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# *Driver's Intention to Use Smartphone-Car Connectivity*

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## **ABSTRACT**

Car is now more than just a transportation method. Now a smartphone or a portable device can be easily connected to your car and this allows us to enjoy broader range of contents like music and navigation. This study aims to study investigate what leads drivers to use such 'car-connectivity' services. Based on the Unified Theory of Acceptance and Use of Technology (UTAUT) as theoretical framework, this study examines the relationship between four derived constructs (facilitating condition, technographics, mobile literacy, and prior similar experience) and behavioral intention to use car connectivity functionalities. The results show that two of them (facilitating condition and technographics) have significant impact on the intention to use car connectivity services but the other two (mobile literacy and prior similar experience) did not show statistically significant relationship with the behavioral intention.

**Keywords:** Car connectivity, facilitating condition, technographics, intention to use new technology, the UTAUT

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## **1. INTRODUCTION AND RESEARCH QUESTION**

Smartphone convergence with other industries now became no surprise news. The advancement of smartphone technology allows for integration with other entertainment media and this study views that the next hot convergence of smartphone will be with automobiles in the form of ‘car connectivity’. In fact, major brand cars such as Ford, GM, and Hyundai automobile have already started supporting car connectivity functionalities. A representative example service of this car connectivity service is ‘MirrorLink(or mirroring)’ service. MirrorLink is a technology that mimics your smartphone’s screen on a larger screen built in your car. It was developed by the Car Connectivity Consortium (CCC), which is a cooperating group to develop global standards for smartphone in-car connectivity. This cooperating group consists of the world’s leading automotive (Honda, Mercedes-Benz, etc.), mobile communications companies (Nokia as the leader of this Consortium, HTC, etc.) and consumer electronics (Samsung, LG Electronics, etc.). These companies are the ones that represent 70% of the worldwide market share in vehicles and over 60% of the global market share in smartphones.

Likewise, car is now considered as a medium more than just a transportation method. Both car manufacturing companies and business players from other industries are excited and seeking for ways to create profits from drivers’ media use while driving. In fact, this is why players in both industries have been actively researching and developing ‘smart car’. However, even though consumers want seamless media experience in car and entertainment, many of them have high safety concerns about smart car and thus are hesitant to use one. On the other hand, car connectivity service, which requires only a simple smartphone connection to the car through a connecting port or Bluetooth technology, seemed to be more accepted by drivers. This study aims to find what leads drivers to use car connectivity service. Thus, this study investigates relationship between four derived constructs and behavioral intention to use car connectivity functionalities.

*RQ. What are the factors that have influence on drivers’ intention to use car connectivity service?*

## **2. THEORETICAL FRAMEWORK**

Given that people using car connectivity service is an innovative behavior which implies the use of new technology, this study employs the technology adoption model, the Unified Theory of Acceptance

and Use of Technology (UTAUT). Unified Theory of Acceptance and Use of Technology (UTAUT) is developed by Venkatesh, Morris, Davis, and Davis(2003) as a synthesis of eight technology acceptance and use models: the Theory of Reasoned Actions (TRA), the Technology Acceptance Model (TAM), TAM2, the Motivational Model (MM), the Theory of Planned Behavior (TPB), the Combined Model of TAM and TBP (C-TAM-TPB), the Model of PC Utilization (MPCU), the Social Cognitive Theory (SCT) and lastly the Innovation Diffusion Theory (IDT).

The UTAUT identifies four key drivers of the adoption of new technology: performance expectancy, effort expectancy, social influence, and facilitating condition. This study takes the relationship between facilitating and the behavioral intention to apply to the context of car connectivity service. Along with facilitating condition, this study will add three more constructs (i.e., technographics, mobile literacy, and prior similar experience) that influence behavioral intention to use car connectivity service.

### **3. PRIOR STUDIES AND HYPOTHESES**

#### **A. Facilitating condition**

Facilitating conditions are believed to include “the availability of training and provision of support” (Lu et al, 2005; Venkatesh&Davis, 2000; Trandis, 1979). Facilitating conditions have been identified as having an effect on infusion or adoption of a number of new information system innovations (Jones et al, 2002; Cheung&Chang, 2000). It should also include, beyond technical assistance, non-technical control, for instance, data transmission security, favorable legal and regulatory protection (Lu et al, 2003). Another similar definition of this concept would be “individual perceptions of the availability of technological and/or organizational resources such as knowledge, resources, and opportunities that can remove barriers to using a system” from Venkatesh’s study (2003).

Venkatesh et al. (2008) found that facilitating conditions had a significant effect on behavioral expectation. Behavioral expectation here refers to an individual’s “self-reported subjective probability of his or her performing a specified behavior, based on his or her cognitive appraisal of volitional and non-volitional behavioral determinants” (Warshaw&Davis, 1984). That is to say, better facilitating condition of a technology or a relevant system will make people anticipate themselves to use that technology or system in the future, which can support a positive relationship between facilitating condition and intention to use car connectivity services. In a similar sense, Chang and Cheung (2001)

revealed that facilitating conditions affect intention to use internet, meaning that if an individual perceives that there are enough resources, the intention to use or continue to use the internet will be stronger. Taking the similar logic, this study expects that people will show intention to use car connectivity services if they think that their smartphone is technically supported and available for the car-connected service. In this light, the first hypothesis is suggested as follows.

