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Abstract: With the development of information and telecommunication technology, more and more products can integrate such technologies to provide more convenient service to consumers. The connected car is the presence of devices in an automobile that connect the devices to other devices within the vehicles and or devices, networks and services outside the car including other cars, home, office or infrastructure. The data generated by telematics and vehicle infotainment systems is highly revealing of personal lifestyles, habits and preferences include customer account. The purpose of the paper is to figure out effect of social behaviors of connected car on social adjustment as partner, and how this relationship affects determining willingness to provide personal information of connected car consumers. To do so, a research model and the hypothesis have been developed accordingly. The model will be tested by using the sample from South Korea's care driver. The potential contributions have been addressed consequently.

Keywords: connected car, privacy, social behavior, social adjustment, privacy calculus model

1. INTRODUCTION

The connected car is the presence of devices in an automobile that connect the devices to other devices within the vehicles and or devices, networks and services outside the car including other cars, home, office or infrastructure. Connected car is currently defined as mutual and simultaneous relationship among the portal at the automotive company, the vehicle, the communication link between the vehicle and the portal [20]. According to NHTSA, "level 2" automation for driving is now available with automatic sensing technologies such as LIDAR, distance sensors, position estimator in the aspect of usage of connected car, which means semi-auto drive based on driver's characteristic.

The data generated by telematics and vehicle infotainment systems is highly revealing of personal lifestyles, habits and preferences include customer account. Vehicle performance, driver behavior, biometrics and health, location, personal communications, use of features and applications [13]. These private data have been considered as not an absolute right but is subject to economic principles of cost-benefit analysis and trade-offs. If so privacy could be treated as tradable commodity. When benefits exceed costs, users are willing to give their information to the company or service provider both individual and societal levels.

Previous studies of e-commerce on privacy calculous model could shed light on further study of privacy and connected car in the aspect of network connectivity, and range of benefits/concerns. However, social factor should be additively covered in the privacy-calculous model of the connected car due to CAS (Computers as Source).

The purpose of the paper is to figure out effect of social behaviors of connected car on social adjustment as partner, and how this relationship affects determining willingness to provide personal information of connected car consumers. The study will be based on pseudo experiment for driver perception of connected car social behavior experience, and after survey will be conducted based on structure equation modelling (SEM).

This study is organized as follows: in next section, the literature review of connected car and the term of

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computers as sources have been proceeded. In addition, the hypothesis has been developed. Thereafter, we introduced the research methodology that will be employed in this study. Finally, the discussion and potential contributions have been outlined.

2. LITERATURE REVIEW

2.1 Connected car

The connected car can be described as a vehicle with one or more external wireless communication possibilities, which connects the vehicle to an external network (see Figure 1). The requirement of external wireless communication distinguishes the connected car from other vehicles where internal connections already exists, e.g., the On-Board Diagnostics II (OBD-II) interface used for wired vehicle diagnostics or the USB ports that are becoming more and more common [12]. The connected car consists of three domains of vehicle, consisting of the in-vehicle network and ECUs, the portal at the automotive company, delivering services to the vehicle, and The communication link between the vehicle and the portal [20].

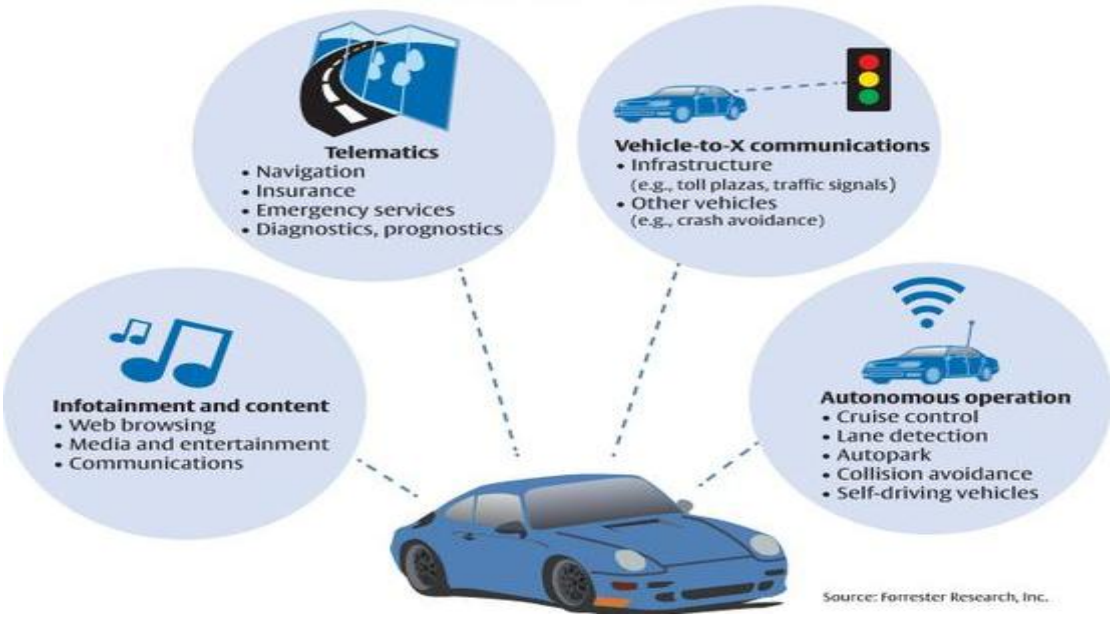

Figure 1: The structure of connected car (source: Forrester Research, Inc.)

