HOW TO DESIGN INFORMATION TECHNOLOGY THAT FACILITATES DETACHMENT FROM WORK: AN EMPIRICAL INVESTIGATION OF WORK-DISCONTINUANCE INTENTION

Michael Klesel
*University of Siegen, michael.klesel@uni-siegen.de*

Katharina Jahn
*University of Siegen, katharina.jahn@uni-siegen.de*

Marius Müll
*University of Siegen, marius.mueller@uni-siegen.de*

Björn Niehaves
*University of Siegen, bjoern.niehaves@uni-siegen.de*

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Katharina Jahn, University of Siegen, Siegen, Germany, katharina.jahn@uni-siegen.de
Marius Müller, University of Siegen, Siegen, Germany, marius.mueller@uni-siegen.de
Björn Niehaves, University of Siegen, Siegen, Germany, bjoern.niehaves@uni-siegen.de

Abstract

Information Technology (IT) becomes more and more part of our lives both at home and at work. However, theory-based research concerning the question how information technology can be designed to facilitate employees’ work-life-balance is scarce. We fill in this gap building upon boundary theory to identify design-relevant constructs in the context of work-life-balance. As boundary theory suggests that holding up strong boundaries between work and private life is beneficial for health and well-being, we focused on the design of IT that supports employees’ discontinuance of work when reaching the end of their working time. We used nudge theory to derive 14 possible design options for the IT artifact, including one non-nudge design option that represents the enforcement of work discontinuance. Based on survey data from 67 industry employees, we tested how the design options influenced the work discontinuance intention of employees compared to enforcement. Our results indicate that nudging through disclosure, eliciting intentions and increasing ease has a significantly higher effect on work discontinuance intention than enforcement while nudging through a reminder has a significantly lower impact.

Keywords: Design Science, Boundary Theory, Psychological Detachment, Nudge Theory
1 INTRODUCTION

The digitalization and the ubiquity of technology (Lyytinen and Yoo 2002) affect both work and private life and changed the modern workplace. Today, individuals are not only using and adopting enterprise technologies but also use their private technology for business purposes. To that end, fixed working environments become rare and new environments such as “home office” are becoming more common.

The omnipresence of technology blurred the boundaries between work and private life (Ashforth, Kreiner, and Fugate 2000; Clark 2000; Köffer, Anlauf, Ortbach, and Niehaves 2015). Technology use at home impedes psychological detachment from work (Park, Fritz, and Jex 2011) and increases work-home-interferences and strain (Derks, van Duin, Tims, and Bakker 2015). One reason for this might be that a lot of technologies generally deny individual needs and instead maintain an ongoing attention of the user. For instance, E-Mail applications often push information, social media continuously sends notifications about updates and Youtube is automatically playing one video after the other (Sadler, Robertson, and Kan 2006; The New York Times 2015). This leads to continuous use of technology and a constant occupation with technology brings the risk of negative effects such as stress, strain, or overload. Related psychological effects, such as stress or meaningfulness of work has been part of well-known theories such as the job demand control model (Karasek and Theorell 1992) or the job characteristic model (Hackman and Oldham 1976) and have been widely used to develop Information Systems (IS) theories (e.g. Ahuja, Chudoba, Kacmar, McKnight, and George 2007). Consequent, building upon these theories, IS research was able to better explain effects like turnover intention (Moore and Benbasat 1991) or job satisfaction (Bala and Venkatesh 2013).

When looking at work related phenomena, there is a great amount of theories available that can be used in the design science paradigm. Using these theories, design-relevant propositions can be generated in order to develop design theories. Particularly researchers in the field of information systems research can benefit from comprehensive discussions about design-relevant research, known as the design science paradigm, that offers a rich toolbox including guidelines (Hevner, March, Park, and Ram 2004), conceptualizations (Baskerville and Pries-Heje 2010; Kuechler and Vaishnavi 2012; Niehaves and Ortbach 2016) and evaluation methods (Venable, Pries-Heje, and Baskerville 2016).

Guided by the design science paradigm, the objective of this study is to design an IT artifact that facilitates detachment from work based on boundary theory (Ashforth et al. 2000) and detachment theory (Sonnentag 2012). Specifically, we analyse how to design IT that facilitates the work discontinuance intention of an employee. In consideration of the increasing autonomy of employees enabled by technology (Mazmanian, Orlikowski, and Yates 2013) and insufficient impact of enforcement strategies as the emergence of Shadow IT suggest (Haag, Eckhardt, and Bozoyan 2015; Zimmermann and Rentrop 2014), we furthermore use nudge theory to implement design options apart from enforcement. In summary, we raise the following research questions (RQ):

RQ 1: How to design an IT artifact that facilitates employee’s work discontinuance intention?

