Order Effects in Observations of Stated and Revealed Privacy Preferences

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Abstract. Many Internet services rely on consumers disclosing their personal data. Despite heavy usage and wide acceptance of services like Online Social Networks, doubts about sustainability of trusted relationships remain. Surveying consumers about their preferences reveals severe concerns about the fate of their personal data. In stark contrast to privacy concerns (stated preferences), however, consumers generously disclose personal data in exchange for free Internet services (revealed preferences). It has been argued that individuals experience dissonant states in privacy decision making. The tension between stated and revealed preferences is eliminated with the decision made in order to reduce discomfort. This paper proposes a survey design to determine 1) order effects as indicators for dissonant states in privacy decision making, and 2) the degree of experienced tension between stated and revealed preferences. Observations of data valuation and disclosure behavior are dissonant if they do not commute, i.e. disclosing data prior to valuating privacy does not equal privacy valuation before data disclosure. Determining the degree of dissonance in privacy decision making is expected to inform the design of transparency mechanisms to influence experienced dissonance between stated and revealed privacy preferences.

Keywords: Privacy Decision Making, Cognitive Dissonance, TET 2.0.

1 Introduction

With the global acceptance of Internet services dealing with personal data, generous disclosure behavior of individuals has posed pressing research problems. One of the biggest issues at present is the challenge to establish trust among all the Web participants involved in order to sustain the benefits of digital life for individuals and society at large. Measuring trust or the lack of it, however, is a difficult exercise, last but not least due to paradoxical preferences stated and revealed by Web users. What came to be known as the privacy paradox measures the contradiction between high valuation of privacy and generous disclosure of personal data [1]. Many attempts to explain this discrepancy have been put forth from psychological, sociological, and economic perspectives. Some authors argue that individuals attribute a higher value to the benefits of Web services arriving sooner in time compared to the associated costs and

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long-term risks in the far future [2]. Others share the view that peer group pressure imprisons Web users in Online Social Networks effectively rendering opting out behavior and avoidance of data disclosure undesirable [3]. Economically, it has been argued that Web users have information deficits about the way their data is used and valued on data markets which makes them careless about privacy matters [4].

More recently, privacy decision making has been put under the light of cognitive dissonance theory [5]. The theory of cognitive dissonance attempts to explain the behavioral phenomenon of a person experiencing two conflicting cognitions (behaviors, ideas, beliefs, or attitudes) [6]. People reduce or eliminate the tension arising from the dissonance by either changing cognitions or adding new cognitive elements in order to reduce discomfort. Subjects in dissonant situations experience an inconsistent state of mind and with the decision made they rationalize their choice in order to re-establish a consistent state. For instance, a smoker who knows or learns about negative health effects, either stops smoking, changes his attitudes towards smoking, or adds explanations about smoking to reduce dissonance, e.g. car driving is more dangerous than smoking. Likewise, Web users are supposed to experience two conflicting situations. On the one hand, they appreciate the right to be left alone in private. But when confronted with attractive Web services they change their attitude and generously disclose sensitive information about their personality and private life. Cognitive dissonance seems to have an impact upon privacy decision making and raises the following research questions:

1. Do Web users experience cognitive dissonance in privacy decision making?
2. What is the degree of cognitive dissonance in privacy decision making?
3. Can Transparency Enhancing Technology (TET) influence cognitive dissonance and trigger change?

The objective of this paper is to propose a design to measure cognitive dissonance in privacy decision making and pave the way for further studies on the effectiveness of Transparency Enhancing Technology (TET). TETs like privacy statements or dashboards for personal data management are meant to enable Web users to exercise their right to informational self-determination, i.e. their right to control, edit, manage, and delete personal information and decide when, how, and to what extent it is communicated to others [7]. At present, TETs are hardly used. Offering to Web users incentives thereby influencing dissonant behavior may inform TET 2.0, a new generation of transparency mechanisms changing user behavior towards trusted relationships based upon their free self-determination.

