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Understanding Privacy Disclosure in the Online Market for Lemons: Insights and Requirements for Platform Providers

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Abstract. Future used car markets may use personal data to reduce information asymmetries between car sellers and buyers, e. g. on past driving behavior. Reducing information asymmetries is attractive for used car platforms as they can move from pure information provision to orchestrating transactions. However, car sellers and buyers have to agree to sharing personal data. What kind of data is interesting for them? Under what circumstances are they willing to share this data? What should a platform do to support data sharing? We explore those research questions as part of the Cardossier project by conducting experiments with the Car-Market Game, simulating a future car market. The results indicate that there is no market for pure personal data (e. g. photographs of sellers), but there is a market for car usage data. From future used car platforms the participants expect disclosure control and disclosure transparency in an environment free of interpersonal trust.

Keywords: Privacy Preferences, Personal Data Disclosure, Trust, Used Car Platforms

1 Introduction

The used car market is characterized by information asymmetries: The seller of a car knows more about the quality of a car than a potential buyer. As already noted by Akerlof [1], markets with such information asymmetries are prone to fail as ‘lemons’ (= bad cars) drive out ‘peaches’ (= good cars) until the market collapses. It is thus in the primary interest of used car platforms, such as Autoscout24, to decrease information asymmetries. If potential buyers could gain sufficient information about the quality of a used car, they would not need leave the platform to physically inspect many cars or turn to professional used car dealers because of their reputation and guarantees. This would increase traffic on the platform and ultimately the revenue of the platform.

Systems like Cardossier promise to increase market transparency: They collect all important events in the lifecycle of a car, e. g. registrations, accidents, repairs, and driving behavior. So, used car platforms are interested to integrate them into their

offering. However, the history of a car can contain sensitive data about the car's drivers and owners. European data protection laws require the consent of the car sellers for the release of such sensitive data. So, the question arises: What can a platform do to acquire this consent from car sellers?

As a first step, the platform needs to understand what sensitive information car buyers are interested in when looking for a used car. Interesting sensitive information may not be limited to information about the car's history. Car buyers may also want to establish interpersonal trust in the car seller in order to accept any remaining information asymmetries; and car sellers may want to establish trust in the car buyer to make sure that they receive the payment for the car and that the car is not misused while they are still legally responsible for it. Such interpersonal trust building could be mediated [2] by platforms by providing certified information about the seller or the buyer. So, we ask very generally:

RQ1: What sensitive data are sellers and buyers interested in and willing to share?

Only if information consumers (= classically: the buyers) are 'sufficiently' interested in getting access and information providers (= classically: the sellers) are 'sufficiently' willing to provide data, there is a chance that they can share data on the platform. Economically, 'sufficient' means that the information consumers need to value information at least as high as the information providers value the compromised privacy. If this is the case, a platform can facilitate the exchange of data, e. g. by asking the information consumer to remunerate the information provider. In a first exploratory study, we will address research question 1. The answer provides the platform insights, *what* data should be provided.

However, willingness to share is not free of context. Car sellers may want to release sensitive data only to selected buyers and only once the negotiation has progressed to a certain stage. So, the question *how* data sharing should be orchestrated remains. We will address this question in a second exploratory study, asking:

RQ2: What preferences and expectations do individuals have when disclosing their personal information in the used car market?

The answer to this question will provide used car platforms with requirements for building systems that facilitate data exchange and ultimately reduce information asymmetries in the market for lemons.

The subsequent section will first introduce related work on emerging changes in the used car market and the role of platforms as a mediator and as a car data market. As the envisioned markets do not yet exist, behavioral data on privacy preferences and privacy disclosure behavior is still lacking. We therefore inform our research from the closest existing domain: eCommerce. We ask how privacy is conceptualized there, what people expect, and how data disclosure is managed.

After the related work, we introduce the chosen research methodology, the research setting, and the data collection. As we strive to improve the market position of the used car platform, we selected a design research approach. The research is situated as a part of the Cardossier project. Data is collected from experiments with Car-Market Game. Car-Market Game is a game that simulates a future used car platform.

The subsequent results section offers the data collected in two experiments. Data from the first experiment indicates that there is no market for purely personal data (e.

g. a photograph of the other party), but there is a market for car usage data. Data collected in the second round of experiments validates the insights from the first experiments. In addition, results indicate that participants expect disclosure control and disclosure transparency in an environment free of interpersonal trust.

The subsequent discussion section analyzes what the insights mean for used car platforms, translates those insights into requirements for platform owners, and present novel insights concerning privacy in eCommerce. Conclusions and limitations close the paper.

