12-15-2019

Towards an Integrative Understanding of Privacy Nudging – Systematic Review and Research Agenda

Torben Jan Barev
University of Kassel, torben.barev@uni-kassel.de

Andreas Janson
Kassel University, andreas.janson@uni-kassel.de

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Research in Progress

Torben Jan Barev
University of Kassel
Torben.Barev@uni-kassel.de

Andreas Janson
University of Kassel
Andreas.Janson@uni-kassel.de

ABSTRACT

When using digital technologies, various data traces are left behind for collection, storage and analysis. Innovative solutions for information systems are needed that mitigate privacy risks and foster information privacy. One mechanism to achieve this are privacy nudges. Nudges are a concept from behavioural economics to influence individual's decisions. This paper focusses on building an integrative understanding of privacy nudging. Specifically, we conceptualize the constituting characteristics of privacy nudges by conducting a systematic literature review to cover the current state of knowledge in the interdisciplinary privacy nudge literature stream. We structure the intrapersonal factors that determine effectiveness for each privacy nudge in a morphological box and conceptualize on this basis current research coverage as well as demand for future research. Finally, we develop theoretical propositions contributing to the discussion of how to study and design effective privacy nudges that can pave the way for more privacy sensitive IT systems.

Keywords

Privacy Nudging, Nudging, Information Privacy, Personality

INTRODUCTION

By 2022, 60% of the global gross domestic product is estimated to come from digital technologies (O'Halloran & Winston Griffin, 2019). When using digital technologies, various data traces are left behind for collection, storage and analysis. Widespread analysis of personal data yields substantial innovation potential, economic value as well as more efficient working models (Erevelles *et al.*, 2016). Yet, only 45% of people believe these technologies to improve their lives (O'Halloran & Winston Griffin, 2019). In the same context, public concern about the potential risks that the availability of personal information entails is growing. Especially as the vulnerability to discrimination, commercial exploitation and unwanted monitoring is ubiquitous. Thus, the acceptance and trust in modern IT systems are hindered.

Consequently, innovative solutions for information systems (IS) are needed that mitigate privacy risks and foster information privacy. Implementation such mechanisms can increase the acceptance, trust and usage of modern IT-systems. Privacy sensitive IT-systems can then constitute a competitive advantage for the company. One mechanism to achieve this is the implementation of privacy nudges in digital environments. Nudges are a concept from behavioral economics which are described as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options, or significantly changing their economic incentives" (Thaler & Sunstein, 2008). Thus, privacy nudges should help users to make better privacy decisions in their personal and professional life. However, when taking privacy nudging in specific into account, the effectiveness varies as nudges spark different reactions from one person to another (Sunstein, 2015).

Hence, this research project focusses on building an integrative understanding of user characteristics and nudge characteristics that determine nudge effectiveness in privacy-related decisions. Combining personal factors with the design of privacy nudges can pave the way for more privacy-sensitive IT systems. Accordingly, the guiding research question (RQ) of this short paper is as follows:

RQ: How can privacy nudges incorporate personal factors to increase their effectiveness?

For tackling the research question of this research-in-progress, we provide an introduction to decision making processes and privacy nudging. Then, we conduct a systematic literature review to match privacy nudge principles with the affected user characteristics. This serves as an overview concerning the current privacy nudge literature. At last, we provide (1) theoretical propositions contributing to the discussion of how to study and design effective privacy nudges, as well as (2) our next steps in our research endeavor.

THEORETICAL BACKGROUND

Information Privacy in Decision Making

Particularly in the context of information privacy related decisions, human decision-making is often imperfect, and

decisions are made that often do not correspond to the objectives pursued. Specifically, people value their privacy while they do not always protect it; this phenomenon is known as the Privacy Paradox (Barth & Jong, 2017). Research has shown that users of digital systems often act irrationally due to cognitive, emotional and social factors (Acquisti *et al.*, 2017; Thaler *et al.*, 2010). One approach to explain this is stated by Daniel Kahnemann's dual-process theory, which constitutes that individuals use two systems of thought. System 1 represents our intuitions or our unconscious autopilot. System 2 expresses itself through our conscious planning and control, which requires significantly more mental effort and time. Both systems are active at the same time and usually work together smoothly (Kahneman, 2012). In everyday life though, individuals rarely have enough time and information to fully evaluate all alternatives with both systems. Instead individuals tend to deploy so-called heuristics (mental short-cuts) (Hertwig & Grüne-Yanoff, 2017). Heuristics are informal rules of thumb that reduce the complexity of decision making and thus represent abbreviations in decision making. Although heuristics are an efficient way to solve recurring problems, they can lead to systematic errors such as biases in information evaluation (Kahneman, 2012). For example, personal data is often disclosed carelessly because the risk of unwanted monitoring is mentally less tangible (availability heuristics). These false conclusions are often systematic and thus predictable deviation from rational behavior. At this point nudges come to play. Nudging is a promising approach, so that the individual users of digital systems are enabled to make "better" decisions for their own data protection.