The method of research presented in this paper follows the design science paradigm [8]. A survey design is developed and implemented on the basis of methodological considerations on how to operationalize the measurement of cognitive dissonance in privacy decision making. Drawing from Flender and Müller (2012), privacy decision making is inconsistent or dissonant if observations of stated and revealed privacy preferences are not interchangeable, i.e. they do not commute [5]. The design developed in the following accounts for order effects in measurements of privacy preferences.

2 Order Effects Indicate Dissonance in Privacy Decisions

The baseline of many privacy research problems is the paradoxical observation of generous data disclosure and high appreciation for privacy [9,10,11,12]. When people reflect upon the value and sensitivity of their personal information most of them are deeply concerned about the fate of the traces they leave on the Internet. Contrary to stated preferences, however, most people reveal a low valuation of their personal data when it comes to eased communication and cooperation on the Internet, comfortable online shopping, or reciprocal attention spending in Online Social Networks. A recent explanation of the privacy paradox was developed in [5] and draws from cognitive dissonance theory. According to preference (type) indeterminacy in privacy decisions, the paradoxical nature of privacy decisions stems from the fact that states of decision outcomes are constructed with the decision made and thus do not exist prior to their construction. Moreover, the state of a decision outcome depends on the sequential order of successive measurements of privacy preferences. If sequential observations of stated and revealed privacy preferences interfere, order effects apply and indicate dissonance.

Mathematically, two conflicting privacy decision situations are modeled as two observables, or properties. The outcome state of a sequence of successive privacy decisions is determined with the decision made but not prior to it. For instance, measuring "high valuation of privacy" and observing "generous data disclosure" are two states of two privacy decision situations A (stated preference) and B (revealed preference). By means of a numerical example representative of the privacy paradox, it was shown that the sequences AB and BA do not commute, i.e. $AB_p \neq BA_p$ where p is a state after two sequential decision situations A and B with the potential states *a1*) high valuation and *a2*) low valuation for A, and *b1*) data disclosure and *b2*) data concealment for B. Prior to an actual decision, individuals reside in a dissonant state of potentiality, i.e. a linear superposition a1 + a2 and b1 + b2 respectively. With the decision made the tension between A and B reduces the dissonant state to p which marks an opinion change, a behavioral change, or rationalization. It was shown that A and B cannot be measured simultaneously, i.e. they are incompatible or do not commute, by proving the probability of data disclosure after data valuation to be lower than the probability of data disclosure before data valuation. In other words, order effects in sequences of successive measurements of stated and revealed preferences model the dissonant situation of individuals experiencing a tension between two conflicting though not yet determined cognitions.

Theoretically, cognitive dissonance offers a new explanation of why people disclose data they way they do by arguing that privacy preferences are indeterminate and dissonant up to the point in time a decision is made. Stating preferences and revealing preferences about personal data are not interchangeable. Instead observations of stated and revealed preferences interfere, i.e. order effects apply when stating preferences before revealing preferences and vice versa.

The next section discusses studies for determining privacy preferences empirically. There is a multitude of methods for measuring Willingness-to-Pay (WTP) for public and private goods. Each method only represents the attempt to come as close as possible to the truth [13]. There is not one best method. Rather appropriateness of a method depends upon validity and feasibility with regard to a given research problem. Validity of a method for measuring cognitive dissonance in privacy decision making has to account for the context-dependent nature of privacy preferences. Preferences are not out there readily determined. In fact, preferences are never revealed but constructed with the decision made. Two basic methodological assumptions derive from the discussion so far. First, the design for measuring preferences abstains from naive realism, or the claim that true preferences are out there readily determined. Second, the design assumes that observing order effects is a necessary condition for dissonant privacy decisions.