2 Background and Related Work

2.1 Emerging changes in the used car market

Cars become increasingly software-intensive [3] and car manufacturers strive to develop platforms [4] to generate value from the data gathered during car usage. EU initiatives limit their power, forcing car manufacturers to provide open interfaces for third parties to make use of the data. Other actors in the car ecosystem, such as garages, insurances, mobility service providers, and registration authorities, wake up and see the opportunities in generating value from their ‘data treasures’. They team up in Blockchain consortia [5] to jointly generate value in a distributed setting [6]. One value proposition is a jointly generated Cardossier that reduces the information asymmetries in the used car market. While such a Cardossier may be a double-edged sword for garages and established used car dealers [7], used car platforms will be net-benefactors. Until now, their activities have been limited to the information search phase [8] of a used car sale. The actual deal is closed outside the platform with a used car dealer or a private person. A trustworthy and complete Cardossier turns a used car into a commodity and it may be traded without inspection just like a new car. This allows used car platforms to expand their offering up to the actual transaction phase, i. e. deals can be negotiated and closed over the platform. The platform can then offer new services such as payments, certified data or trust mediation.

Prior research indicates that there indeed is a market for trusted car data [9] and that a complete Cardossier has a value in the order of 100 Euros. This research assumes that this data is available in the market place and stakeholders are willing to share it. Researchers have addressed multiple issues here such as the architecture of such a system [5], assuring data quality [10], the inclusion of the public sector [11], and the building of an appropriate governance [12]. It is also clear that car usage data can be sensitive and is protected by GDPR [13]. Therefore, its use on platforms needs the car owner’s consent. However, it remains unclear whether the sellers are actually willing to share sensitive data and where the buyers see value.

There are three types of data that is potentially relevant for used car sales:

1. The static core data of a car, such as its brand, age, color, or weight. This data is readily available as soon as the car has been produced and it is captured in public platforms for little charge. Most countries agree that this data is not sensitive.

2. The car usage data covering what has been done with the car and what has happened to it, e. g. repair data, accident data, registration data, or driving behavior data (who?, where?, when?, how careful? etc.). In Europe, this data is regarded as sensitive data under GDPR.
3. The personal data of the sellers (or buyers), i. e. their names, addresses, picture, job, credit history etc. This data is also sensitive.

Static core data is or will soon be readily available in many countries and is not sensitive. Therefore, it is not relevant for this study. The other two types of data are relevant. If car usage data is relevant and the platform can persuade the stakeholders to release it, the platform can not only expand its reach on the value chain, but also establish itself as an actor in car data trade [9]. If personal data of the sellers or buyers is important, a used car platform can establish itself as a mediator of interpersonal trust [2]. Research on this issue should take into account what we already know about privacy in the eCommerce sector.

2.2 Privacy in eCommerce: Privacy Behavior and Privacy Negotiations

Privacy can be defined as a dynamic process of social boundary management by which individuals grant or deny access to other individuals or one's group [14]. *Privacy boundaries* are often negotiated between the involved parties and readjusted over time. However, if they are not clearly defined or the parties differ in their privacy rules, conflicts arise. These conflicts can affect the willingness to disclose information and hinder the relationship between the parties, or worse, lead to reluctance [15].

In the eCommerce context, *online privacy* can be referred to as the process of controlling access to the self while using Internet services. A distinction is made between the *desired level of online privacy* (the extent of control users want) and the *achieved level of online privacy* (factual privacy that users acknowledge having and executing) [14]. Bringing their achieved online privacy in line with their desired level is a continuous process of optimizing privacy and self-disclosure. Thereby, individuals follow the *privacy calculus* that posits: Online self-disclosures are based on a cost-benefit tradeoff [16] that is influenced by the lack of control resulting from the risk of fraudulent actions and mistrust towards the information recipient (in eCommerce mostly a company) [17]. The literature, however, stresses that emotional, situational, affect-based and contextual factors also influence this calculation [18], especially in online contexts [19]. The actual *online privacy behavior* furthermore depends on the user's attitude towards privacy. The user's attitude is influenced by past experiences with privacy breaches and by their skills in using the Internet (literacy) [20].

Privacy behavior and privacy calculus manifest themselves in user preferences on withholding and revealing personal information. These preferences can be administered by privacy management. An appropriate privacy management does not only allow users to control data access, but also offers *traceability* of data use by the platform, data providers, and data consumers [21]. Previous research covered traceability of personal data in social networking sites [22], on mobile phones [23], and towards third parties in business relations [21]. However, there is currently no insight into a peer-to-peer used car market.

