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DESIGNING HEDONIC USER EXPERIENCES: THE EFFECT OF PSYCHOLOGICAL NEED FULFILMENT ON HEDONIC MOTIVATION

Dorothee Rocznik
BMW Group, dorothee.rocznik@bmw.de

Klaus Goffart
BMW Group, klaus.goffart@bmw.de

Manuel Wiesche
Technical University of Munich, manuel.wiesche@in.tum.de

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Research in Progress

Rocznik, Dorothee, BMW Group, Munich, Germany, dorothee.rocznik@bmw.de

Goffart, Klaus, BMW Group, Munich, Germany, klaus.goffart@bmw.de

Wiesche, Manuel, Technical University of Munich, Munich, Germany, Manuel.Wiesche@in.tum.de

Abstract

Within the last two decades the investigation of emotional and experiential influences in technology acceptance gained increasing attention. Especially in the context of the Internet of Things (IoT) researchers discovered the potential of designing hedonic experiences for customers. Recent studies integrated hedonic motivation as a core construct of the Unified Theory of Adoption and Use of Technology (UTAUT2) and confirmed the importance of its role. Nevertheless, we still lack research on the psychological processes underlying the hedonic motivation. Previous research on user experience hints at psychological need fulfilment to be the construct that explains the role of the hedonic motivation within UTAUT2. In the preliminary stages of the investigation, we establish a relationship between psychological need fulfilment and hedonic motivation in a field study. The aim of this study is to make a theoretical contribution by identifying the psychological needs that underlie the hedonic motivation within the framework of UTAUT2 in the context of IoT devices at home. Moreover, the expected outcomes are meant to serve as guidelines for the development of enjoyable products.

Keywords: Hedonic motivation, Need fulfilment, User experience, UTAUT2, Technology acceptance.

1 Introduction

In a survey on technology and holiday traditions, nearly 80% of the interviewees reported that using technology increases their perceived enjoyment or reduces stress during holidays (Baar, 2016). Similar to this survey, several studies highlight the importance of positive user experiences for technology consumption and acceptance (e.g., Järvinen, Ohtonen and Karjaluoto, 2016; Thong, Hong and Tam, 2006). Facing the importance of perceived enjoyment, raises the question about *how* we can develop and design enjoyable systems. In order to understand how technology has to be shaped ideally for consumers, we have to understand the psychological needs consumers expect to be fulfilled by using a technology (Au, Ngai and Cheng, 2008). Therefore, our research concentrates on two central components of a user's subjective experience with a technology, namely hedonic user experiences (e.g., Hassenzahl et al., 2000; Venkatesh, Thong and Xu, 2012) and psychological need fulfilment (e.g., Sheldon et al., 2001). With the help of psychological need fulfilment, we aim to identify the psychological processes that underlie hedonic user experiences and technology acceptance. Providing a better understanding of hedonic experiences and its drivers will help us to develop and design enjoyable systems more accurate because the identified psychological needs can be targeted in innovation processes.

Our research also concentrates on hedonic qualities of technology acceptance and the user's hedonic motivation to use a system or technology. Hedonic motivation is of high interest in our research be-

cause research on information systems (IS) (e.g., van der Heijden, 2004; Venkatesh, Thong and Xu, 2012), consumer research (e.g., Füller, Böhm and Krcmar, 2016; Holbrook and Hirschman, 1982) and psychological research (e.g., Hassenzahl, Burmester and Koller, 2003) showed that hedonic motivation and related constructs (e.g., hedonic quality: Hassenzahl, 2001; pleasure: Jordan, 2002) have to be considered in order to understand technology acceptance and human use behaviour (Brown and Venkatesh, 2005). Nevertheless, the psychological processes that explain the effect of hedonic motivation on technology use are not fully uncovered yet. Therefore, we focus on the following research question: *Which psychological processes underlie the user's hedonic motivation while using a technology?* In order to answer this research question, we draw on theories of technology acceptance from the field of IS research (i.e., Unified Theory of Acceptance and Use of Technology (UTAUT2): Venkatesh, Thong and Xu, 2012) and psychological need fulfilment (e.g., Hassenzahl et al., 2015). Thus, we want to combine psychological research and IS research in order to focus on the relationship between psychological need fulfilment, hedonic motivation and use of technology.

Through answering our research question, we will make theoretical and practical contributions. First, we will expand existing theories on technology acceptance among the understanding of the psychological processes that underlie hedonic user experiences. Here, we want to identify a need profile that is positively related to a hedonic user experience and include the identified psychological needs as new constructs into the UTAUT2. Second, we will provide guidelines for future innovation processes that illustrate how IS have to be developed and designed in practice in order to create hedonic experiences.

This research-in-progress-paper is structured as follows: First, we are going to provide a theoretical background on a dual-sided view on hedonic user experiences. Here, we are going to include the following two perspectives: (1) the hedonic motivation as a part of theories of technology acceptance from IS research (i.e., UTAUT2) and (2) hedonic product qualities and the related psychological need fulfilment from the field of psychological research. Afterwards, we are going to present our research model and our planned research agenda. This will also include an overview of our sample. Finally, our expected theoretical and practical implications and ideas for future research will be presented in detail.