3 Observations of Privacy Preferences

To determine preferences of individuals about products and services Willingness-to-Pay (WTP) measures the value someone attributes to a material or ideal good. Generally, direct and indirect WTP methods are distinguished [14]. The former ask for the price someone would be willing to pay for a good. This could be the maximum price someone is willing to pay or the minimum price someone would charge for a good. Indirect methods survey participants about the legitimacy of a given price for the product in question. The problem with direct methods is the variability of preferred prices as individuals may differ substantially in their valuation of goods. Asking for the legitimacy of a given price bears the problem that answers provide less information about the true value individuals attribute to the product. Generally, WTP methods strive for incentive compatibility, i.e. subjects ought to reveal truthfully any private information about their willingness to pay for a good without taking strategic considerations into account, e.g. concealing private information now may bring bargaining advantages in the future. Thus incentive compatibility presupposes preferences to be out there readily determined for the subject though concealed for strategic reasons.

Determining WTP for privacy necessitates special consideration. Privacy is not a tangible good traded on designed or pre-configured markets. Rather it is a derived human right and treated differently with dependence upon culture and political regime. For instance, in Germany, privacy is often associated with the right to informational self-determination, i.e. the right of individuals to control, edit, manage, and delete their personal data and decide when, how, and to what extent it is communicated to others [7]. Hence privacy is more of a public good like environmental prevention or protection from crime provided by the administration though, like property rights, it is tightly linked to each individual in a society. The value individuals attribute to their personal data is a good indicator for their perceived importance of privacy. Since people do not trade personal data like they buy cars or pay for clothes but rather disclose personal data in exchange for using free (Internet) services WTP determination is somewhat different compared to classical goods or resources.

In the context of privacy research Willingness-to-Accept (WTA) payments for personal data and Willingness-to-Protect (WTPr) personal data are common variants of WTP. WTA observes the value someone would accept from a third party for making use of his personal data. The value someone would pay for data protection is measured by WTPr.

In the context of Online Social Networks, Krasnova et al. (2009) conducted a conjoint analysis to determine WTP of users being assured that the provider does not make use of their personal data [15]. The authors abstain from incentive compatibility and ask indirectly about stated privacy preferences of network users. From the background of their knowledge that the provider does not make use of personal data, users' average willingness to pay a monthly fee for continuing using the network was found to lie between €14.40 and €17.24.

Beresford et al. (2010) conducted a WTA study and showed that participants were willing to accept even small amounts of money for the disclosure of their data [16]. Participants were obliged to buy a product online and with disclosure of personal data they received a small discount. Receiving a discount for data disclosure determines WTP indirectly. Obligations to actually buy a product generate incentive compatibility.

Bauer et al. (2012) determined WTPr or the price someone would pay for data protection [17]. The authors conducted a study according to the BDM method [18]. Participants received information about a fictive scenario where all Facebook users were threatened by the loss of their profile and asked directly for their WTPr personal data. Incentive compatibility was implemented by means of a lottery drawing.

Acquisti et al. (2009) examined participants receiving shopping vouchers where the value of each voucher depended on personal data disclosure [19]. Participants were offered a price for their personal data. The more they were willing to disclose information the higher was the voucher value. According to this strategy participants were indirectly asked about their WTA payments for personal data and incentivized by the possibility to actually redeem vouchers. Interestingly, the authors were able to show that WTA payments for personal data is higher than WTPr personal data. Data protection and data sales are two different scenarios and with dependence upon contextual situation people value their data differently. Likewise, it appears reasonable that stated and revealed preferences are contingent upon observational context.