The used car market resembles more peer-to-peer markets like eBay than business-to-consumer markets like the core of Amazon. In these consumer-to-consumer markets, the quality of products is frequently uncertain, and prices are frequently agreed upon in auctions or negotiations. The used car business distinguishes itself from even those consumer-to-consumer platforms, as it deals with a highly valuable product with a history that is potentially sensitive. Hence, it is unclear whether the disclosure control and trust building strategies suggested by literature (e. g. [17, 24]) can be applied in this context.

3 Research Design and Methodology

This research was conducted as part of an Action Design Research [25] project striving to develop the Cardossier. The research reported here strives to uncover requirements for enhancing the trade of sensitive data in used car markets. Requirements are a typical outcome of design research [26, 27]. The requirements were elicited in two exploratory studies. In each of them, users were exposed to the Car-Market Game, an experimental platform that simulates a future used car market. This Car-Market Game provided features for searching for cars, buying and selling data from the Cardossier, negotiating with potential sellers, and settling a transaction. After playing the Car-Market Game, the participants were asked to state their privacy expectations and to evaluate existing privacy features. The first study explored the interest in sensitive data and the willingness to share personal information to find an answer to our RQ1. The second study investigated the car sale negotiation process for an in-depth understanding of the privacy disclosure behavior and inherent preferences of the participants to derive requirements as an answer to our RQ2. For data collection we used a mixed-method approach, including quantitative and qualitative methods [28]. The next sections will briefly introduce the Cardossier project and the methods for data collection before it will go into details on the experimental design.

3.1 The Cardossier Project¹

The “Cardossier Project” aims to develop an electronic record for the used car trade in Switzerland based on a consortium distributed ledger. The initial consortium of companies and organizations consisted of an insurance company, a car dealer and importer, a car sharing company, a road traffic authority, a software company, and two universities. The main objective of this project is the reduction of information asymmetries by providing a car’s history that decreases uncertainty and increases trust between the parties involved. It aims to digitalize and improve the processes, minimize redundancies, and establish a trusted *digital ecosystem* for car-related data management between all the players participating in the life cycle of a car. The different stakeholders contribute car-specific data, utilization-related personal data and personal data to the Cardossier. A more detailed explanation can be found in [10, 29].

¹ <https://www.cardossier.ch> (Last accessed: 11/30/2020)

3.2 Data Collection

We conducted two experimental games with the Car-Market Game in 2018 and 2019. After each game, we applied surveys to gather information on privacy preferences and expectations [30]. The survey applied open questions, closed questions, and Likert scales. The questionnaire in the first survey consisted of the following sections that are of relevance for this study:

- Demographic data of the test persons
- Assessment of relevance of personal information
- Willingness to buy/trade personal information
- Importance to control the disclosure of personal information

The questionnaire in the second survey consisted of the following sections that are of relevance for this study:

- Demographic data of the test persons
- Willingness to disclose data
- Importance of control
- Importance of traceability
- Evaluation of design elements

The survey after the second experiment was augmented with semi-structured interviews [31] with a subset of the participants. Each interview addressed the following topics: general questions about the interviewee, attitude to data markets and attitude to disclosure of data. These interviews were recorded and transcribed in a verbatim manner [30]. Based on this, two researchers deductively and inductively processed the core themes to understand the relations between them (axial coding). This process generated insight concerned with, e.g. interest in data, willingness to buy/sell, disclosure behavior and negotiation behavior as presented below [32].

3.3 Experimental Design

The Car-Market Game can be configured to simulate a traditional or future used car platform (i. e. AutoScout24.ch). Buyers find information on cars posted by the seller and then can negotiate directly within the platform about the sales price using a chat dialog. In each experiment, the participants had to sell (role of seller) respectively buy (role of buyer) a car. The goal was to maximize the relative revenue² when buying or selling a car.

In the first experiment (E1), 50 bachelor students participated. The students volunteered for the experiment but received incentives (shopping vouchers). Table 1 shows their demographic data. To communicate the intentions of the Cardossier project in a clear and readily understandable manner before the experiment, a moderator held a presentation using a screencast that showed the features of the game. Each participant was randomly assigned either the role of a buyer or the role of a seller. Sellers were

² Computed from the final sales/purchase price and the actual value of the car.

provided with cars and information on cars from an existing collaborating used car platform. Buyers were provided with a budget for buying the car. The experiment consisted of two game rounds in which different versions of the game were played. After each round, the test persons had to fill out a questionnaire about their willingness to trade or their interest in the data items.³ In the first round, the participants played a classical scenario (*classical round*), similar to existing conventional online used car platforms. In the second game round, car buyers and sellers could buy verified car lifecycle information from the Cardossier (*round with Cardossier*).