Privacy Nudging

Nudging is based on the principle of libertarian paternalism in order to influence user's decisions. This means that user can, at any time, freely choose a decision option (liberalism component). The individual's freedom of choice is not restricted, since none of the options are prohibited, and the economic incentive of the alternatives is not significantly changed. However, the individual is nudged to select the alternative that represents the supposedly greatest benefit for him (paternalism component) (Mirsch *et al.*, 2018).

In digital environment, nudging typically uses design elements in the user interface to influence behavior (Weinmann *et al.*, 2016). A sub-form of the digital nudges are the so-called *privacy nudges*. Privacy nudging describes a targeted influence on the decision-making process in order to lead people to make "better" decisions regarding their privacy (Acquisti *et al.*, 2017). Privacy nudges can influence both systems of thought by exploiting or mitigating heuristics in order to guide individuals to their informational self-determination (Weinmann *et al.*, 2016).

The full potential of nudges can sometimes not be exploited as many nudges aim to change the behavior of the "average" user. This may lead to weak results, as it is possible that a certain nudge has a strong positive effect on some individuals, but smaller, insignificant or even negative effects on others. (Egelman & Peer, 2015). An integrative understanding of nudges to be most effective is necessary. For this, it is crucial to know the mechanisms that need to be triggered to lead to the desired behavior. We therefore assess intraindividual processes influencing users' decision making.

METHODOLOGY

We conducted a structured literature review to analyze the privacy nudge literature. Following, we conceptualized the results for each privacy nudge in a morphological box and developed theoretical propositions contributing to the discussion of how to study and design effective privacy nudges. The systematic literature review was performed in May 2019 and draws on the methodology proposed by vom Brocke et al., as well as Webster and Watson (Webster & Watson, 2002; Vom Brocke *et al.*, 2015). The keyword "privacy nudg*" was used for the search. In order to ensure a certain degree of quality of the contributions, only scientific journals and conferences were considered. We excluded publications older than from the year 2000. Based on the proposed search process, a total of 111 articles can be identified. After an evaluation of the articles, 30 relevant articles can be selected, adding 8 relevant articles from the forward and backward search.

Following, we conceptualize the results for each privacy nudge. For this, research presents different approaches to classify privacy nudges (Hansen & Jespersen, 2013; Johnson *et al.*, 2012; Münscher *et al.*, 2016; Sunstein, 2014; Acquisti *et al.*, 2017). For the development of our morphological box (Meth, 2013), we adapt a privacy nudge classification proposed by Acquisti et al. (Acquisti *et al.*, 2017), which is presented in table 2. Here, privacy nudges are classified in six categories, which represent their underlying nudge mechanism: Defaults, Presentation, Information, Feedback, Error, Social Influence.

Privacy Nudge	Description
Defaults	Preselected options are set as defaults predetermining which private data is shared (Acquisti *et al.*, 2017)
Presentation	Provide contextual cues to convey the expected risk (Turland *et al.*, 2015)
Information	Providing additional information in to enable a realistic perspective on risks (Wang *et al.*, 2014)
Feedback	Feedback is provided after the process on consequences of user's actions (Acquisti *et al.*, 2017)
Error Resiliency	Expecting users to make errors and allow them to recover from them (Wang *et al.*, 2014)
Social Influence	Indication of popularity of an alternative serves as orientation for own behavior. (Zhang & Xu, 2016)

Table 2. Privacy Nudge Mechanisms adapted from Acquisti et al. 2017

RESULTS OF LITERATURE REVIEW

In the morphological box, which is presented below, we are matching the intrapersonal factors to the specific nudge types. Assigned to the nudge types, each line in the morphological box describes one dimension of intrapersonal processes that is assumed by literature to determine the effectiveness of privacy nudges. The initial letter of each nudge indicates connections between the intrapersonal processes and the specific privacy nudge as a result of our review. By adding numbers to each intrapersonal process, we illustrate the research coverage of each factor. Each count constitutes one research paper that assumes a correlation between the stated intrapersonal process and the respective privacy nudge.