RQ2: Which design option, drawing upon nudge theory, has the strongest effect on work discontinuance intention?

To answer the research questions, the paper continues as follows. The subsequent section lays the ground of this work by describing the context. Based on that, we propose our theoretical foundation in Section 3. We proceed with describing our methodological approach. In Section 5, we present our results. We discuss our findings and conclude by describing contributions, revealing the limitations and by showing promising paths for future research.
2 BACKGROUND

In information systems, widely recognized theories such as the Job Characteristic Model (Hackman and Oldham 1976), the Job Demand Control Model (Karasek and Theorell 1992) or role theory (Katz and Kahn 1978) have been used as a lens to analyse job-related phenomena. In various studies, IS researchers were able to build on these theories to explain IS-related aspects including turnover intention, innovation behaviour, or the change of job characteristics through the implementation of enterprise systems (Bala and Venkatesh 2013). Although IT can enable a broad variety of positive effects such as performance, satisfaction, or innovativeness at the workplace, current research also shows that negative effects can emerge. For example, IT can cause stress that impedes performance and increases role conflict (Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan 2007). Therefore, finding ways to foster positive effects of IT usage becomes increasingly relevant.

Since previous research has primarily focused on psychological variables (for instance Hackman and Oldham 1976) and individual coping mechanisms (for instance Galluch, Grover, and Thatcher 2015), design-relevant research has received only little attention so far (Bresnahan, Brynjolfsson, and Hitt 1999; White, Hill, McGovern, Mills, and Smeaton 2003). This is unfortunate, as IS research has strong conceptualizations for the design of information technology for specific purposes including workplace design. Indeed, the creation and the design of IT artifacts is at the core of information systems since the beginning of the discipline. In the late 1960s Herbert Simon published his seminal work on “The Science of the Artificial” (Simon 1969) where he points out the distinct characteristics of artifacts and how to address them with knowledge from natural science. Current studies contributed to this body of knowledge by proposing guidelines (Hevner et al. 2004), methods (Peffers, Tuunanen, Rothenberger, and Chatterjee 2007), strategies to positioning design science endeavours (Baskerville, Kaul, and Storey 2015; Gregor and Hevner 2013), and frameworks to evaluate Design Science Research (Venable et al. 2016).

In order to examine design-relevant aspects in the work context, we chose a theory based approach following the design science paradigm (Gregor and Jones 2007; March and Smith 1995; Niehaves and Ortbach 2016). With regard to IT at the workplace and workplace-design, it is particularly interesting to develop theories that explain effects such as stress or overload. For this purpose, different conceptualizations for explanatory theories, i.e. theories that explain the effects of an artifact, have been proposed (see Table 1). For instance, Gregor (2009) uses the notation of an interior mode and an exterior mode, where the first focuses on theorizing about how the design can be implemented and the latter about the effects of the artifact in its environment. To that end she proposes to use propositions such as “A system with feature X will perform better on measure M than a system without feature X” (Gregor 2009, p. 9). A similar conceptualization has been brought forward by Baskerville and Pries-Heje (2010) who propose the notion of a Design Practice Theory and an Explanatory Design Theory. The former explains how to design an (IT-) artifact and the latter explains why certain features should be included in an artifact. In the same tune, Kuechler and Vaishnavi (2012) suggest the notion of a design relevant explanatory/predictive theory (DREPT) capturing knowledge about why an artifact has certain effects. Most recently, Niehaves and Ortbach (2016) demonstrate how to develop and test explanatory design theories (Baskerville and Pries-Heje 2010) using Structural Equation Modelling (SEM).

<table>
<thead>
<tr>
<th>Explanatory Design Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>“prescribes principles that relate requirements to an incomplete description of an object” (Baskerville and Pries-Heje 2010, p. 273)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exterior Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Types of theory, which aim primarily at analyzing, describing and predicting what happens as artifacts exist and are used in their external environment.” (Gregor 2009, p. 7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design relevant explanatory / predictive theory (DREPT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A type of theory suggested in this paper that augments the “how” information content of the traditional ISDT statement with explanatory information explaining why the artifact has the effects it does.” (Kuechler and Vaishnavi 2012, p. 396)</td>
</tr>
</tbody>
</table>
Explanatory Design Theory