After analyzing the results of the first experiment, we changed and extended the game application according to our findings and feedback.

In the second experiment (E2), 48 university students participated voluntarily (see Table 1 for their characteristics). All took part in the subsequent survey and five volunteers were interviewed directly after the experiment. The main objective of the experiment was to investigate the test persons' privacy disclosure behavior while negotiating about used cars. Therefore, the subjects played only the game version with the Cardossier.

Table 1. Demographic data of test persons

Character		E1 (n=48/50) ³		E2 (n=48)	
		Frequency (%)		Frequency (%)	
Gender	Male	38	(79.2%)	37	(77.1%)
	Female	10	(20.8%)	11	(22.9%)
Age	20-30	44	(91.7%)	47	(97.9%)
	31-40	3	(6.2%)	1	(2.1%)
	41 and above	1	(2.1%)	-	(-)
No. of used cars bought so far	0	35	(72.9%)	34	(70.8%)
	1	10	(20.8%)	9	(18.8%)
	2 and more	3	(6.3%)	5	(10.4%)
Already bought a car via an online platform?	yes	13	(27.1%)	7	(14.6%)
	no	35	(72.9%)	41	(85.4%)

4 Results

We structure our findings according to our two exploratory studies and the research questions raised in the introductory section.

4.1 First study: Exploring interest in data and willingness to share

In the first study, we addressed the first research question (RQ1): What sensitive data are sellers and buyers interested in and willing to share?

After playing the conventional game (classical round without the Cardossier), the subjects were asked to evaluate the potential relevance of sensitive data (Table 2). The vast majority of the buyers and sellers selected the history of accidents as rele-

³ Note: 2 persons failed to complete the survey after the first round.

vant. Half the buyers and the vast majority of the sellers also regarded driving behavior as relevant. So, all in all, utilization related personal data clearly appears to be relevant. The picture is less clear on personal data. While a little more than half the participants regarded name, address, and date of birth as relevant, only a minority regarded bank data and information on the driving experience (as indicated by how long the person has had a driver's license) as relevant.

Table 2. Assessment of the relevance of personal information by item type

Personal data	<i>Car Buyers (n=24)</i> ⁴	<i>Car Sellers (n=24)</i> ⁵
	Frequency (%)	Frequency (%)
Name, date of birth, address	13 (54.2%)	12 (50.0%)
Bank / payment data	9 (37.5%)	8 (33.3%)
Driving experience	4 (16.7%)	12 (50.0%)
Utilization-related personal data		
History of accidents	21 (87.5%)	20 (83.3%)
Driving behavior (frequent/infrequent)	12 (50.0%)	20 (83.3%)

In the second game round of the first experiment, the participants were exposed to the Cardossier. Therefore, we could ask more specifically for their willingness to buy or offer the data items after this game. The picture is similar to results after the first round (Table 3): The majority of the sellers would be willing to sell the history of accidents and the past driving behavior. A majority of the car buyers would also be willing to buy a history of accidents. However, only 40% would buy data on driving behavior. Their willingness to buy personal data is even lower: It ranges between 20% and 32% while less than half of the sellers would be willing to sell this data.

Table 3. Assessment of the willingness to buy/offer personal information by item type

Personal data	<i>Car Buyers (n=25)</i> ⁶	<i>Car Sellers (n=25)</i> ⁷
	Frequency (%)	Frequency (%)
Name, date of birth, address	8 (32%)	11 (44%)
Bank / payment data	6 (24%)	8 (32%)
Driving experience	5 (20%)	10 (40%)
Utilization-related personal data		
History of accidents	20 (80%)	19 (76%)
Driving behavior (frequent/infrequent)	10 (40%)	14 (56%)

We conclude from this experiment that it is dubious whether market participants are really interested in personal data and willing to share it for money. The picture is

⁴ Question: "What personal information about the seller would influence your buying decision?"

⁵ Question: "What personal information about yourself would you provide to a potential buyer in order to obtain a higher price, if necessary?"

⁶ Question: "What personal information about the seller would you pay for to support your purchase decision?"

⁷ Question: "What personal information about yourself would you provide in the Cardossier in order to achieve a higher return (higher sales price/revenue for your provided data)?"

more positive for data on car usage: Here, participants appear to be interested and willing to trade for money.