2   Theoretical Background

In the following paragraphs, we focus on two perspectives on hedonic user experiences. First, we concentrate on IS research, which includes hedonic as a motivational component that influences technology perception. This perspective on hedonic user experiences is illustrated with the help of the UTAUT2 (Venkatesh, Thong and Xu, 2012). Second, we concentrate on hedonic user experiences in psychological research. In this field, the research focuses on hedonic as a product quality (Hassenzahl et al., 2000). After comparing these two perspectives on hedonic, we focus on psychological need fulfilment as a core construct to explain and create hedonic user experiences and enjoyable systems.

2.1   Hedonic user experiences in IS research

In this section, we concentrate on hedonic user experiences in the field of IS research. According to Venkatesh, Thong and Xu (2012, p. 161) in this context hedonic motivation is defined as "the fun or pleasure derived from using a technology". Here, hedonic is seen as a motivation that influences human behaviour and the acceptance of information technology (IT). The user's acceptance of new technology and the related positive experience is a field of high interest in past and present IS research (see Venkatesh, Thong and Xu, 2016). Several models in the field of IS try to portray the relevant variables for the user's acceptance of new technologies (e.g., Davis, 1986; Venkatesh et al., 2003). Among those theories, we focus on the latest adaption of the Unified Theory of Acceptance and Use of Technology (i.e., UTAUT2: Venkatesh, Thong and Xu, 2012). The UTAUT2 was developed based on previous research on the Technology Acceptance Model (TAM: Davis, 1986) and the UTAUT (Venkatesh et al., 2003). Similar to the UTAUT, the UTAUT2 focuses on the influence of the user's performance expectancy, his effort expectancy, the expected social influence and facilitating conditions on his be-

havioural intention and his actual usage of a new technology. Moreover, the influences of habit, price value and hedonic motivation on the intention to use a technology are integrated in the model. These influences are moderated by the user's age, gender and experience with the technology. In contrast to the UTAUT, which focuses on an organizational setting, the UTAUT2 focuses on a consumer context. Within the UTAUT2, our research focuses especially on the construct of hedonic motivation. We concentrate on hedonic motivation because IS research identified hedonic motivation as an important predictor for the usage of technology and other consumer products (e.g., Brown and Venkatesh, 2005; Järvinen, Ohtonen and Karjaluoto, 2016). For example, Järvinen, Ohtonen and Karjaluoto (2016) found that hedonic motivation compared to habit and price value was the most important construct for explaining variance in behavioural intention with regard to using the social networking system Instagram. Furthermore, hedonic motivation showed a significant indirect effect on use behaviour. Additionally, in IS research, the successful integration of hedonic motivation in the UTAUT2 (Venkatesh, Thong and Xu, 2012) showed that there are other important constructs for predicting use behaviour besides the former most important constructs of usefulness and ease of use which stand for a primarily pragmatic view on technology use (see Davis, 1986). Furthermore, Lallmahomed (2013) investigated Facebook as a hedonic volitional context of system use and found that hedonic performance expectancy has a positive effect on behavioural intention and actual system use. Referring to hedonic IS (e.g., videos on smartphone), van der Heijden (2004) showed that perceived enjoyment (PE) has a greater influence on the intention to use than perceived usefulness. Similar results were found in the context of online shopping (Childers et al., 2001). In two studies, Childers et al. (2001) showed that PE is a predictor for the attitude towards shopping online. Referring to the shopping environment, the findings illustrated that in a more hedonic shopping environment, PE is a stronger predictor for the attitude towards shopping online than perceived usefulness. Moreover, PE has a positive effect on IT continuance (Thong, Hong and Tam, 2006). With the help of an online survey, Thong, Hong and Tam (2006) showed that PE has a significant positive effect on the continued usage of mobile internet services. Although PE or rather hedonic motivation have been found to have a significant influence on behavioural intention and use behaviour (e.g., Järvinen, Ohtonen and Karjaluoto, 2016; Venkatesh, Thong and Xu, 2012), the drivers of hedonic motivation are not fully explained yet (see Venkatesh, Thong and Xu, 2016). Therefore, we focus on closing this research gap by identifying the drivers of hedonic motivation. Thereby, we want to provide a better understanding of why hedonic motivation is so important in the consumer context and how we can develop and design IT for hedonic user experiences.