"An explanatory IS design theory seeks to inform a designer about which features should be included in an artifact and why. Structurally, it consists of two or more connected hypotheses, while a single hypothesis in its basic form describes the relationship between an independent variable (cause) and a dependent variable (effect). To fulfill its informative function for a designer, at least one of the hypotheses of an explanatory IS design theory must include an independent variable that can be systematically manipulated through the design of an artifact. In principle, explanatory IS design theories constitute normative theories, which means that at least one dependent variable is regarded as desirable or undesirable.” (Niehaves and Ortbach 2016, p. 4)

Table 1: Conceptualization of Explanatory Design Theories

The presented conceptualizations of explanatory design theories are valuable concepts that assist researchers to explain design-relevant effects. For the purpose of this research endeavour, we follow the definition of Niehaves and Ortbach (2016) for the following reasons: First, they most precisely describe how to use dependent and independent variables to build testable hypotheses for design science research. As we want to analyse work discontinuation intention (dependent variable), this conceptualization is helpful to develop a new design theory. Second, as they tend to bring behavioural science and design science together, their conceptualization can guide our work on how to include theories from behavioural science. Finally, since they integrate previous research (Baskerville and Pries-Heje 2010; Gregor 2009; Kuechler and Vaishnavi 2012) it is the most comprehensive conceptualization. As suggested, relevant variables or hypotheses need to be deduced. This process is guided by kernel theories (Iivari, 2007). Therefore, the aforementioned theories (e.g. job demand control model) are suitable theories to derive variables such as autonomy or overload to develop design theories.

3 THEORETICAL FOUNDATION

3.1 Boundary Management

Boundary theory (Allen, Cho, and Meier 2014; Ashforth, Kreiner, and Fugate 2000; Clark 2000; Nippert-Eng 1996; Reyt and Wiesenfeld 2015) states that individuals structure their environment through constructing boundaries of different strength between life domains. Boundaries are defined as “lines of demarcation between domains, defining the point at which domain-relevant behavior begins or ends” (Clark 2000). When boundaries are strong, switching from one domain to the other is difficult. In contrast, when there are weak boundaries, individuals can switch easily back and forth through the domains (Ashforth et al. 2000; Clark 2000). In the context of the work domain and the private life domain, separation occurs when boundaries are strong and individuals keep their work and private life strictly disconnected. On the other hand, when boundaries are weak and individuals cross boundaries regularly, integration occurs (Ashforth et al. 2000; Nippert-Eng 1996). Integration and separation have different effects on health and work life balance. Separation seems to be associated with more work life balance while integration seems to result in a higher work-to-family conflict (Kinman and Jones 2008; Kossek, Ruderman, Braddy, and Hannum 2012; Powell and Greenhaus 2010).

A construct that is associated with boundary management is psychological detachment from work (Sonntag 2012). Psychological detachment is a state of “switching off” (Sonntag 2012, p. 114) from work, without doing anything that is connected to the job or thinking on work related tasks (Sonntag 2012). Individuals who have high psychological detachment tend to have a higher psychological well-being and show less symptoms of strain (Moreno-Jiménez, Rodríguez-Muñoz, Pastor, Sanz-Vergel, and Garrosa 2009; Siltaloppi, Kinnunen, and Feldt 2009; Sonntag and Bayer 2005) than individuals with low psychological detachment. In the context of boundary management, separation of work and private life leads to higher psychological detachment (Sonntag, Kuttler, and Fritz 2010). In IS research, IS discontinue theory (Furneaux and Wade 2011) addresses a similar aspect, i.e. the detachment of an existing technology towards a new one. Intention to discontinue is similar in respect to the detachment from one system which is similar to the moment when individuals are crossing a boundary from one domain to another as suggested by boundary theory. However, discontinue theory primarily focuses on
organizational level and analyses a final discontinuance behaviour. To analyse temporal discontinuance behaviour, as needed in this study, an adaption of discontinuance is needed that conceptualize a temporal intention to stop work. However, to the best of our knowledge, a construct that covers a temporal work discontinuance intention has not been conceptualized so far. Therefore, we define work discontinuance intention as “the conscious decision to temporarily stop work against the background of individual preferences or in order to prevent negative consequences (such as stress or overload).” For instance, when an employee suffers of too much work, he or she can aim to do the work at another time and plan to finish the work for this moment.

3.2 Nudge Theory

Emerging from the field of behavioural economics, nudge theory suggests that individual behaviour can be influenced (“nudged”) without the use of regulations, enforcement, or economic incentives (Sunstein 2014; Thaler and Sunstein 2008) only by the way of presenting choices. For instance, the arrangement of food in a cafeteria or in a grocery store can be either presented to increase the purchase of healthy food by putting fresh vegetables at eye height or to increase profit by putting products with a high margin there (Thaler, Sunstein, and Balz 2014).