4.2 Designing for Privacy in the Car-Market Game

Beyond those key insights on willingness to share, interviews and questionnaires from the first experiment offered additional insight for the designing for privacy in the Car-Market Game. Participants voiced a clear preference for controlling the disclosure of sensitive data. In the questionnaire, the participants rated its importance with 5.48 on a Likert scale from 1 = 'Not at all important' to 7= 'Extremely important'. The analysis of the interviews led to the identification of three important topics: The global disclosure of information to all participants of the platform, the disclosure of information to a specific partner during the course of the negotiation and the transparency of the public profile.

We therefore implemented the following design elements:

- *Global Disclosure Control* (global, see Figure 2, on the left): Buyers and sellers can define, if and for which price they disclose data to all users of the platform.
- *Individual Disclosure Control*: Sellers can define, which car usage data they disclose to their current negotiation partner for free (Figure 3).
- *Privacy Preview* (see Figure 2, on the right): Buyers and sellers can see what their public profile looks like.

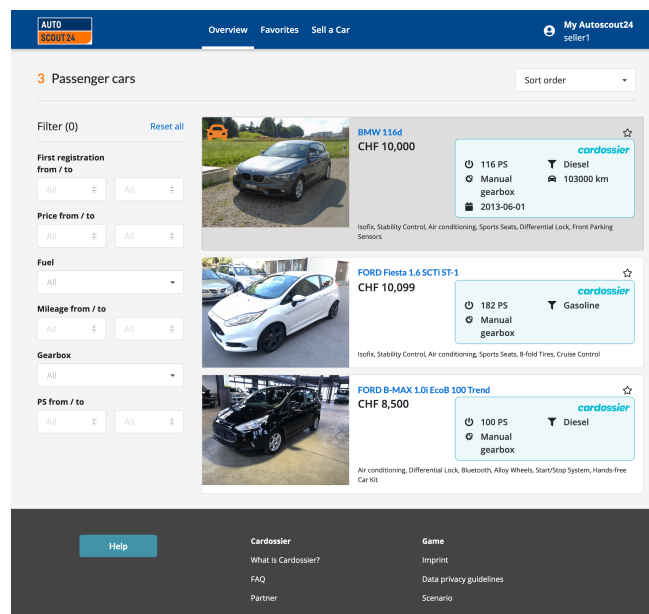


Figure 1. Searching for cars in the marketplace

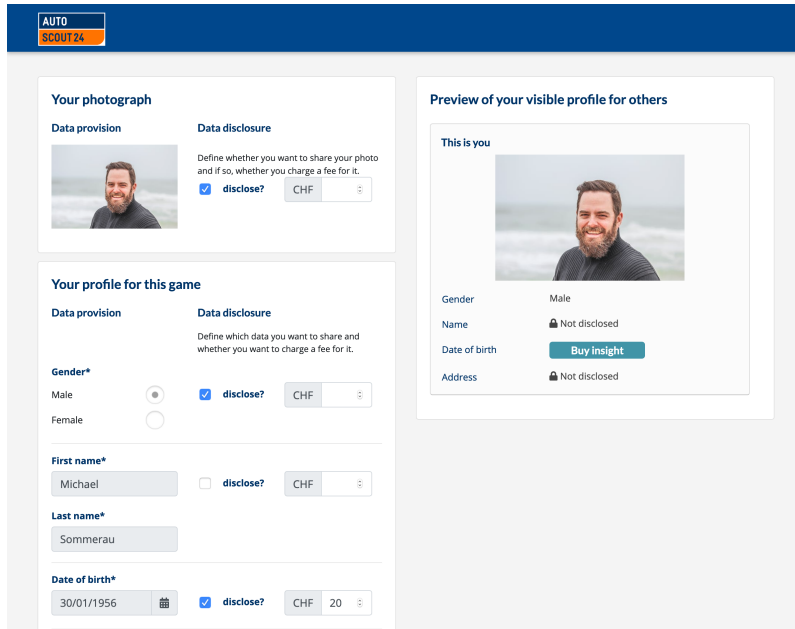


Figure 2. Example of global disclosure control and preview of personal data

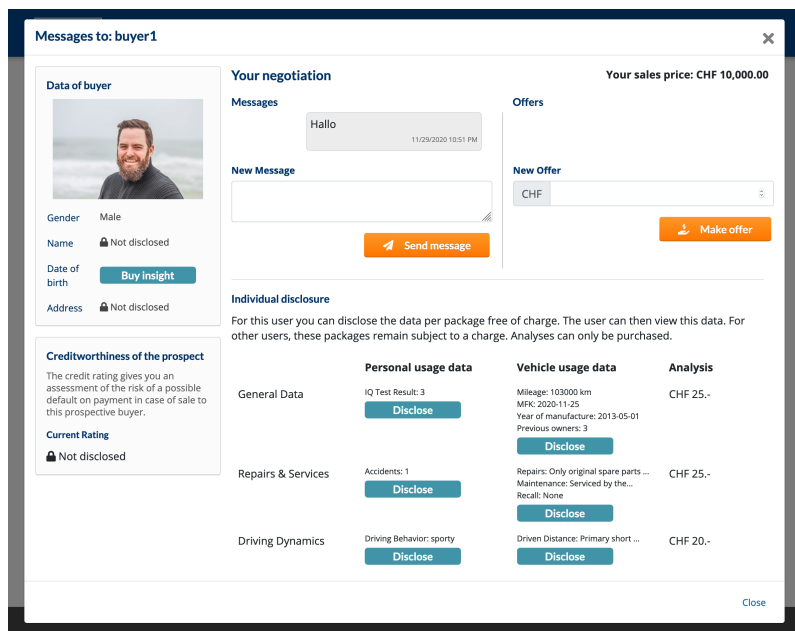


Figure 3. Individual privacy disclosure and chat for negotiation

We furthermore added a personal photograph of the seller or buyer (see Figure 2, on the upper left) to the prior personal information as an element that could enhance interpersonal trust.

In the actual game, all users would sign in and set their global privacy settings (Figure 2). The sellers would then finish their car profile (e. g. adding sales price) and wait for interested buyers to start a negotiation. The buyers select cars from the marketplace (Figure 1) and start a negotiation (Figure 3). During the negotiation, sellers can release sensitive data for free.

4.3 Second exploratory study: Identifying preferences and expectations

The second study had two goals:

First, we wanted to validate the insights from the first study: Is personal data of car buyers and sellers really not relevant in the course of a car sale? And is car usage data really relevant? To get more insights we made the privacy choices more personal for the test participants: We added real pictures of them to their player profile to make the personal data more realistic. And we personalized their car data through in-game tests: an IQ test was used to calculate the accident history for the sellers' cars (the more fault points, the more accidents) and an online driving test was used to derive the driving behavior data of their cars⁸. We also made the privacy choices more economically sound: Both buyers and sellers were not only asked about their willingness to sell or buy personal data, but could also set a price for their personal data in their global settings and offer it there. Since the participants were exposed to privacy management features in the game, we could not only ask for their preferences but also study their behavior. The results should finally answer RQ 1 on *what* data should be provided by a platform.

The second goal addresses RQ2: *How* should this data be provided, and privacy be managed? Assuming that at least some sensitive data is relevant, we wanted to understand, how buyers and sellers accepted the disclosure control design elements and what further preferences they had for disclosure control.

a) Results for RQ1: What sensitive data are sellers and buyers interested in and willing to share?

In the questionnaire the participants voiced only limited willingness to disclose personal data (Table 4). The ratings show that the willingness to disclose data toward an individual counterpart has a moderate agreement, for personal data as well as car usage data. The disclosure free of charge has the lowest approval, and the general disclosure of car usage data is also rated slightly positive.

⁸ To comply with ethical guidelines, the players could opt out of using their real data; genuine data use was incentivized by a flat payment of 20 Swiss francs and 72% of the participant opted for it.

Table 4. Willingness to disclose
(Average rating on a scale from 1= 'I do not agree at all' to 7= 'I totally agree'; n=48)

	<i>Willingness to disclose globally</i>	<i>Willingness to disclose for free</i>	<i>Willingness to disclose to an individual counterpart</i>
Personal data	3.8	3.0	4.1
Utilization-related personal data	4.3	3.6	4.4

Consequently, only gender data was released for free by the majority (Table 5). For the other data items the information providers either asked for a fee (27%-54%) or did not disclose them at all (20-35%).