2.2   Hedonic user experiences in psychological research

Next, we focus on hedonic product qualities and need fulfilment as two central concepts of the psychological perspective on hedonic user experiences. Hedonic qualities were first applied to interactive technology by Hassenzahl et al. (2000). According to Hassenzahl, Kekez and Burmester (2002), we define hedonic quality as a product quality that "addresses human needs for excitement (novelty/change) and pride (social power, status)" (p. 257). Hedonic quality can be described through adjectives like innovative, exciting and exclusive. In contrast to hedonic qualities, according to Hassenzahl, Kekez and Burmester (2002), we define pragmatic quality as a product quality that "addresses human needs for security, control and confidence" (p. 275). Pragmatic quality can be described through adjectives like clear, supporting and controllable. Diefenbach, Kolb and Hassenzahl (2014) reviewed 151 publications about research on hedonic in the field of human-machine-interaction. As a state-of-the-art they found that 85% of the publications followed the definition described above and defined hedonic quality with the help of a contrast to pragmatic quality. Concerning the current application of the hedonic construct, they found that most publications analysed it in a specific product domain, namely websites (28%; e.g., Mahlke, 2002), mobile devices (25%; e.g., Väätäjä, 2008), software (15%; e.g., Hassenzahl et al., 2000), and video games or virtual worlds (12%; e.g., Holsapple and Wu, 2007). The reviewers, however, also identified significant gaps of research. First, there is a lack of empirically founded design approaches for hedonic quality. Second, we are still missing a clear "concept of the hedonic itself" (p. 312) and studies that explore the concept in a wider range. Hence, there is a need

for exploring the concept in more product domains and more domains of IT (e.g., IoT at home) and a need for exploring the underlying constructs (i.e., psychological need fulfilment).

2.3   A dual-sided perspective on hedonic user experiences

After introducing a dual-sided perspective on hedonic user experiences in IS research and psychological research, it is important to compare both perspectives. In terms of the TAM and its further developments, recent studies used the constructs of perceived usefulness and perceived ease of use analogously with the construct of pragmatic quality. Perceived enjoyment is used analogously with hedonic quality (e.g., Brecht et al., 2012). Whereas the psychological approach and its related research model is very close to the product and its qualities (i.e., hedonic quality: Hassenzahl et al., 2000), the approach related to the UTAUT2 is closer to higher order processes that influence technology acceptance (i.e., hedonic motivation: Venkatesh, Thong and Xu, 2012). Since the psychological processes underlying the hedonic motivation are not fully explored yet (see Venkatesh, Thong and Xu, 2016), our research is meant to integrate the psychological approach into the IS research approach in order to focus on the relationship between psychological need fulfilment, hedonic motivation, and use behaviour.

2.4   Psychological need fulfilment

In the following, we concentrate on how we aim to identify the psychological processes that underlie the hedonic motivation within UTAUT2. We focus on past research in the field of psychology and bring in psychological need fulfilment as the core construct that underlies hedonic motivation. According to Sheldon and Kasser (1998) and Sheldon et al. (2001), we define needs as "necessary inputs rather than as driving motives, leaving open the possibility that particular motives may not satisfy organismic needs, even if they are attained" (Sheldon et al., 2001, p. 325). This view on needs explains that psychological needs function one level deeper than motivation. Therefore, needs can explain the psychological processes that underlie the hedonic motivation in UTAUT2. Moreover, according to Sheldon et al. (2001) needs are relevant inasmuch as identified relevant needs can be targeted. Consequently, identified relevant needs for a hedonic experience with IT can be targeted in innovation and design process with the aim to enhance technology acceptance and hedonic user experiences.

For the purpose of our research, we selected seven needs that were already identified to have an impact in prominent psychological theories (i.e., self-determination theory (SDT): Deci and Ryan, 1985; and Maslow's theory on motivation and personality: Maslow, 1954) and were supported by empirical data. Following the SDT (Deci and Ryan, 1985) "an understanding of human motivation requires a consideration of innate psychological needs for competence, autonomy, and relatedness" (Deci and Ryan, 2000, p. 227). Hence, we integrated the three needs competence, autonomy and relatedness into our research model. For example, Sheldon and Filak (2008) manipulated the three needs competence, autonomy and relatedness in an experimental setting and found positive effects of all three needs on intrinsic motivation, positive mood, willingness of recommendation and performance in the context of game learning. Additionally, a positive effect of relatedness was found for value added services in the automotive context (Knobel et al., 2012). Moreover, following Maslow's theory on motivation and personality (Maslow, 1954), we integrated security as a core need into our research model. Following Sheldon et al. (2001) we did not include the other four needs that are part of Maslow's theory on motivation and personality, namely physical health, self-esteem, love or belongingness, and self-actualization. Precisely, Sheldon et al. (2001) argued that love or belongingness is equivalent to the need for relatedness, which is part of the SDT and therefore already included in our research model. Moreover, we excluded physical health, self-esteem, and self-actualization because they were found to be less important for satisfying experiences than competence, autonomy, and relatedness (Sheldon et al., 2001). Furthermore, we included the need for meaning in our research model. Interestingly, this construct is rarely considered in studies on user experience and technology acceptance. A recent study shows, however, a high impact of meaning on need fulfilment and affect (Klapperich and Hassenzahl, 2016). Furthermore, we included the needs for popularity and stimulation because previous research

highlighted their importance for the user's experience with technology (Hassenzahl, Diefenbach and Göritz, 2010; Hassenzahl et al., 2015). Recent studies also focus on the combination of the seven psychological needs that are considered in our research (see table 1) and found positive connections between overall need fulfilment, hedonic qualities and positive affect (e.g., Hassenzahl et al., 2015; Tuch, Schaik & Hornbæk, 2016).