Nudge theory can be described as a form of soft paternalism which means that an individual is guided in a predetermined direction (Richard H. Thaler and Sunstein 2008) without any enforcement. It is carefully noted that the direction is determined by the choice architect who is able to influence how choices are presented. In the supermarket, for instance, it is the employee who is responsible to arrange the food. The basic principle of nudge is to maintain the individuals freedom of choice at all time (Sunstein 2014). Hence, each individual is able to decide whether to buy groceries at eye level or foot level. Based on the idea that there is always a broad variety of choices to present, Thaler and Sunstein coined the term choice architecture. To classify and operationalize nudge-options, different concepts have been proposed (Johnson et al. 2012; Sunstein 2014). Generally, three different strategies can be distinguished: simplify the desired choice, intensify the tie with desired choice, and impede undesired choices. In order to simplify the desired choice, mechanisms are used to make the decision process more easy and convenient (e.g. by reducing alternatives). Intensifying the tie with desired choices brings out or strengthens choice intentions (e.g. by reminding the individual). The final strategy type is implemented by impeding the undesired choice (e.g. by labelling the undesired choice negatively). Although all three strategy types follow a primary objective, they are interrelated. For instance, by simplifying the desired choice, the undesired one is impeded automatically. Table 2 gives an integrated view and the main characteristic of the suggested options.

<table>
<thead>
<tr>
<th>primarily strategy</th>
<th>Nudge Option</th>
<th>main characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>simplify desired choice</td>
<td>default rules&lt;sup&gt;a&lt;/sup&gt; (1. Default)</td>
<td>the desired choice is predefined (default). Therefore, the undesired choice require proactive behaviour and is, thus, more difficult to put into practice.</td>
</tr>
<tr>
<td></td>
<td>reduce number of alternatives&lt;sup&gt;a&lt;/sup&gt; / simplification&lt;sup&gt;b&lt;/sup&gt; (2. Ease)</td>
<td>increase convenience in making a choice by simplifying choice options</td>
</tr>
<tr>
<td></td>
<td>technology and decision aids&lt;sup&gt;c&lt;/sup&gt; (3. Decision aid)</td>
<td>technology aids simplify desired choices</td>
</tr>
<tr>
<td></td>
<td>focusing on satisficing&lt;sup&gt;d&lt;/sup&gt;</td>
<td>desired choice is simplified by offering a convenient sufficient solution</td>
</tr>
<tr>
<td></td>
<td>translate and rescale for better evaluability&lt;sup&gt;d&lt;/sup&gt; (4. Rescale)</td>
<td>reporting information in a more convenient way to favour the desired choice</td>
</tr>
<tr>
<td></td>
<td>decision staging&lt;sup&gt;d&lt;/sup&gt;</td>
<td>choices are presented in sections (i.e. stages) to simplify the desired choice</td>
</tr>
<tr>
<td></td>
<td>partitioning of options&lt;sup&gt;d&lt;/sup&gt;</td>
<td>choices are presented in partitions to simplify the desired choice</td>
</tr>
</tbody>
</table>
Table 2: Concepts to build a choice architecture

In our day-to-day life, there is a plethora of technology-related nudges already implemented. For instance, notifications that remind you automatically of certain events, health apps that inform you about your current consumption or the automatic extension of your subscriptions (Sunstein 2014). All of them respect the freedom to choose another option (e.g. to cancel a subscription), however, most of the time the former is retained. The fact that individuals do not decide completely rational (Simon 1955; Simon 1972) becomes apparent.

In IS research, nudge theory has been only marginally exploited so far. In the context of gamification it has been proposed as a concept to help people make better decisions (Hamari and Koivisto 2013). Other authors made use of nudge theory to further explore under which circumstances (i.e. choices) users are willing to pay a premium price for privacy (Egeleman, Felt, and Wagner 2013). Since nudge theory influences the individual intention which has been broadly used and adapted in information systems research (Ajzen 1991; Davis 1989; Fishbein and Ajzen 1975), it opens the door for a broad variety of applications. To address our research question, nudge theory offers a broad spectrum of design-options to support individuals’ intention to discontinue work.

4 METHODOLOGY

4.1 Data collection

Method selection. In order to answer our research questions, we gathered data from an online survey including design options and demographics. Using an online survey for this purpose is most convincing to address our research question because participants can answer these questions at their computer which is close to a working environment.