For example, the default nudge addresses several factors. All factors that enable the default nudge are marked with an "D", and the adhered number indicates the research coverage. The correlation between intrapersonal factors and the default nudge is explicitly in five papers discussed. The status quo bias for instance is assumed by 2 papers to enable the default nudge (indication in this field: D2). Yet, some factors enable various nudges, such as framing effects. The indication of P5, I, F3, S4 illustrates that five papers assume correlations between framing effects and presentation nudges (P5), three papers assume correlations between framing effects and information (I3) or feedback nudge (F3), and four papers assume correlations between framing effects and the social influence nudge (S4).

Privacy Nudge Type	Heuristic	Bias	Personality	Emotions
Default (D) (5)	Availability Heuristic (P,I1)	Status Quo Bias (D2)	Openness to new experiences (D,P,I,F,E,S1)	Creepiness (S1)
		Overconfidence Bias (D,P1)	Conscientiousness (D,P,I,F,E,S1)	
Presentation (P) (8)		Priming (P1)	Extraversion (D,P,I,F,E,S1)	
Information (I) (8)	Hyperbolic Discounting (D,E,S1,F2)	Anchoring (D,P1,I,S2)	Agreeablenes (D,P,I,F,E,S1)	
Feedback (F) (10)		Loss Aversion (D,S2,P,F,E1)	Emotional Stability (D,P,I,F,E,S1)	Fear (I,S1)
Error Resiliency (E) (2)		Incomplete Information (D,E1,P2,I5,F4, S3)	Impulsivity (S1)	
	Framing Effects (P5,I,F3,S4)	Post-Completion Error (P1)	Risk-taking (S1)	
Social Influence (S) (13)		Representativenes s Bias (D1)	Sociability (S1)	

Figure 2. Morphological Box Presenting Characteristics Assumed to Determine Privacy Nudge Effectiveness

Generally, research in the privacy nudging literature covers predominantly cognitive effects that affect privacy nudging. Heuristics and biases enable primarily the effect of privacy nudges. Throughout all privacy nudges hyperbolic discounting, framing effects, loss aversion and incomplete information are the processes that privacy nudge literature focuses on.

In terms of personality traits, research diverges. A model that is often used in psychology to grasp individual's personality is the "Big 5 for Personality". Yet, the five-factor model only seems as a weak predictor of privacy attitudes (Egelman & Peer, 2015). Personality traits such as risk-taking, impulsivity and sociability appear to serve as better trigger, and should be considered in the privacy nudge design (Coventry et al. 2016). The same applies for the individual's current emotional state (Egelman & Peer, 2015; Coventry *et al.*, 2016). Especially fear and creepiness may influence privacy related decisions. For instance, if a consumer feels creepy, his judgement is influenced. This emotion can discourage him to select an option as he feels uncomfortable choosing it. Thus, specific emotional states can lead a consumer away from choosing risky options (Zhang & Xu, 2016).

To elaborate on the underlying mechanisms that enable each privacy nudge, we will introduce each nudge separately in the following paragraphs. For the sake of brevity of this short paper, we will focus on the main mechanisms that are affected.

Default privacy nudges are very effective since individuals often do not adapt privacy settings to their needs, the default option (the status-quo) remains overly preferred (status-quo bias) (Acquisti *et al.*, 2017; Thaler & Sunstein, 2008). In addition, the default option is used as a reference point. Each decision option is now weighed against this alternative, and the decision is influenced in this direction (Tversky & Kahneman, 1974).

Research concerning *presentation nudges* focuses mainly on framing effects. Framing effects exist, when two identical alternatives influence the consumer's decision-making behavior differently due to their different presentation. For example, colored fonts draw attention to selected elements in order to emphasize certain decision alternatives.

Regarding *information privacy nudges*, the probability of privacy violations is often incomprehensible underestimated. This can be attributed to representation heuristic, which states that individuals tend to incorrectly associate the frequency of observations of an event with its probability of occurrence. In this context, research also discussed the availability heuristic, which suggests, that decisions are based on information that is mentally easy accessible (Tversky & Kahneman, 1974; Acquisti *et al.*, 2017). To counteract these heuristics, nudges can inform individuals about the risks and consequences of the actions (Acquisti *et al.*, 2017).

Feedback nudges create awareness of individual's previous and current decisions and their consequences. Research analyzing this nudge covers mainly framing effects,

hyperbolic discounting and in large parts the state of incomplete information. It is assumed that the feedback nudge is enabled as individual's have not sufficient knowledge to make decisions in line with their motivations (Weinmann *et al.*, 2016).