The leading IT companies such as Apple, Alibaba, and Google struggle to take the first positioning on the connected car market. It is expected that Apple's connected car interface "iDash" will resemble touch screen dashboard of iPad with cameras for head and eye tracking, lasers for light, and voice actuation for hands free adjustments. Under the new system a driver will be able to control not only the radio and the temperature, but the headlights, wipers, mirrors, and much more [10]. Senior managing consultant at NTT DATA described car company side of connected car, automated driving calls for access to the extensive sensor data of the vehicle. He asserted that connected car would allow drivers benefits in security, efficiency, and comfort. For instance, long range radar, laser scanner on front and rear view camera would allow driver prediction of traffic and road conditions on voice or image on highly automated driving. Moreover, dynamic route planning significantly saves time by avoiding traffic jams. When these vehicles share data about their destinations with other cars, city traffic management roads would be much more efficiently used which help us better using resources. ESP and lane keeping give tactile feedback, and gesture based control would be available on the modern cockpits of

connected car [7].

However, as consumers demand more personalized services and smarter, safer, and more seamless in-car features that means more data and more questions about privacy. The data generated by telematics and vehicle infotainment systems is highly revealing of personal lifestyles, habits and preferences. In addition to customer account data and vehicle performance data, it includes driver behavior data, biometrics and health data, location data, personal communications (voice, text, email, and social networking), web browsing data, personal contacts and schedules, use of features and applications, and choice of music, radio and other streamed audio or video content [13]. Some of these data is personal data, deserving privacy protections therefore data and questions about privacy should be covered in using connected car. Drivers give their private information to get better perceived ease of use like personalization of service, financial rewards (insurance). In this purpose aspect connected car using experience has similarity with e-commerce using experience because people share their private information to gain personalized services. Furthermore, possible privacy concerns such as large amounts of data include private data is collected by service provider or telecommunication company, and unauthorized secondary use and possibility of hacking is another similarity. In these aspects, e-commerce private information sharing case could be adapted toward connected car private information sharing.

2.2 Computers as Sources

Connected car can be considered as computers as source (CAS) due to the fact that humans apply the same social heuristics toward inanimate machines as they do in human-human interaction. Computers simply generate output as programmed, they seem to become oblivious to the asocial nature of interaction and rather automatically apply the same social heuristics toward inanimate machines as they do in human-human interaction [19].

When computers emulate human-like attributes, such as interactivity and speech, people tend to focus on those cues, and fail to take into account the asocial nature of the interaction. Interactive cues of connected car like head-body tracking and voice actuation triggers driver to adapt human-human interaction rules. These interactive ues seem promising in their ability to cue cognitive heuristics pertaining to credibility assessments because they are all structural features that underlie the design aspects or surface-level characteristics associated with powerful first impressions of connected car credibility. Moreover, when the computer first provided some information about its technical capacity (self-disclosure), participants' responses were more intimate than when the computer simply asked the same questions without revealing about itself. This triggers spontaneously social behaviors grounded in interpersonal relationships. After receiving useful information from the computer to accomplish an experimental task, participants spent more time on the second task to "help" the computer than when the computer had offered them irrelevant information [9]. Depending on how particular affordances and information manifest itself to drivers, those can lead to positive or negative outcomes. In short social behavior of computer i.e., self-disclosure, giving useful information, positive feedback affect participants consider computer as a partner, which fits with definition of social adjustment of the privacy calculous model.

2.3 Privacy cost

Privacy is defined as the ability of individuals to decide when, what, and how information about them is disclosed to others [8]. There have been two opinions about privacy, one is people have the right to be let alone, and the other is individuals should not have a right to conceal facts about themselves [28]. The latter asserts that privacy is not an absolute but can be assigned an economic value and traded for goods and services. Value-based definitions of privacy argue that a call for greater privacy is, fundamentally, antagonistic to the political economy of the information markets [5] [14] [21]. In this view, privacy is not an absolute right but is subject to the

economic principles of cost-benefit analysis and trade-offs [11]. Bennett [3] further formalized the notion of privacy as a tradable commodity. It can be assigned an economic value and can be considered in a cost-benefit calculation at both individual and societal levels.