Need	Description
Competence	Feeling that you are capable and effective in your actions rather than feeling incompetent or ineffective.
Autonomy	Feeling that your activities are self-chosen and self-endorsed. Autonomy refers to a quality of self-involvement in momentary behaviour.
Relatedness	Feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared of.
Security	Feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances.
Meaning	Feeling that you are developing your best potentials and making life meaningful rather than feeling stagnant and that life does not have much meaning.
Popularity	Feeling that you are liked, respected, and have influence over others rather than feeling like a person whose advice or opinion nobody is interested in.
Stimulation	Feeling that you get plenty of novelty and stimulation rather than feeling bored and under stimulated by life.

Table 1.   Definitions of psychological needs. Except for the definition of autonomy (Sheldon et al., 2001, p. 326), all definitions are cited from Hassenzahl et al. (2015, p. 533).

3   Research Model

In this research, we consider the following research question: Which psychological processes underlie the consumers' hedonic motivation in technology acceptance? In order to answer this research question, we draw on theories of technology acceptance from IS research and psychological need fulfilment. Hence, we want to identify a need profile that is positively related to the hedonic motivation within the UTAUT2. Thus, our research model consists of the following two main parts: First, we integrated all variables relevant in UTAUT2. We choose UTAUT2 because UTAUT2 as well as our research focus on voluntary use of technology in the consumer context. Moreover, UTAUT2 highlights the importance of hedonic motivation for technology acceptance which is also the central construct in our research. For example, previous research in the field of UTAUT2 stresses the importance of hedonic motivation for behavioural intention with regard to mobile banking (e.g., Alalwan, Dwivedi, Rana, 2017), online shopping (e.g., Pascual-Miguel, Agudo-Peregrina, Chaparro-Peláez, 2015) and health and fitness apps (Yuan, Ma, Kanthawala & Peng, 2015). Secondly, we integrated psychological need fulfilment. Therefore, we selected the seven needs listed above (see Table 1), which were found to be important in psychological theories (i.e., self-determination theory (SDT): Deci and Ryan, 1985; and Maslow's theory on motivation and personality: Maslow, 1954) and were supported by recent studies (e.g., Hassenzahl et al., 2015; Tuch, Schaik & Hornbæk, 2016; Knobel et al., 2012; Knobel et al., 2013; Sheldon & Filak, 2008; Sheldon & Gunz, 2009).

Furthermore, we control for two constructs in our research. First, we control for the time of day (morning vs. evening). Hassenzahl, Kekez and Burmester (2002) showed that the evaluation of a software or product depends on the situation in which it is used. Since we posit that the time of day (morning vs. evening) represents different usage situations, we expect that this influences the evaluation of the prototype. Second, we assess the personal innovativeness in new technology of each participant. According to Agarwal and Prasad (1998, p. 206), we define innovativeness in the domain of IT as "the will-

ingness of an individual to try out any new information technology". Agarwal and Prasad (1998) found that the same new technology is perceived differently by people with high and low personal innovativeness. Precisely, a high personal innovativeness had a positive influence on product perception and intention to use, which were assessed with the help of the TAM. Several newer studies confirmed this relationship not only for the TAM but also for its adaptions (e.g., Escobar-Rodríguez and Carvajal-Trujillo, 2014; Hong et al., 2011; Miltgen, Popovic and Oliveira, 2013). For example, Escobar-Rodríguez and Carvajal-Trujillo (2014) found that high personal innovativeness with regard to IT has a positive effect on the intention to purchase tickets online. Figure one illustrates our research model.
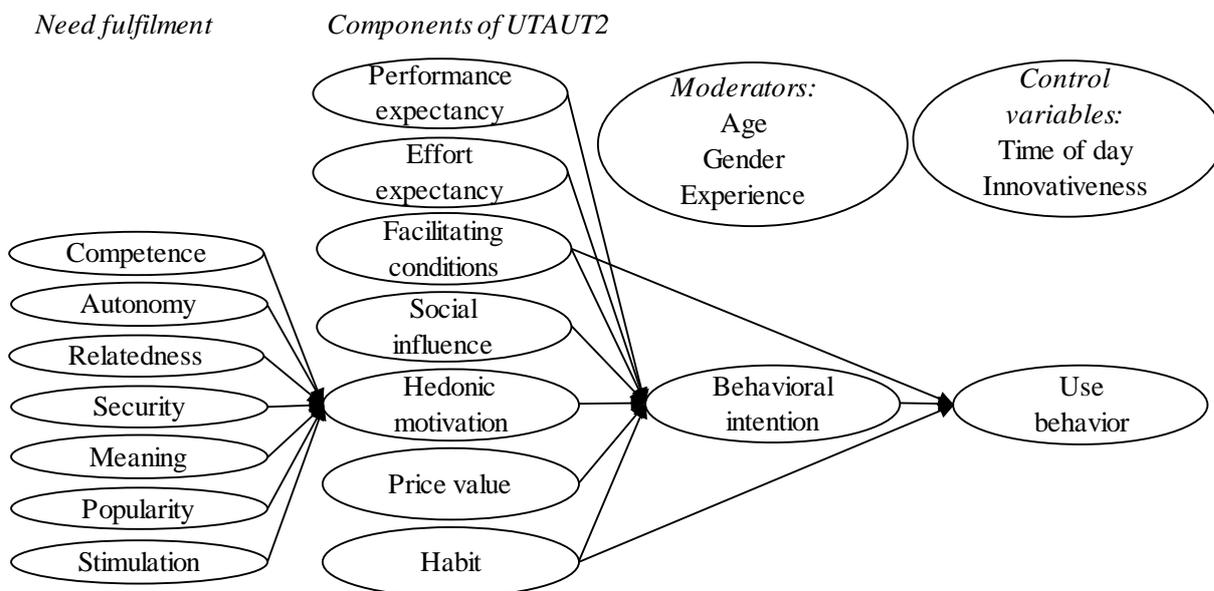