Table 5. Global disclosure of data (n=48)

	<i>Not disclosed</i> Frequency (%)	<i>For free</i> Frequency (%)	<i>For a fee</i> Frequency (%)
Personal data			
Photo	17 (35.4%)	11 (22.9%)	20 (41.7%)
Gender	3 (6.2%)	32 (66.7%)	13 (27.1%)
Name	10 (20.8%)	15 (31.3%)	23 (47.9%)
Date of birth	11 (22.9%)	11 (22.9%)	26 (54.2%)
Address	17 (35.4%)	5 (10.4%)	26 (54.2%)
Utilization-related personal data (sellers only; n=24)			
Accident history	7 (29.2%)	2 (8.3%)	15 (62.5%)
Driving behavior	9 (37.5%)	6 (25.0%)	9 (37.5%)

How does this offer impact the actual market transactions on sensitive data? (Table 6). Nearly no transactions on personal data occurred. So, the valuation of the seller was consistently higher than the valuation of the buyers. Therefore, we conclude: There is no market for personal data in the used car market.

Table 6. Purchases from game data of E2 (n=48)

	<i>Number of purchases</i>	<i>Average amount of purchases</i>	<i>Expected average price⁹</i>
Personal data			
Photo	1	CHF 50.00	CHF 117.09
Gender	0	-	CHF 32.62
Name	0	-	CHF 70.19
Date of birth	0	-	CHF 76.16
Address	0	-	CHF 56.50
Utilization-related personal data			
Accident history	14	CHF 119.29	CHF 93.93
Driving behavior	1	CHF 15.00	CHF 70.00

The picture is different for car usage data. Although only a minority offered this data for free, quite a few transactions happened (see Table 6). So, there is a market for car usage data what is slightly confirmed with the results of our survey: On a scale from

⁹ Values higher or equal to CHF 1000 were regarded as outliers and left out

1= ‘I do not agree at all’ to 7= ‘I totally agree’ the respondents rated the statement of being willing to buy utilization-related personal data with 4.2. The interviews supported this observation without providing further insights.

b) Results for RQ2: What preferences and expectations do individuals have when disclosing their personal information in the used car market?

All three new design elements were evaluated positively.

Global Disclosure: All participants actually used global disclosure in their general offering to the marketplace. In the questionnaire the global disclosure mechanism (Figure 4) was rated transparent¹⁰ with a 4.9 on a Likert scale from (1= ‘I do not agree at all’ to 7= ‘I totally agree’). So, we conclude that the participants of the used car market expect a global disclosure control (= preference P1).

Individual Disclosure: Willingness to provide data to individuals was rated highest in the questionnaire (Table 4) and 15 participants actually used individual disclosure control in their negotiations. Thus, we conclude that the participants of the used car market expect a context-dependent individual disclosure control (= Preference P2).

Privacy Preview: During the game all participants used the preview function (located on the same page in the right; see Figure 2). After the game we asked the test persons if the preview function made the disclosure settings transparent¹¹ and got an agreement with a mean of 5.0. For this reason, we formulate as third preference (P3): Car buyers and sellers want to have a preview of the disclosure outcome.

Traceability: We furthermore asked the participants of the second experiment whether tracing is important to them, i. e. to see to whom and for how long data was disclosed and who has accessed it, at what time. We got a clear agreement in all cases (Figure 4), although a traceability support was currently not yet implemented in the game. Thus, based on these answers, we state our fourth preference (P4): Data providers prefer traceability of data access and accessing actor.

In the discussion section, we will develop the insight and preferences towards requirements that online used car platforms should address.

“It is important for me to trace, ...”

- what data was disclosed to whom.
- what data was disclosed for what time.
- who had accessed my data.
- when my data were accessed.

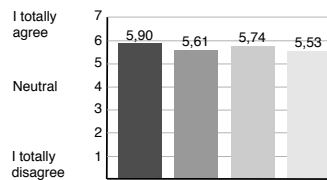


Figure 4. Importance of traceability regarding time and accessing actor

5 Discussion

The study results offer several insights for used car platform providers. *What sensitive data are sellers and buyers interested in and willing to share?* The results indicate that buyers and sellers do not have significant interest in each other’s personal data. Thus, it is not promising for the platform providers to design their system as a media-

¹⁰ Question: “I can track to whom I share my data and when”

¹¹ Question: “The preview function made the release settings easy to understand”

tor for interpersonal trust [2]. Rather, they should opt for a platform that is free of this kind of trust [33], via which car buyers and sellers negotiate to release information about their primary object of interest: the car and its history. In principle, a market exists for car usage data; and buyers and sellers are willing to engage in transactions of data. Thus, a Cardossier does not only promise to enhance traffic on a car platform, but platform providers may also extend their business model to providing certified car data [34]. This has further implications for used car ecosystems such as the Cardossier ecosystem. They should focus their efforts on collecting data on car usage and shy away from collecting data on the car owners. This is good news as personal data is even more difficult to handle and the collection of such data is even more difficult to justify than car usage data.