Error resiliency privacy nudges can assist consumers, as decisions on privacy often favor risky and ill thought through decisions without taking possible long-term consequences into account. This is based on so-called hyperbolic discounting, in which the immediate benefit is overestimated, and costs incurred later are underestimated by individuals (Acquisti *et al.*, 2017). To counteract this, a time delay can be used as a privacy nudge (Wang *et al.*, 2014). In this way, the individual should be persuaded to act less impulsively and to rethink the message and possible negative consequences (Acquisti *et al.*, 2017).

The effect of *social influence privacy nudge* is based on the principle of social norms. The individual derives from the behavior of his fellow individuals to what extent it is appropriate to share personal information (Coventry *et al.*, 2016). Besides cognitive effects, research analyses the influence of personality traits that determine the effectiveness of this nudge. Research suggests that personality traits such as impulsivity, sociability and risk-taking are enabling the effectiveness of this nudge varyingly strong.

PROPOSITIONS FOR FUTURE RESEARCH

It is already evident that in the area of privacy nudges many authors have investigated the relationships between cognitive characteristics and effective privacy nudges. However, it must be said that it would be necessary to work out which cognitive effects are exploited, and which are mitigated. In addition, the objective for further objective could be how strong specific cognitive function in relation to each other and how strong they affect privacy nudging. An empirical validation could be a valuable research topic. In the area of personality traits significantly less research has been conducted. In order to design more effective privacy nudges and derive privacy nudge design knowledge, this might represent an interesting research gap that might be worth exploring. As the "Big 5 for Personality" seems only as a weak leverage point for privacy nudges, we suggest focusing on other personality traits such as impulsivity, risk-taking and sociability. Little research has already been conducted but needs to be objective for further elaboration. Therefore, we propose the first proposition that also contributes to the design of better privacy nudges:

Proposition 1: The consideration of intrapersonal factors improves the effectiveness of privacy nudging.

Emotions are generally considered as strong influencers in decisions making (Ho & Lim, 2018). Specifically, in the privacy nudge literature fear and creepiness are considered to influence privacy-related decisions. However, due to this point, predominantly social influence and information nudges are analyzed to make use of these emotions. Future research could therefore explore how other privacy nudges could address states of emotions as well. We formulate the second proposition as follows:

Proposition 2: Adapting privacy nudges to emotionally loaded individuals improves the effectiveness.

Our review results suggest that targeted privacy nudges can improve privacy-related decision making. As most of the analyzed intrapersonal characteristics are unconscious factors, effective personalized nudges should focus on system 1 thinking. Nonetheless, we highlight that privacy-decisions might also be related to be educative in some way, thus, making nudging the reflexive system 2 necessary. However, these theoretical linkages are not covered up until now from research. We therefore formulate the third proposition as follows:

Proposition 3: Address system 1 thinking with adaptive privacy nudges directly improves privacy-decisions while addressing system 2 thinking improves learning behavior and indirectly improves privacy decisions.

The propositions based on our review question offer possible directions for future research. Elaborating on these theoretical propositions may contribute to the discussion of how to study and design effective privacy nudges. Combining the personalization of privacy nudges may represent a promising approach to lead individuals to informational self-determination. When knowing how adaptive privacy nudges can be designed, the right execution can be considered. It can be worth discussing how personalized nudges can operate automatically and without active user involvement. Automated and adaptive privacy nudges could then mitigate privacy risks and foster information privacy in modern IT systems. In doing so, it must be considered and should be objective to further discussion, what relationship of personalization or data analysis and anonymity of the user is most desirable. It can be discussed to what extent guidance and assistance is most appropriate for users.

CONCLUSION AND NEXT STEPS

Improving the design of privacy nudges can pave the way for more privacy sensitive IT systems. Thus, fostering acceptance and trust in modern IT systems. As next steps, we focus with our completed research on deriving successful configurations of privacy nudges and empirically test them, thus, also operationalizing the propositions of our short paper. For this purpose, we analyze the review results in the next step with a qualitative meta-analytical approach that makes use of the qualitative comparative analysis methodology (Combs *et al.*, 2019). The then derived configurations are tested for an empirical grounding of the derived theoretical implications.

ACKNOWLEDGEMENT

This paper presents research that was conducted in context of the project "Nudger" (funding number: 16KIS0890K,

managed by the VDI/VDE Innovation + Technik GmbH), funded by the German Federal Ministry of Education and Research (BMBF). The responsibility for the content of this publication remains with the authors.

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