Figure 1.   Our research model.

4   Research Agenda, Methodology and Expected Results

The goal of our research is to investigate the psychological processes that underlie the hedonic motivation within UTAUT2. In order to reach this goal, we want to identify a need profile that is relevant for the user's hedonic motivation while using IoT devices. In our studies, we use a smart home mobility prototype as an example for an IoT device.

Following a call for mixed method approaches in IS research (Venkatesh, Brown and Bala, 2013), we combine qualitative and quantitative methods in our research agenda. The first step of our multi-level empirical design is an explorative field study (see step 1 in Figure 2). In this field study, participants will use a smart home mobility prototype for four days in a naturalistic context (i.e., at home). The prototype will show everyday information (i.e., date, time, calendar, weather and news) and information about the participant's individual mobility options (i.e., departure times of public transport, information about traffic, information about the range and distance of the own vehicle). Within the context of a briefing interview, the experimenter will visit each participant at home and install the prototype on the participant's individual behalf. Next, the participant will use the prototype at home for four days. The four-day usage of the prototype is meant to sensitize the participant for the topic of IoT devices and his individual needs regarding technology at home. During this time, the participant has to answer an online survey concerning features of the smart home prototype twice a day (i.e., in the morning and evening). This will help to secure that the prototype actually comes into use every day. Moreover, at each day the participant's most positive experience with the prototype will be assessed. The participant is then asked to rate this experience concerning the seven psychological needs listed above (see Table 1). Here we use a questionnaire that assess each of the seven needs with the help of

two items. For the needs for competence, relatedness, security, popularity and stimulation, we use the selection of items from Sheldon et al. (2001) that was also used by Hassenzahl et al. (2015). For the need for autonomy we use the selection of the two items with the highest factor loadings from the three items from Sheldon et al. (2001) that was also used by Klapperich and Hassenzahl (2016). For meaning we constructed two items following the twelve attributes for meaning from Huta and Ryan (2010, p. 742: "meaningful" and "dear to me"). Since our research includes a German sample, all items were translated from English to German according to an adaption of Brislin's Translation Model (Jones et al., 2001).

After this four-day usage period, the participant will take part in a qualitative semi-structured interview. The interview will focus on the smart home mobility prototype and the positive and negative experiences the participant had while using the prototype. Similar to the method that Sheldon et al. (2001) used to identify which psychological needs are truly most relevant for satisfying and unsatisfying experiences, the participants are asked to consider their experiences with the prototype and report the most positive and the most negative experience with the prototype. Next, the reasons for the valence of these experiences is discovered in a semi-structured interview. Afterwards, the interview data will be clustered qualitatively with regard to the fulfilled psychological needs that underlie these experiences. Moreover, the participants are asked to talk about their most favourite IoT device at home and their most positive experience with that device. Then the participants are again asked to rate their experience concerning the seven psychological needs listed above (see Table 1). With the help of the qualitative clustering analysis and the descriptive statistics of the participant's self-rated need fulfilment, we expect to replicate the seven psychological needs (see Table 1) as drivers for positive user experiences.