Participants. We recruited participants by promoting the survey via e-mail and facebook. Therefore, we used convenience sampling. A total of 72 questionnaires were answered completely. After we excluded participants whose answers indicated they only flipped through the questionnaire, 67 participants remained. Out of the participants 37.31% were female, 62.69% were male. The mean age of the
participants was 31.11 years, ranging from 20 to 55. Participants worked 39.23 hours on average per week and 25.66 hours on a computer. Further information of the sample is presented in table 3.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Working time (in hours per week)</th>
<th>Time on a computer (in hours per week)</th>
<th>Work experience (in years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 31.11</td>
<td>39.23</td>
<td>25.66</td>
<td>5.99</td>
</tr>
<tr>
<td>SD 9.42</td>
<td>11.42</td>
<td>13.74</td>
<td>6.23</td>
</tr>
</tbody>
</table>

Table 3: Overview of the sample.

Measures. Work discontinuance intention was measured with one question that asked whether the participants would stop working for this day. Participants could answer on a 10-point likert scale. Using only one variable to measure the independent variable is common in surveys that present different scenarios that must be rated repeatedly (Trinkle, Crossler, and Warkentin 2014).

Nudge options. Based on the presented nudge options (c.f. Table 2), we derived 13 distinct nudge scenarios. Additionally, we designed a non-nudge design option called enforcement that represented the enforced shut down of the computer. In total, we used 14 design options. Since we are interested in the individual work discontinuance intention, we excluded nudge options that addresses more than one decision (i.e. “decision staging”, “partitioning of options”, “simplification”). We operationalized the 13 nudge design options as messages that were meant to pop up when the employee reaches finishing time (i.e. 5 pm). Examples of the screen captures that were presented can be seen in Figure 1 and Figure 2. The operationalization of the constructs is presented in Table 4.
<table>
<thead>
<tr>
<th>Nudge-Option</th>
<th>Text message</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Default</td>
<td>E-Mail and Communication from 9 am to 5 pm.</td>
<td>(configured as default)</td>
</tr>
<tr>
<td>2. Ease</td>
<td>“Click here, to finish work. Your data will be stored. The system shuts down.”</td>
<td>Shut down symbol</td>
</tr>
<tr>
<td>3. Decision Aid</td>
<td>Your regular working time is over. Based on your calendar, there is a free</td>
<td>yes/no button</td>
</tr>
<tr>
<td></td>
<td>timeslot tomorrow to do your work. Do you want to open your calendar to review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>your appointments?</td>
<td></td>
</tr>
<tr>
<td>4. Rescale</td>
<td>[green]: You are in the regular working time. [orange]: You are over the</td>
<td>traffic light working time labelling system</td>
</tr>
<tr>
<td></td>
<td>regular working time. [red]: You are considerably over working time.</td>
<td></td>
</tr>
<tr>
<td>5. Social</td>
<td>80% of your colleagues are already at home.</td>
<td>ok button</td>
</tr>
<tr>
<td>6. Precommitment</td>
<td>Do you want that the system will be shut down at 5 pm for the rest of the</td>
<td>yes/no button</td>
</tr>
<tr>
<td></td>
<td>week?</td>
<td></td>
</tr>
<tr>
<td>7. Reminder</td>
<td>Your regular working time is over.</td>
<td>ok button</td>
</tr>
<tr>
<td>8. Past Experience</td>
<td>You worked for [local norm of working hours + 20%] hours last week.</td>
<td>ok button</td>
</tr>
<tr>
<td>9. Elicit</td>
<td>Yesterday, you shut down your system at that time. Do you want to do the</td>
<td>yes/no button</td>
</tr>
<tr>
<td></td>
<td>same today?</td>
<td></td>
</tr>
<tr>
<td>10. Time Window</td>
<td>You have 10 minutes left to finish your work.</td>
<td>ok button</td>
</tr>
<tr>
<td>11. Label</td>
<td>Do you want to finish work?</td>
<td>Yes (green symbol), No (red symbol)</td>
</tr>
<tr>
<td>12. Warning</td>
<td>Take care of your health! Finish work to prevent negative consequences.</td>
<td>ok button</td>
</tr>
<tr>
<td>13. Disclosure</td>
<td>Your regular working time is over. If you continue with work, you renounce</td>
<td>ok button</td>
</tr>
<tr>
<td></td>
<td>your leisure time.</td>
<td></td>
</tr>
<tr>
<td>14. Enforce</td>
<td>Your working time is over. Your work status will be saved. The system shuts</td>
<td>ok button</td>
</tr>
<tr>
<td></td>
<td>down.</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Operationalization of nudge-options

**Procedure:** After opening the link to the survey, a cover page was provided (De Leeuw and Dillman 2008), including a short introduction that explained the context of the survey and assured privacy for their answers. Next, we asked participants about their average weekly working hours, their average time working at a computer, and how many years they had been working at their current employer. The subsequent section asked them about their boundary management at work and at home. Then, participants were instructed to read the following text before being presented with the design options:

“You are responsible for taking care of your employer’s web page. You have to publish a lot of new information on the web page due to the good order situation.