In summary, there are direct and indirect methods as well as incentive compatible and incentive incompatible means for determining privacy preferences. Direct methods are cognitively more demanding as personal data is not a tradable good. Participants may not have a clue about the monetary value of their data. Moreover, for measuring cognitive dissonance the monetary value is not of interest. What counts is the deviation between stated and revealed preferences. Obligations to buy products under consideration of discounts, vouchers, or other benefits offered in exchange for data disclosure create incentives to reveal true preferences. However, in most economic transactions and even more in Online Social Networks or other data sharing scenarios based on reciprocity, data disclosure is a side effect and there is no explicit trade-off between product and data. Incentive compatible methods create a highly artificial observational context and it is questionable if obligations trigger the

revelation of true preferences. From the assumption of preferences being constructed with the decision made incentive compatibility appears even more suspicious. Last but not least, some authors argued that auctions and lotteries bear understanding problems and, instead of avoiding strategic valuations, they cause strategic behavior [20].

4 Order Effects in Observations of Preferences

In many disciplines such as linguistics or cognitive psychology it is well known that the meaning of words or concepts depend on the context of their usage. Homonyms such as apple are good examples of context-dependent semantics. In the context of a eating a fruit apple has a different meaning compared to the context of a using a computing device. In his Philosophical Investigations Wittgenstein famously noticed that language has more than a denotative function. Speaking words or asking questions is always part of an activity, or form of life [21]. Likewise, determining WTP through surveying participants is a highly context-dependent activity. Here it was shown that the order of questions posed in a survey changes answering behavior of participants [22]. In other words, WTP is influenced by order effects which are expected to be a rule rather than an exception [23].

In several WTP surveys observations of proximal and distal order effects have been made [24]. Proximal order effects influence WTP according to the sequential measurement of successive questions. Distal order effects influence WTP due to information provided, or questions asked, outside of the WTP questions posed. For instance, asking participants about the price they would charge for disclosing their address details prior to asking them for the price they would charge for revealing their income level is supposed to reveal proximal order effects. WTP is expected to differ from the WTP where questions are ordered the other way round. If participants assume that income level will be associated with address details their valuation is expected to differ from the situation where they do not draw this association.

Distal order effects stem from information provided prior to WTP questions, or demographic questions determining participants' age and gender. For instance, values for WTA or WTPr of users in Online Social Networks are supposed to differ with respect to a scenario where the network provider is named, e.g. Facebook, or a scenario where the provider is kept incognito.

In the literature several attempts have been made to design surveys in a way that prevents order effects. Bateman et al. (2001) ask participants to value product bundles where each bundle is ranked according to its size [25]. Top-down rankings list large bundles on top, whereas bottom-up rankings show products descending from small to large bundles. The authors argued that WTP is higher for product bundles following up on smaller bundles. Vice versa, WTP is lower for bundles valued after the previous judgment of a larger bundle. A potential explanation of such proximal order effects is a successively changing visible choice set. A visible choice set is a complete list of goods participants have in mind during the whole surveying process. The direction of goods to be valued, i.e. top-down or bottom-up, but also changing number and type of goods, influences perceptions of visible choice sets. To prevent proximal order effects

occurring with dependence upon changing visible choice sets (stepwise disclosure), participants should be informed about all products to be valued prior to revealing their WTP (advanced disclosure).

As a mean to avoid order effects a priori advanced disclosure substantiates the role of knowledge about the good to be valued. Several studies witness a decreasing likelihood of order effects when participants are used to the particular good in question [26]. For instance, Boyle et al. (1993) found that WTP of people inexperienced in white-water rafting is prone to order effects while WTP of rafting professionals is not [27]. Kartmann et al. (1996) proved the absence of order effects in surveys where patients had to state WTP for treatments they were familiar with [28]. Transferred to the privacy paradox, familiarity with one's own privacy preferences is likely to have an impact on cognitive dissonance. If advanced disclosure indeed influences privacy preferences remains an empirical question.

Batemann et al. (2001) and Bateman et al. (2003) argued that in sequential answers to successive WTP questions order effects are likely to occur if participants state their willingness to pay for additional or extra features of previously judged goods [22,25]. Such inclusive lists present goods not as alternatives to be valued independently of each other, but as associated features where the value depends on previous judgments of related goods. Exclusive lists are countermeasures and present goods independently of each other. In other studies Kumar et al. (1991) and Chrzan (1994) conducted a conjoint analysis where product profiles are presented with varying attributes [29,30]. The authors showed that the order of product attributes influences WTP.