After identifying a relevant need profile with the help of the procedure explained above, we will design an experiment in order to test the relevance of the identified needs empirically (see step 3 in Figure 2). Therefore, we will create different types of an IoT prototype. In order to create a controlled experimental setting, the renderings will differ concerning the shaping of the identified needs (i.e., high vs. low shaping of a need). For example, the need for relatedness could be manipulated in a webcam stream by streaming the home town of a participant (i.e., high relatedness) versus streaming a random city without any personal connection (i.e., low relatedness). The effect of these conditions on the user's hedonic motivation and the user's intention to use the IoT prototype will be tested with a randomized within-subject-design. The manipulations will be validated in a pre-experiment (see step 2 in Figure 2) before the actual experiment will be conducted in order to support our research model empirically. As part of our quantitative analysis, we will calculate a multi-group analysis in order to compare the structural equation model of the experimental group and the control group. Here, we expect the group with manipulated high need fulfilment to show a higher hedonic motivation and a higher intention to use the prototype (i.e., a higher technology acceptance) compared to the control group. Figure two illustrates the main phases of our research agenda.
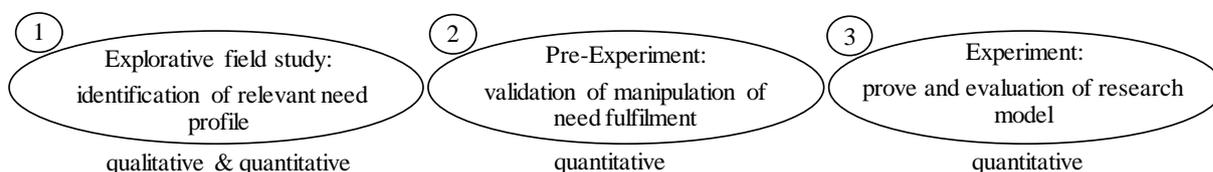

Figure 2.   Overview of the three main phases of our research agenda.

4.1   Participants

For our field study (i.e., step 1 in Figure 2), 48 employees of a local car manufacturer were recruited via mail and with the help of posters at a business campus in Munich (Germany). Our sample consists of 20 female (41.70%) and 28 male (58.30%) participants. Their mean age is 31.98 years (SD = 5.68).

For the following steps of our empirical design, namely the pre-experiment (see step 2 in Figure 2) and the experiment (see step 3 in Figure 2), another sample of participants will be recruited. Approximately n = 15 participants will take part in our pre-experiment in order to validate our manipulation of need fulfilment. As soon as we have selected the relevant needs with the help of our field study and have thereby identified the number of independent variables (i.e., a selection of the seven psychological needs from Table 1) for our experiment, we will calculate the fitting sample size for our experiment with the help of g*power (Faul et al., 2009).

5   Limitations, Future Research and Conclusion

The aim of our research is to identify a need profile that is relevant for the user's hedonic motivation while using IoT devices. As mentioned above, we follow a multilevel mixed-method research agenda. As an example for an IoT device, we use a smart home mobility prototype in our studies. The outcomes of our research will have implications on the research on technology acceptance and on practical innovation processes. Regarding the theoretical relevance, our research provides a contribution to theory by extending the UTAUT2 among the relationship between psychological need fulfilment, hedonic motivation and intention to use. Since we include new constructs (see Table 1) into an existing theory (i.e., UTAUT2) and investigate possible changes within the modified framework (see Figure 1), this is a theoretical contribution (see Alvesson and Kärreman, 2007). Additionally, this is an important contribution to theory because there is still a lack of a clear understanding of the concept of the hedonic (Diefenbach, Kolb and Hassenzahl, 2014). Understanding the psychological processes that underlie the hedonic motivation will provide a better-founded understanding of the construct itself. Furthermore, our research follows a call to explore the construct of the hedonic in more product domains and more domains of IT (e.g., smart home; Diefenbach, Kolb and Hassenzahl, 2014). Since this will explore the generalizability of the UTAUT2 in a new context, this is a theoretical contribution (see Alvesson and Kärreman, 2007).

There are, however, some limitations of our study that should be considered in future research. First, our study contains a restricted sample of German working professionals but does not focus on other cultures, younger consumers and families. Therefore, future studies should focus on families with children and young people that live in shared flats and investigate the needs that have to be triggered in order to enhance their hedonic motivation to use technology. Additionally, a cross-cultural comparison would be a next important contribution to theory. Secondly, our research focuses on a specific context, namely the use of IoT at home. Multiple statistical validations of our theoretical model will, however, be needed in order to enhance the generalizability of our UTAUT2 extension to different contexts of technology use. Moreover, future studies should investigate possible effects of the participants' learning curve after multiple interactions with the prototype on their technology acceptance.

Regarding the practical relevance, the outcomes can be used as guidelines for future design processes. This is an important contribution to practice because "concrete strategies or design decisions to create hedonic quality are still limited" (Diefenbach, Kolb, Hassenzahl, 2014, p. 310). Since we define needs according to Sheldon and Kasser (1998) and Sheldon et al. (2001), we assume that psychological needs function one level deeper than motivation. Thus, fulfilled needs can enhance human motivation. Therefore, the fulfilment of psychological needs can explain the shape of an individual's hedonic motivation while using IS. Furthermore, since identified psychological needs can be targeted, relevant needs for a hedonic experience with IT can be targeted in innovation and design process. This means that the materiality of a new IT (e.g., physical properties) can be shaped according to the ideal profile of psychological need fulfilment. Thereby hedonic user experiences, technology acceptance and finally use behaviour can be influenced positively by understanding the psychological processes that cause the hedonic motivation within UTAUT2. In summary, this contribution will make hedonic motivation in IS more assessable and controllable. Hence, this contribution will enable product designers and development engineers to steer hedonic motivation and develop and design for hedonic motivation in innovation processes. In conclusion, our findings will help to develop more enjoyable systems.