Your regular finishing time is 5 pm. However, you could not finish all your work yet. In the next part of the survey, you will be presented with screen captures at 5 pm.”

Thereafter, 7 out of the 14 design options (13 nudge options, 1 enforcement) were presented in random order and each participant had to indicate his or her work discontinuance intention for each design option displayed. Finally, participants were asked about their gender, age, and had the opportunity to give additional comments in a free text field.

4.2 Data analysis

In the context of our study, all individuals indicated their work discontinuance intention for several design options. This implies that the response behaviour of the individual can affect the answers for the different design options and that the responses within an individual are not independent from each other. Under these conditions, an approach that can differentiate variability within design options and
variability between subjects is required. Therefore, we decided to use multilevel modelling (Snijders and Bosker 1999) and conducted the data analysis with R 3.2.3 (R Core Team 2015). Multilevel modelling considers different levels of analysis. In our study, individual responses to the design options (level 1) are nested in individuals (level 2). Multilevel modelling is recommended for nested data, for example, in vignette studies (Hox, Kreft, and Hermkens 1991).

To test whether the use of multilevel modelling was appropriate for the dataset, intra-class correlations (ICC) were calculated on the basis of the intercept-only model. The ICC estimates how much variance can be attributed to group membership (i.e. different individuals). An ICC greater than zero indicates that some variance can be explained based on differences between individuals and it is, thus, recommended to use multilevel modelling (Kreft and de Leeuw 1998). In our study the ICC indicated that 44.62% of the variance is explained by differences between individuals. Therefore, the use of multilevel modelling is supported by the data. For calculating the models, we first calculated the random intercept model (null model) and added the control variables in the next step (model 2). We used dummy coding for the different design options and added them in the last step (model 3, enforce was used as reference condition).

5 RESULTS

5.1 Means and standard deviation

Disclosure has the highest mean on work discontinuance intention, whereas nudging through a reminder was the least efficient option to support work discontinuance intention. Ease, eliciting intentions, precommitment, past experience, time window, and warning all had a mean higher than the mean point of the work discontinuance intention scale. All other design options had a mean of 5 or lower. The standard deviations ranged from 2.79 for reminder to 3.28 for decision aid. All means and standard deviations for the different design options are presented in Table 5. In order to explore whether these visible differences were significant, we analysed the dataset further using multilevel analysis.

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>4.74</td>
<td>5.57</td>
<td>5</td>
<td>4.76</td>
<td>4.5</td>
<td>5.3</td>
<td>3.11</td>
</tr>
<tr>
<td>SD</td>
<td>3.15</td>
<td>3.05</td>
<td>3.28</td>
<td>3.01</td>
<td>2.84</td>
<td>3.13</td>
<td>2.79</td>
</tr>
<tr>
<td>M</td>
<td>5.57</td>
<td>5.57</td>
<td>5.48</td>
<td>4.86</td>
<td>5.14</td>
<td>6.29</td>
<td>4.58</td>
</tr>
<tr>
<td>SD</td>
<td>3.01</td>
<td>2.89</td>
<td>3.2</td>
<td>3.03</td>
<td>2.98</td>
<td>3.31</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Table 5: Means and standard deviations for the different design options.

5.2 Multilevel analysis

As a first step in the multilevel analysis, we tested whether significant intercept variation (e.g. variation between subjects) in the ratings of work discontinuance intention exists. Thus, we compared the random intercept model with a model without random intercept. The $\chi^2$-test was significant ($p < 0.001$, df = 1), suggesting a significant variation between subjects. The results of the subsequent multilevel analysis are presented in Table 6. After adding the control variables age, degree, and gender to the model, we included the variables for the different design options in the model. Results indicate that ease ($\beta = 1.16$, $p = .043$) and disclosure ($\beta = 1.89$, $p = .001$) lead to a significantly higher work discontinuance intention than enforce. Additionally, eliciting intentions ($\beta = -0.96$, $p = .089$) leads to a higher work discontinuance intention on a $p < .1$ significance level. Reminder ($\beta = -0.96$, $p = .094$) and default ($\beta = -0.21$, $p = .703$) were the only design options that were negatively related to work discontinuance
intention. However, this relationship was only significant for reminder, with a significance level of $p < .1$. No other design options were significantly related to work discontinuance intention.

