Measurement items	Scale	Source
Enjoyment (ENJ)	To what extent do you agree/disagree with the following statements? • I find using the App interesting • I find using the App enjoyable • I find using the App exciting • I find using the App fun	7-point "strongly disagree" - "strongly agree" scale	Van der Heijden, 2004; Hamari & Koivisto, 2015
Ease of use (EoU)	To what extent do you agree/disagree with the following statements? • The interaction with the App is clear and understandable • Interaction with the App does not require a lot of mental effort • I find the App easy to use • I find it easy to get the App to do what I want it to do	7-point "strongly disagree" - "strongly agree" scale	Van der Heijden, 2004
Usefulness (USE)	To what extent do you agree/disagree with the following statements? • By using the App I am better informed about speed limits and traffic rules • By using the App I can better make decisions while driving than in the past • By using the App I can capture traffic information (speed limits and traffic rules) more quickly and easily than in the past	7-point "strongly disagree" - "strongly agree" scale	Van der Heijden, 2004
Continued use (CUI)	To what extent do you agree/disagree with the following statements? • I intend to use this App in the next 3 months	7-point "strongly disagree" - "strongly agree" scale	Turel, 2015

	• I predict I would use this App in the next 3 months • I plan to use this App in the next 3 months		
Discontinued use (DUI)	To what extent do you agree/disagree with the following statements? • I intend to stop using this App in the next 3 months • I predict I would stop using this App in the next 3 months • I plan to stop using this App in the next 3 months	7-point "strongly disagree" - "strongly agree" scale	Turel, 2015
Contribution (CI)	To what extent do you agree/disagree with the following statements? • I intend to share information (speed limits, no crossing zone etc.) with the App's community (cloud) frequently in the future • I will try to further share information (speed limits, no crossing zone etc.) with the App's community (cloud) • I will always make an effort to share new information (speed limits, no crossing zone etc.) with the App's community (cloud)	7-point "strongly disagree" - "strongly agree" scale	Lin, 2007
User conception (UC)	All in all, I consider the App to be… • serious - fun • instrumental - entertaining • work-related - leisure-related *(omitted)*	7-point semantic differential scale	Developed by the authors

B. Cross-loadings: results of factor loadings of the measurement items

	CUI	DUI	ENJ	EoU	CI	USE	UC
CUI1	**0.855**	-0.463	0.486	0.381	0.325	0.488	0.337
CUI2	**0.921**	-0.540	0.561	0.452	0.381	0.588	0.344

CUI3	**0.917**	-0.571	0.592	0.506	0.409	0.589	0.330
DUI1	-0.552	**0.902**	-0.366	-0.273	-0.176	-0.307	-0.326
DUI2	-0.493	**0.903**	-0.288	-0.224	-0.161	-0.256	-0.278
DUI3	-0.530	**0.889**	-0.305	-0.236	-0.144	-0.298	-0.336
ENJ1	0.487	-0.330	**0.722**	0.390	0.346	0.434	0.239
ENJ2	0.564	-0.320	**0.803**	0.530	0.434	0.622	0.325
ENJ3	0.385	-0.187	**0.811**	0.413	0.359	0.49	0.131
ENJ4	0.467	-0.279	**0.821**	0.525	0.353	0.464	0.159
EoU1	0.352	-0.226	0.443	**0.790**	0.274	0.372	0.283
EoU3	0.409	-0.261	0.481	**0.816**	0.302	0.394	0.263
EoU4	0.481	-0.229	0.538	**0.815**	0.389	0.47	0.239
CI1	0.381	-0.17	0.439	0.334	**0.901**	0.427	0.228
CI2	0.393	-0.183	0.431	0.369	**0.923**	0.428	0.235
CI3	0.358	-0.135	0.426	0.383	**0.896**	0.423	0.231
USE1	0.546	-0.307	0.495	0.418	0.357	**0.839**	0.376
USE2	0.463	-0.208	0.549	0.376	0.389	**0.829**	0.284
USE3	0.566	-0.297	0.594	0.465	0.448	**0.881**	0.348
UC1	0.301	-0.294	0.236	0.277	0.243	0.316	**0.901**
UC2	0.378	-0.344	0.272	0.263	0.226	0.405	**0.926**
UC3 *(omitted)*	0.122	-0.037	0.044	0.084	0.119	0.228	**0.453**

All standardized factor loadings were statistically significant with $p < 0.01$.