References

Alalwan, A. A., Dwivedi, Y. K. and N. P. Rana (2017). "Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust." *International Journal of Information Management* 37 (3), 99-110.

Agarwal, R. and J. Prasad (1998). "A conceptual and operational definition of personal innovativeness in the domain of information technology." *Information systems research* 9 (2), 204-215.

Alvesson, M. and D. Kärreman (2007). "Constructing mystery: Empirical matters in theory development." *Academy of Management Review* 32 (4), 1265-1281.

Au, N., Ngai, E. W. and T. E. Cheng (2008). "Extending the understanding of end user information systems satisfaction formation: An equitable needs fulfillment model approach." *MIS Quarterly* 32 (1), 43-66.

Baar, A. (2016). *Technology Finding More Acceptance During Holidays.* URL: http://www.mediapost.com/publications/article/288586/technology-finding-more-acceptance-during-holidays.html (visited on 11/21/2016).

Brecht, F., Berger, C., Eckhardt, A. and O. Günther (2012). "Corporate career presences on social network sites: An analysis of hedonic and utilitarian value." In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. New York, USA: ACM Press, pp. 2441–2450.

Brown, S. A. and V. Venkatesh (2005). "Model of adoption of technology in the household: A baseline model test and extension incorporating household life cycle." *MIS Quarterly* 29 (4), 399-426.

Childers, T. L., Carr, C. L., Peck, J. and S. Carson (2001). "Hedonic and Utilitarian Motivations for Online Retail Shopping Behavior." *Journal of Retailing* 77 (4), 511-535.

Davis, F. D. (1986). "A technology acceptance model for empirically testing new end-user information systems: Theory and results." PhD thesis, Massachusetts Institute of Technology.

Deci, E. L. and R. M. Ryan (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Deci, E. L. and R. M. Ryan (2000). "The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior." *Psychological inquiry* 11 (4), 227-268.

Diefenbach, S., Kolb, N. and M. Hassenzahl (2014). "The 'hedonic' in human-computer interaction: history, contributions, and future research directions." In: *Proceedings of the 2014 conference on Designing interactive systems*. New York, USA: ACM Press, pp. 305-314.

Escobar-Rodríguez, T. and E. Carvajal-Trujillo (2014). "Online purchasing tickets for low cost carriers: An application of the unified theory of acceptance and use of technology (UTAUT) model." *Tourism Management* 43, 70-88.

Faul, F., Erdfelder, E., Buchner, A. and A.-G. Lang (2009). "Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses." *Behavior Research Methods* 41 (4), 1149-1160.

Füller, K., Böhm, M. and H. Krcmar (2016). "Designing for Positive User Experience in Product Design: A Qualitative Analysis of Toolkit Design Elements and Their Implications on Emotional Reactions and Perceptions. In: *Proceedings of the 49th Hawaii International Conference on System Sciences (HICSS)*, Koloa, HI, USA: IEEE, pp. 1810-1819.

Hassenzahl, M., Platz, A., Burmester, M. and K. Lehner (2000). "Hedonic and ergonomic quality aspects determine a software's appeal." In: *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*. New York, USA: ACM Press, pp. 201–208.

Hassenzahl, M. (2001). "The effect of perceived hedonic quality on product appealingness." *International Journal of Human-Computer Interaction* 13 (4), 481-499.

Hassenzahl, M., Kekez, R. and M. Burmester (2002). "The importance of a software's pragmatic quality depends on usage modes." In: *Proceedings of the 6th international conference on Work With Display Units*. Berchtesgaden, pp. 275-276.

Hassenzahl, M., Burmester, M. and F. Koller (2003). "AttrakDiff: A questionnaire to measure perceived hedonic and pragmatic quality." *Human & Computer 2003*, 187-196.

Hassenzahl, M., Diefenbach, S. and A. Göritz (2010). "Needs, affect, and interactive products—Facets of user experience." *Interacting with Computers* 22 (5), 353–362.

Hassenzahl, M., Wiklund-Engblom, A., Bengs, A., Hägglund, S. and S. Diefenbach (2015). "Experience-oriented and product-oriented evaluation: psychological need fulfillment, positive affect, and product perception." *International Journal of Human-Computer Interaction* 31(8), 530-544.

Holbrook, M. B. and E. C. Hirschman (1982). "The experiential aspects of consumption: Consumer fantasies, feelings, and fun," *Journal of Consumer Research* 9 (2), 132-140.

Holsapple, C.W. and J. Wu (2007). "User Acceptance of Virtual Worlds: The Hedonic Framework." *Newsletter ACM SIGMIS Database* 38 (4), 86–89.

Hong, W., Thong, J. Y. L., Chasalow, L. C. and G. Dhillon (2011). "User acceptance of agile information systems: A model and empirical test." *Journal of Management Information Systems* 28 (1), 235-272.

Huta, V. and R. M. Ryan (2010). "Pursuing pleasure or virtue: The differential and overlapping well-being benefits of hedonic and eudaimonic motives." *Journal of Happiness Studies* 11 (6), 735-762.