<table>
<thead>
<tr>
<th></th>
<th>Null model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$</td>
<td>Std. Error</td>
<td>$p$</td>
<td>$\beta$</td>
<td>Std. Error</td>
</tr>
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<td>Intercept</td>
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<td>0.27</td>
<td>.000***</td>
<td>9.56</td>
<td>2.18</td>
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<tr>
<td>Age</td>
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<td>0.02</td>
<td>.267</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
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<td>0.54</td>
<td>.393</td>
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<td>0.54</td>
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<tr>
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<td>0.36</td>
<td>.003**</td>
<td>-1.08</td>
<td>0.36</td>
</tr>
<tr>
<td>1. Default</td>
<td>1.16</td>
<td>0.57</td>
<td>.043†</td>
<td>-0.21</td>
<td>0.57</td>
</tr>
<tr>
<td>2. Ease</td>
<td>0.22</td>
<td>0.61</td>
<td>.717</td>
<td>0.05</td>
<td>0.57</td>
</tr>
<tr>
<td>3. Decision Aid</td>
<td>0.36</td>
<td>0.55</td>
<td>.514</td>
<td>0.64</td>
<td>0.59</td>
</tr>
<tr>
<td>4. Rescale</td>
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<td>0.57</td>
<td>.094†</td>
<td>0.46</td>
<td>0.59</td>
</tr>
<tr>
<td>5. Social</td>
<td>0.97</td>
<td>0.57</td>
<td>.089**</td>
<td>0.78</td>
<td>0.59</td>
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<tr>
<td>6. Precommitment</td>
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<td>0.56</td>
<td>.703</td>
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<td>0.56</td>
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<tr>
<td>7. Reminder</td>
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<td>0.57</td>
<td>.001***</td>
<td>1.16</td>
<td>0.57</td>
</tr>
<tr>
<td>-2 logLik</td>
<td>2238.2</td>
<td>2232.5</td>
<td>2192.1</td>
<td>2232.5</td>
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<tr>
<td>Df</td>
<td>3</td>
<td>6</td>
<td>19</td>
<td>6</td>
<td>19</td>
</tr>
</tbody>
</table>

$N = 469$ (design options), $N = 67$ (individuals), † $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6: Multilevel-Analysis for work discontinuance intention.

6 DISCUSSION

6.1 Discussion of the results

Our results indicated that disclosure, ease, and eliciting intentions lead to a higher work discontinuance intention than enforce, while reminding participants of their finishing time resulted in a lower work discontinuance intention. The other nudge variations did not significantly differ from enforcing work discontinuance. In the following section, we extract three relevant aspects from these findings, answering our research questions on how IT can be designed to evoke work discontinuance.

First, disclosure, ease, and eliciting intentions seemed to have the greatest influence on the intention to discontinue work out of all design options. For disclosure, this might be the case because it was the only option which associated a positive outcome (leisure time) with the discontinuance of work. This is consistent with the propositions of prospect theory (Kahneman and Tversky 1979). The loss of leisure time through overtime seems to be worse than the additional gain of money or self-actualization that is associated with overtime. For ease and eliciting intentions, there weren’t any outcomes for work discontinuance that could be directly associated with a gain or a loss. Instead, we used a purely technological approach for designing ease by simplifying the path to work discontinuance. In the case of eliciting intentions, we additionally reminded participants of the previous day and explicitly asked them if they would like to act in the same way in this moment.

Second, nudging through a reminder resulted in a lower work discontinuance intention than enforcing work discontinuance through a shutdown. This might be because it merely reminded participants of the possibility to discontinue work without giving any additional information about why this might be important or how this was related to a past experience. Therefore, the reason it did not have an additional
effect on WDI probably was that the effect of merely reminding was not strong enough. As nowadays almost everyone has multiple access to the current time (watch, smartphone, computer), they are reminded every day at a specific time to finish work. Thus, employees might have already habituated to that kind of nudge because habituation occurs when a stimulus appears repeatedly (Rankin et al. 2009).

Third, the remaining nudge options are not significantly different from the enforce design option. This result is overall in line with nudge theory, as the theory states that nudging is an effective alternative to enforce regulations (Goldstein, Johnson, Herrmann, and Heitmann 2008). However, our findings also brought up some additional questions in this regard. According to previous research in the field of nudge theory, the default option ought to have the greatest effect on shaping behaviour in a desired way (Goldstein et al. 2008; Johnson et al. 2012; Richard H. Thaler and Sunstein 2008). This was not the case with the default option in our study, as it did not show a significant difference to enforcing work discontinuance. This might be because we did not operationalize the default option with a focus on shutting down the computer but decided to focus on stopping the chance to communicate with others instead.