Privacy concerns is receiving increased attention due to the huge amount of personal information being collected, stored, transmitted and published on the internet. Smith et al. [23] identified four dimensions of an individual's concern about privacy, namely: (1) collection, (2) errors, (3) unauthorized secondary use and (4) improper access. The four factors provide a framework to explain the concerns for information privacy [24]. Due to the fact that most data from connected car is based on actual driving and map, inaccuracy possibility could be reduced. However, still large amounts of personally identifiable data are being collected by company, companies could use personal information for undisclosed purposes, and companies are able to fail to protect consumer's privacy. This brings us Knigtian uncertainty from unknown purpose of large data collection, privacy risk belief that when private information is revealed, and privacy protection belief. Consumer privacy concerns vary dramatically by information type. Consumers are likely to avoid revealing personal information that may identify themselves to companies in exchanges for values or services that companies would provide [23].

Privacy risk is the degree to which an individual believes that a potential for loss is associated with the release of personal information to an entity [17]. The construct is related to the potential loss of control over personal information [6]. In the privacy literature, privacy risk has been treated as multidimensional construct. Risky events are those for which individuals can assign a known or knowable probability to each possible outcome. Ambiguous events are those for which such assignment is impossible, either because the probabilities are unknown/unknowable or because one or more possible outcomes are not known/knowable, and therefore are characterized by a qualitatively different type of uncertainty. Hence, the term uncertainty is reserved to denote situations characterized by quantifiable risk and unquantifiable risk like Knightian uncertainty. Knight stated the word 'risk' to describe the ''measurable uncertainty'', where the possible outcomes are known and they can be categorized in groups with assigned probabilities ''either through calculation a priori or from statistics of past experience''. The 'true' uncertainty, on the other hand, applies to situations where no probability can be computed, as agents do not have the information necessary to assign a probability measure ''because the situation dealt with is in a high degree unique'' [29]. Through past literature we believe that privacy concern, privacy risk and Knightian uncertainty are the dimension of privacy cost that may negatively influence the willingness to provide personal information in connected car context. Thus the following hypothesis have been proposed:

H1. Privacy concern will have a negative effect on willingness to provide personal information of connected car users.

H2. Privacy risk will have a negative effect on willingness to provide personal information of connected car users.

H3. Knightian Uncertainty from collecting large amounts of data will have a negative effect on willingness to provide personal information of connected car users.

2.4 Privacy rewards

Three main types of benefits of information disclosure have been assumed according to the prevailing literature review on the privacy calculous. Financial rewards, personalization, and social adjustment benefits [18]. Though perceived usefulness still has an important value, drivers currently use navigation systems which enable them the fastest way to the destination with estimated time. Furthermore, perceived usefulness can be divided into quality values such as conciseness, comparability, timeliness and these values strongly connected affordances such as interactivity [25]. Secondary services from relationship could create the additional perceived

ease of use or convenience, but this paper would focus on the effect of direct connected relationship among domains of the connected car.

The effect of financial benefits to attract customers to reveal their personal information has been proven, and the effect on connected car is predictable with UBI-Usage-Based Insurance or discount on purchasing car when using connected car service on subscription. Also, time or cost savings from semi/full-auto drive could be considered as possible financial rewards from connected car. Liu et al. [15] found that personalized services played a significant moderating effect on the relationship between users' disclosed information and their perceived benefits. The value consumers place on personalization was almost twice as influential as their concerns for privacy when determining usage of personalization services [4]. Social adjustment benefits (defined as the establishment of social identity by integrating into desired social groups) can also have an effect on willingness to disclose personal information [16]. Social adjustment benefits could be considered in the aspect of computers as sources (CAS) theory on connected car cases. Trust, partnership with the machine from receiving useful information on time with positive feedback could be different from e-commerce cases. We therefore hypotheses:

H4. Financial rewards will have a positive effect on willingness to provide personal information of connected car users

H5. Personalization will have a positive effect on willingness to provide personal information of connected car users.

H6. Social adjustment will have a positive effect on willingness to provide personal information of connected car users.

Based on above discussion, we considered the dimension of disclosure privacy rewards as financial rewards, personalization and social adjustment benefits; while the disclosure privacy costs include privacy concern, privacy risk and Knightian uncertainty. In addition, we also considered gender, age, driving experience, past invasion of privacy and media exposure as control variables. The research model is shown in Figure 2.