What preferences and expectations do individuals have when disclosing their personal information on the used car market? Buyers and sellers prefer global disclosure control (P1), individual disclosure control (P2), a preview of the disclosure outcome (P3), and to trace data access and the accessing actor (P4). This leads to the three generic requirements of ‘Selective Disclosure Control’, ‘Disclosure Information Transparency’ and ‘Disclosure Process Transparency’ (Table 7).

Table 7. Summary of requirements derived from preferences

<i>Preference</i>	<i>Generic Requirements</i>
<i>P1</i> : Individuals expect global disclosure control.	Selective Disclosure Control
<i>P2</i> : Individuals expect context-dependent individual disclosure control.	
<i>P3</i> : Individuals expect to have a preview of the disclosure outcome.	Disclosure Information Transparency
<i>P4</i> : Individuals expect to trace data access and the accessing actor.	Disclosure Process Transparency

Selective Disclosure Control: We define selective disclosure control as the possibility to disclose data continuously or for a single instance according to the preferences and the situation of the data subject. Selective disclosure control enables car sellers to keep control over their data depending on their own perception of sensitivity (cf. [35, 36]). Our results indicate that selective disclosure control in the used car market can be globally, i. e. context-independent (*P1*) or individually, i. e. context-dependent (*P2*).

Disclosure Information Transparency: The ability to transmit how disclosure information is presented can be conceptualized as an instance of information transparency ([37], p. 4). Disclosure information transparency can thus be defined as the degree of the data subject being enabled to monitor and comprehend the information used as the basis of personal data disclosure and to assess their quality and suitability. Disclosure information transparency enables data subjects to effectively prevent undesired consequences and produce a desired profile toward others [36].

Disclosure Process Transparency: The ability to trace information use can be conceptualized as an instance of process transparency ([38], p. 280). Disclosure process transparency can thus be defined as the degree of the data subject being able to follow and comprehend the performed activities with their personal data. In the context of a

used car market, buyers and sellers can not only use disclosure process transparency to protect their privacy but also as a strategic instrument in their negotiation. For example, if a seller knows that a buyer has accessed a critical information item (e. g. on an accident), the seller may negotiate differently than if the buyer has not accessed the information item.

The need for selective disclosure control, disclosure information transparency, and disclosure process transparency reveals that the general privacy calculus known from eCommerce is incomplete: In the used car market, online self-disclosure is not only based on a cost-benefit tradeoff [16] on the personal impact and risks of data release, but also on the cost-benefit analysis of releasing data as a tactical instrument during negotiations in an environment free of interpersonal trust. Car sellers may hide (or highly price) sensitive car data of lemons or may signal high quality by making it available for free.

6 Conclusions, Limitations and Future Research

Used car platforms were the primary addressees of this paper and, indeed, they have a lot to gain if they manage to include car usage data into their platform. They can take a larger share of the used car market and establish themselves as data traders. The insights, requirements, and design elements proposed in this paper should be more comprehensively implemented and evaluated to understand how exactly car sellers and buyers can be enabled to efficiently and effectively manage car usage data and how this relates to the value proposition of a future used car platform. Results indicate that platforms should provide selective disclosure control, disclosure information transparency and disclosure process transparency. While it is quite obvious, how global disclosure control should be implemented, individual disclosure control is more challenging: What exactly defines the individual context? How can disclosure control be embedded in the communication and negotiation process? Future research in this direction can not only guide platform providers in building better used car platforms but also lead to a better understanding what the privacy calculus in such settings is.

Future research should also validate the presented results in other contexts as the current results come with limitations. The Car-Market Game and the contained design elements were tested and evaluated with students as test persons. This test group was quite homogenous and the average age was about 25, which is younger than the average used car buyer. In this group, only about half of the participants had have experience with buying used cars. And the experiment was situated in a safe environment; car sellers and buyers may value personal data and interpersonal trust-building higher, if their opponents are potentially threatening.

Other stakeholders will have to react to the threat of being disintermediated. Used car dealers may not only use the remaining information asymmetries as a basis for their business but also apply car usage data to improve their advice giving and to provide

new products [7]. Also, car manufacturers, car importers, and garages may re-evaluate the value of their data treasure and use it to create platforms that compete established used car platforms. They can make different, potentially more attractive, offers for car usage data than car platforms, for example free or discounted services. But all need to understand the needs of car owners, requiring control and transparency. Future research will need to understand how those other stakeholders can take them into account.

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