All in all, in regard to our research questions, we can draw the conclusion that nudging employees is a sufficient approach to influence employees’ work discontinuance intention. Furthermore, out of all nudge options, disclosure, eliciting intentions, and ease have the strongest effect on work discontinuance intention.

6.2 Contributions for theory

Mobile technologies and mobile work enables the continuous ability to work and are, thus, substantial causes for stress and overload (Ayyagari, Grover, and Purvis 2011; Tarafdar, Qiang, Ragu-Nathan, and Ragu-Nathan 2007). For the same reason, it is becoming increasingly difficult to disconnect from technology. By putting this issue in the focus of this study, we contribute to the research field that is concerned with the “dark side” of technology (D'Arcy, Herath, and Shoss 2014). Specifically, we proposed a design-relevant concept that primarily contributes to reduce overload. Furthermore, in connecting work discontinuance with boundary theory (Ashforth et al. 2000; Clark 2000; Nippert-Eng 1996) and psychological detachment (Sonntag 2012), we explored how IT can be designed to enhance positive outcomes. To the best of our knowledge, this is a first conceptualization on how to design technology that allows detachment instead of increasing the users’ connectivity and loyalty. Our findings can be used to further enrich theory development to negative and positive effects of technology use.

Our research also contributes to design science by offering a new design theory for modern workplaces. Building upon previous research (Baskerville and Pries-Heje 2010; Gregor 2009; Niehaves and Ortbach 2016) we conceptualized an explanatory design theory to support work discontinuance intention. Therefore, we prepared the ground for further design science research in the context of information technology design for modern workplaces. Other researcher can build upon our findings to build new design theories in their context.

Finally, we contribute to nudge theory by operationalizing a broad variety of general nudge concepts for information systems research. Since nudge theory has been successfully used in other disciplines, e.g. policy making (Leggett 2014), we hope that our work encourages other researchers to use nudge theory to design information technology and transfer it to other areas such as e-commerce, social network or decision support research.

6.3 Implications for practice

Our research has implications for modern workplace design. Primarily our data suggest that there are at least three superior options (ease, disclosure, elicit) to encourage employees to prevent overwork by nudging them instead of enforcing them. Therefore, it is suggested instead of implementing enforcement-policies in information technology, organizations should consider to implement nudge-
options instead. Based on our general findings, commonly used systems such as communication technologies might be well-suited to apply nudge-options.

Our findings also imply that the remaining nudge options did not show significant differences to enforcement. Therefore, based on these findings applying nudge theory and the idea of soft paternalism (Sunstein 2014; Richard H. Thaler and Sunstein 2008) is equally useful to encourage individuals’ intention to discontinue work.

6.4 Limitations and Outlook

One limitation of the study is that the operationalization was done for a scenario on a personal computer. Therefore, our results may differ in a scenario based on mobile devices such as tablets or smartphones. Furthermore, since dual-use of technology is becoming commonplace it is important to consider that physical detachment is not possible anymore.

A second limitation is that this study is conducted against the background of knowledge work. Therefore, the findings are not transferable to manual labour. However, due to the increasing number of knowledge workers (Thompson, Warhurst, and Callaghan 2001), our findings are relevant for a broad number of employees.

Third, as our sample size was comparably low for multilevel analysis (Hox 1998; Maas and Hox 2005), the power of our data analysis might have led to some effects not being detected. Thus, future studies with larger samples would be preferable.

Finally, conclusions for real work contexts can only partially be drawn from an online survey. It might be that, although participants believed that one nudge option would lead them to discontinuance of work, their reaction in the real work context may be different. Therefore, our study can be regarded as a first step towards getting to know the influence of IT on work discontinuance that has to be supplemented by further research. Laboratory experiments or longitudinal field experiments could especially be beneficial for studying actual work discontinuance in the work context.

Besides addressing the aforementioned limitations this study places a solid foundation for future research on design-oriented research in the context of work. Nudge elements can be used and evaluated for a broader variety of concepts (e.g. to reduce stress, increase satisfaction etc.) to further enhance modern workplaces. Testing nudge options in an experimental setting, for example, to identify potential multiplicative effects between different nudge options, especially between disclosure, ease, and elicit, might be another fruitful approach.

7 REFERENCES