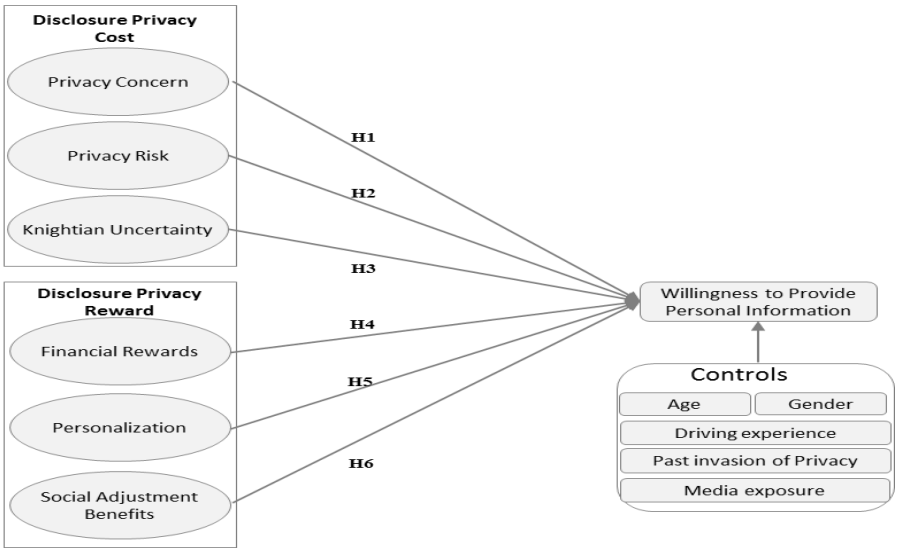

Figure 2. Research Model

3. RESEARCH METHODOLOGY

Human computer communication with human-like attribute and social behavior is the significant difference of connected car from an e-commerce experience. The difference will be tested as treatment condition to figure out its effect toward social adjustment and willingness to give private information. Survey study will be

employed after the treatment condition. Survey study that included items for the constructs specified in the model will be employed in this research. Data (N = more than 300) will be collected via an online survey in South Korea. The target population is adult drivers in South Korea. This is admittedly only a small subset of a possibly much larger population of interest. For example, it would be interesting to collect samples drawn from an international population, because international socio-cultural differences might influence user behavior. Due to resources availability and time constraints, however, we leave these developments to future research. Structural equation modelling such as PLS-SEM will be employed as a data analysis approach because of its ability to account for measurement errors for unobserved constructs and to simultaneously examine the predictive relationships among them [22]. The hypotheses will be tested by examining the structural models. The explanatory power of a structural model could be evaluated by looking at the R^2 value in the final dependent construct. Specifically, we follow the two-step approach suggested by Anderson and Gerbing [2]. As such, we first analyze a measurement model to assess the measurement quality of constructs by using a confirmatory factor analysis (CFA) approach. Subsequently, we estimate a structural model to test the research hypotheses. PLS-based SEM to evaluate both the measurement and structural models will be utilized. Specifically, we will use the statistical software packages SmartPLS 3.2.1. The bootstrap technique is well-known and commonly used in PLS analysis to estimate the significance of weights, loadings and path coefficients.

Table 1: Survey Instrument Details

Variable	Sample Statement	Source
Financial rewards	An offer of a financial reward will decrease concerns about self-disclosure.	Andrade et al. (2002)
Personalization	I value the connected car that are personalized for my usage experience preferences	Chellappa and Sin (2005)
Social adjustment	Friend's suggestions and recommendations will affect my decision to use the connected car.	Tan et al. (2012); Taylor and Todd (1995),
Knightian Uncertainty	I have often only vague and limited knowledge of the actions to protect (or give away) my personal information.	Acquisti et al. (2005)
Privacy risk	What do you believe is the risk for connected car drivers due to the possibility that: Records of driving information could be sold to third parties	Dinev and Hart (2006)
Privacy concern	I am concerned that the information I submit on the connected car could be misused.	Dinev and Hart (2006)
Willingness to provide personal information	To what extent are you willing to provide personal information? Driving a connected car requires me to provide highly personal and password-protected financial information (e.g., driving history and GPS data)	Dinev and Hart (2006)

4. DISCUSSION AND POTENTIAL CONTRIBUTIONS

The purpose of the paper is to figure out the effect of social behaviors of connected car on social adjustment as partner, and how this relationship affects determining willingness to provide personal information of connected car consumers. To do so, a research model and the hypothesis have been developed accordingly. The model will be tested by using the sample from South Korea.

This study will contribute both in theoretical and practical aspects in several ways. Theoretically, we classified the privacy cost as the dimension of privacy concern, privacy risk and Knightian uncertainty. Given the connected car systems need collect driver's personal information, privacy risk and the potential risk may rise that can negatively influence driver's behavior. Further, we defined three dimensions as privacy reward. Rewards may always promote an individual to take an action such as usage. In connected car context, we

specify financial rewards, personalization and social adjustment benefits as the potential rewards that may positively influence connected car user's willingness. This study can also help connected car product related company to better understanding how to increase an individual provide his/her information. Only the connected care systems collect enough information from individuals, it can provide better services to car drivers. In addition, firm also can consider provide privacy rewards to achieve their purposes such as collect more individual data.

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