As discussed by Cai et al. (2011) distal order effects have an impact on survey results [24]. Information and descriptions provided prior to, or outside of, WTP questions is subject to varying interpretations. Therefore, the authors suggest randomizing all the information provided in the survey. Others found incentive compatible methods to be susceptive to distal order effects. Clark et al. (2008) argued that despite the purpose of the BDM method to guide participants in revealing their true WTP, often, people are misguided in understanding that stating their true WTP is in their own best interest [26]. Enlightening participants about what is best for them is a difficult exercise as people are quite unique in their ability to learn and apprehend the purpose behind inquiry. Teaching participants to act compatibly with the incentive provided is hard to control. Similar issues arise for auction mechanisms. Avoiding distal order effects in Vickrey auctions is difficult since explaining incentives behind second-price sealed-bid, i.e. exhausting WTP, also requires participants to learn and apprehend the purpose behind inquiry. Moreover, if participants interact among each other during auction experiments distal order effects are even harder to avoid.

5 A Design for Observations of Dissonant Privacy Preferences

Based on the discussion of WTP studies and order effects in the previous sections a design for measuring preferences in privacy decision making is developed in the

Table 1. Assignment of WTP Questions and Tasks to Treatment Groups

Treatment 1	Task 1	Question A Question B	Treatment 2	Task 1	Question B Question A
	Task 2	Question D Question C		Task 2	Question C Question D
Treatment 3	Task 2	Question C Question D	Treatment 4	Task 2	Question D Question C
	Task 1	Question B Question A		Task 1	Question A Question B

remainder[1]. Individuals experience dissonant states if data valuation (stated preferences) and disclosure behavior (revealed preferences) do not commute. Two basic methodological assumptions derive from the discussion so far. First, the design for measuring preferences abstains from naive realism, i.e. the claim that true preferences are out there readily determined. Second, the design assumes that observing order effects is a necessary condition for dissonant privacy decisions.

There are four questions A, B, C, and D. Questions A, C determine stated preferences for two similar scenarios. Likewise, questions B, D measure revealed preferences. A and B (scenario Facebook) measure the same type of data, i.e. name, address, and phone number, whereas C and D (scenario Amazon) also ask for the same type of data, i.e. bank account, monthly income, and credit card information.

All questions are assigned to two different tasks. Task 1 comprises questions A and B (scenario Facebook); task 2 is composed of questions C and D (scenario Amazon). Each task represents a sequential order of two successive questions. There are four treatment groups each of which is assigned two tasks where the order of the two questions within each task either starts with a stated preference question or a revealed preference question dependent upon the other tasks. For instance, participants in treatment group 1 start in task 1 with a stated preference question and in task 2 with a revealed preference question. The variation of questions and tasks is meant to counteract order effects. The reason for having four questions, or two scenarios (Facebook and Amazon), is that order effects can be determined for each individual of a treatment group. With only two questions, or one scenario (Facebook or Amazon), determining order effects would be possible solely between individuals of different groups. Individuals of one group would face only one order context, i.e. either AB or BA (cf. section 2).

Drawing from other studies observing privacy decision making, stated privacy preferences are best determined by surveying people about the degree to which they agree or disagree with a third party making use of their personal data (agreement). The degree to which people are concerned or agree with a third party constraining their right to privacy by making use of their data accommodates the fact that privacy

[1] A first version of the survey implementation is available at `https://www.elearning.uni-freiburg.de/ofb/iig/, password: abba`

is not a tradable good. Surveying participants indirectly appears reasonable since the real monetary value someone would charge a third party for making use of his personal data is not of interest.