Järvinen, J., Ohtonen, R. and H. Karjaluoto (2016). Consumer Acceptance and Use of Instagram. In: *Proceedings of the 49th Hawaii International Conference on System Sciences (HICSS),* IEEE, New York, pp. 2227-2236.

Jones, P. S., Lee, J. W., Phillips, L. R., Zhang, X. E. and K. B. Jaceldo (2001). "An adaptation of Brislin's translation model for cross-cultural research." *Nursing research* 50 (5), 300-304.

Jordan, P. W. (2002). *Designing Pleasurable Products: An Introduction to the New Human Factors.* London: Taylor & Francis.

Klapperich, H. and M. Hassenzahl (2016). "Hotzenplotz: Reconciling automation with experience." In: *Proceedings of the 9th Nordic Conference on Human-Computer Interaction.* New York, USA: ACM Press, p. 39.

Knobel, M., Hassenzahl, M., Lamara, M., Sattler, T., Schumann, J., Eckoldt, K. and A. Butz (2012). "Clique Trip: feeling related in different cars." In: *Proceedings of the designing interactive systems conference.* New York, USA: ACM Press, pp. 29-37.

Knobel, M., Hassenzahl, M., Schumann, J., Lamara, M., Eckoldt, K. and A. Butz (2013). "A trip into the countryside: an experience design for explorative car cruises." In: *CHI'13 Extended Abstracts on Human Factors in Computing Systems.* New York, USA: ACM Press, pp. 565-570.

Lallmahomed, M. Z. I., Ab Rahim, N. Z., Ibrahim, R. and A. A. Rahman (2013). "Predicting different conceptualizations of system use: Acceptance in hedonic volitional context (Facebook)." *Computers in Human Behavior* 29 (6), 2776-2787.

Lancelot Miltgen, C. L., Popovic, A. and T. Oliveira (2013). "Determinants of end-user acceptance of biometrics: Integrating the "big 3" of technology acceptance with privacy context." *Decision Support Systems* 56, 103-114.

Mahlke, S. (2002). "Factors influencing the experience of website usage." In: *CHI 2002 Extended Abstracts on Human Factors in Computing Systems.* New York, USA: ACM Press, pp. 846–847.

Maslow, A. (1954). *Motivation and personality.* New York: Harper & Row.

Pascual-Miguel, F. J., Agudo-Peregrina, Á. F. and J. Chaparro-Peláez (2015). "Influences of gender and product type on online purchasing." *Journal of Business Research* 68 (7), 1550-1556.

Sheldon, K. M. and T. Kasser (1998). "Pursuing personal goals: Skills enable progress, but not all progress is beneficial." *Personality and Social Psychology Bulletin* 24 (12), 1319-1331.

Sheldon, K. M., Elliot, A. J., Kim, Y. and T. Kasser (2001). "What is satisfying about satisfying events? Testing 10 candidate psychological needs." *Journal of personality and social psychology* 80 (2), 325-339.

Sheldon, K. M. and A. Gunz (2009). "Psychological needs as basic motives, not just experiential requirements." *Journal of personality* 77 (5), pp. 1467-1492.

Sheldon, K. M. and V. Filak (2008). "Manipulating autonomy, competence, and relatedness support in a game-learning context: New evidence that all three needs matter" *British Journal of Social Psychology* 47 (2), pp. 267-283.

Thong, J. Y. L., Hong, S. J. and K. Y. Tam (2006). "The Effects of Post-Adoption Beliefs on the Expectation–Confirmation Model for Information Technology Continuance," *International Journal of Human-Computer Studies* 64 (9), 799-810.

Tuch, A. N., Schaik, P. V. and K. Hornbæk (2016). "Leisure and Work, Good and Bad: The Role of Activity Domain and Valence in Modeling User Experience." *ACM Transactions on Computer-Human Interaction (TOCHI)* 23 (6), 35, 1-32.

Väätäjä, H. (2008). "Factors affecting user experience in mobile systems and services." In: *Proceedings of the 10th international conference on Human computer interaction with mobile devices and services - MobileHCI '08*. New York, USA: ACM Press, pp. 551–551.

Van der Heijden, H. (2004). "User acceptance of hedonic information systems," *MIS Quarterly* 28 (4), 695-704.

Venkatesh, V., Morris, M. G., Davis, G. B. and F. D. Davis (2003). "User acceptance of information technology: Toward a unified view." *MIS Quarterly* 27 (3), 425-478.

Venkatesh, V., Thong, J. Y. and X. Xu (2012). "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology." *MIS Quarterly* 36 (1), 157-178.

Venkatesh, V., Brown, S. and H. Bala (2013). "Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems." *MIS Quarterly* 37 (1), 21-54.

Venkatesh, V., Thong, J. Y. and X. Xu (2016). "Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead." *Journal of the Association for Information Systems* 17 (5), 328-376.

Yuan, S., Ma, W., Kanthawala, S. and W. Peng (2015). "Keep using my health apps: Discover users' perception of health and fitness apps with the UTAUT2 model." *Telemedicine and e-Health* 21 (9), 735-741.