Question A: I am concerned about the following data being used by Facebook for commercial purposes. [1: I disagree - 7: I strongly agree]
1. phone number
2. address details
3. name

Question C: I am concerned about the following data being used by Amazon for commercial purposes. [1: I disagree - 7: I strongly agree]
1. bank account
2. monthly income
3. credit card information

Revealed preferences are determined by measuring the degree to which someone complies with data disclosure as a necessary requirement for continuing using a service after terms and conditions have been changed (compliance). The degree of compliance mirrors the attractiveness of the service and the willingness to disclose personal data in exchange for using the service.

There are several reasons for not choosing an incentive compatible method to determine revealed preferences. As discussed in section 3 obligations to buy a product in line with discounts or vouchers received in exchange for data disclosure creates an artificial context. Moreover, as discussed in section 4, incentive compatible methods are prone to order effects due to their attempt to communicate the incentive behind inquiry. Since participants differ substantially in their ability to learn and comprehend the purpose of determining their true WTP, distal order effects would be introduced into the survey design. Apart from incentives, surveying participants indirectly appears also reasonable here. The real monetary value for continuing using the service is not of interest and variability is reduced.

Question B: Suppose Facebook changes its terms and conditions. To continue using the service all members are required to disclose their personal data truthfully. In case of false information the provider will close the respective account. Would you disclose the following data truthfully in order to continue using the service? [1: No - 7: Yes]
1. phone number
2. address details
3. name

Question D: Suppose Amazon changes its terms and conditions. To continue shopping online on Amazon members are required to disclose financial data. In case of false information the provider will close the respective account. Would you disclose the following data truthfully in order to continue using the service? [1: No - 7: Yes]
1. bank account
2. monthly income
3. credit card information

The following measures are applied to deal with order effects. First, participants accessing the survey are randomly assigned to one of the four treatment groups. According to the order of tasks as shown in Table 1 participants state and reveal their privacy preferences. Randomization of group assignments is meant to avoid order effects built into the design. Order effects can be determined for each individual by comparing WTPs for both scenarios, or they are observed on an aggregate level for each group. Additionally, WTP is compared among the four treatment groups. Second, before stating and revealing privacy preferences, participants receive information about the independence of each of the questions. Avoiding inclusive lists and semantic interdependence of questions explicitly counteracts order effects. Third, prior to WTP questions participants receive information about the process of the survey, i.e. information about the number of questions and what the questions are actually about. Advanced disclosure counteracts proximal order effects which are due to diverging visible choice sets. Finally, before the WTP questionnaire starts, participants' experience with the services is determined by asking for their familiarity with the subject. In the analysis phase familiarity as well as demographics will help clustering data according to their impact on order effects.

6 Conclusion and Future Work

Disclosure and dissemination of data has gained momentum. Incentives for using Internet services are tremendous and most Web users would not like to live without being online anymore. Nevertheless, most Internet users are deeply concerned about their digital future and the fate of their personal data. Being dissonant with regard to attitudes, opinions, and behaviors is omnipresent and not unusual for digital citizens. Here it was argued that cognitive dissonance accounts for the privacy paradox and that it can be measured in terms of order effects in sequential observations of successive privacy decisions. Existing WTP studies for determining the value of privacy have been discussed as well as design principles to avoid order effects built into the survey design. Eventually, a design artifact for measuring order effects in sequential privacy decisions has been proposed and implemented. Conducting the survey and presenting analysis results is planned for the near future.

The implications for follow-up studies are striking. Determining the degree of dissonance opens the arena for studies on the effectiveness of Transparency Enhancing Technology (TET). The guiding design principle for TET 2.0 to influence cognitive dissonance may become incentives, e.g. recommendations or search results, which do not fit putative preferences derived inferentially based upon individual and collective online behavior [31]. Large incentives keep cognitive dissonance low and thus may hinder change instead of reinforcing it. Accordingly, effectiveness of TET 2.0 hinges on the right magnitude of incentives imposed upon individual online behavior.

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