*H1. Drivers with greater facilitating conditions will have stronger intention to use car connectivity functionalities.*

## B. Technographics

Technographics is a concept introduced by Dr. Edward Forrester in a study of VCR users in 1985 and then later on adopted by Forrester Research, Inc. (Bernoff et al, 1998). Forrester developed 'Technographics segmentation' as a marketing tool and this helps classify people according to how they use social technologies. According to Dr. Forrester's work, the profiling of technology consumers "should be based on an amalgam of variables which might best be referred to as 'technographic'... which has a positive relationship with intention to buy". Scholars began to recognize the importance of taking attitude toward new technology as a benchmark to better understand consumers in such digital world and thus suggested the concept of technographics (Modhal, 2000; Bernoff et al, 1998).

In this study, we operationalize 'technographics' that drivers with high technographics level are more early-adaptors, tend to seek for and enjoy new technology, and have more positive attitude toward new technology. Taking this view, we can say that drivers with such characteristics of technographics may be more likely to attempt to experience car connectivity functionalities than others. Thus, our second hypothesis states that drivers with greater level of technographics will show stronger intention to use connected car services.

*H2. Drivers with greater technographics will have stronger intention to use car connectivity functionalities.*

## C. Mobile literacy

'Literacy' originally refers to the ability to read for knowledge, write coherently, and think critically about the written word (Oxford Dictionaries Online). In a technological context, the concept of literacy

is expanding to include the media and electronic text, in addition to alphabetic and number systems. Gilster (1997) developed the concept of ‘digital literacy’ and mobile literacy, based on his own definition of literacy, can be explained as a term that mobile literate person will know how to understand and use mobile media (Kim&Kim, 2011). Then, applying this into mobile services enjoyed in car, we can expect that drivers with higher mobile literacy level are more likely to show stronger intention to enjoy phone-connected-to-car services. Based on this, the third hypothesis is presented as follows.

*H3. Drivers with higher mobile literacy level will have stronger intention to use car connectivity functionalities.*

#### D. Prior similar experience (PSE)

Prior similar experience (PSE) has long been considered as a factor identifying individual differences in technology acceptance studies. Experience with past similar technologies positively affects attitudes and the adoption of new innovations (Kim&Lee, 2008; Lu et al, 2003; Ajzen, 1985). Likewise, it was confirmed that experienced users employ the knowledge gained from their prior experiences to form their intention (Fishbein&Ajzen, 1975) and the experienced users of a certain IT service will have higher behavioral intention than the unexperienced (Taylor&Todd, 1995). In the same vein, Igbaria (1993) proved that users with high prior experience of computer showed less anxiety and greater efficiency in computer use behavior.

Moreover, Ram’s Technology Acceptance Model (Ram, 1987) included prior experience as consumers’ characteristics of technology resistance and a number of scholars’ studies showed that prior experience was one of the significant deciding factors of consumers’ behavior (Bagozzi, 1981; Azen&Fishbein, 1980; Bentler&Speckart, 1979). In this light, people who have experience in using built-in navigation, a similar service in car, can have higher tendency to use car-connectivity services. Thus, the forth hypothesis is as follows.

*H4. Drivers with more prior similar experience will have stronger intention to use car connectivity functionalities.*

## 4. METHODOLOGY

## A. Subjects

To empirically test this model, this study conducted an online survey. The data was collected from Dec. 17 to Dec. 20, 2011. The respondents are drivers with official driver's license and who drive a car that belongs to him or herself, one of the family members, or his or her company. A total of 1,070 respondents participated in the survey and all of the returned answers were included in this research. Regarding demographic characteristics, 49% of the respondents were male and 51% of them were female. Age was also evenly distributed; 24% in 20s, 25% in 30s, 37% in 40s, and 24% in 50s. 83% of the respondent answered that they own navigation and over 83% answered that they use navigation system.

## B. Measures

To measure both independent and dependent variables, which are facilitating condition, technographics, mobile literacy, prior experience, and the intention to use car connectivity functionalities, survey respondents were asked to answer on a seven-point Likert scale.

For 'facilitating condition', respondents were given four question items that include 'My cellphone(smartphone) can afford car-connectivity functionalities' and 'I am subscribed to mobile data rate system that can afford car-connectivity services at reasonable speed rate.' In terms of 'technographics', we asked seven items including 'I am more interested in newly introduced technology or product than other people do' and 'I enjoy telling others about newly released services or products'. As for 'mobile literacy', six question items including 'I am proficient at using my cellphone(smartphone)' and 'I am skilled at installing and using mobile applications'. Last but not least, for 'prior similar experience' construct, we directly asked 'Have you used a built-in navigation system in your car?' in yes or no question and then asked 'If yes, how often did you use the navigation service?' for the respondents to answer in seven-point likert scale.

## 5. RESULTS

The data from survey were analyzed by Smart Partial Least Squares (PLS). Prior to survey results analysis, it was expected that all four independent variables have positive relationship with the dependent variable, the intention to use car connectivity service. That is, all four constructs are

expected to have an influence on drivers' intention to use car connectivity functionalities. For example, as for technographics factor, we can set anticipation that drivers who are interested in newly released technology or excited about purchasing or using new technology will have high intention to use car connectivity functionalities.

However, the results only confirmed facilitating condition( $F=9.636$ ,  $p<0.05$ ) and technographics( $F=17.471$ ,  $p<0.05$ ) to have significant relationship with drivers' intention to use car connectivity service. The other two factors, mobile literacy( $F=1.672$ , n.s.) and prior similar experience( $F=1.162$ , n.s.) did not show statistically significant influence on the intention to use car connectivity functionalities. Likewise, H1 and H2 were supported whereas the other two, H3 and H4 were not supported.

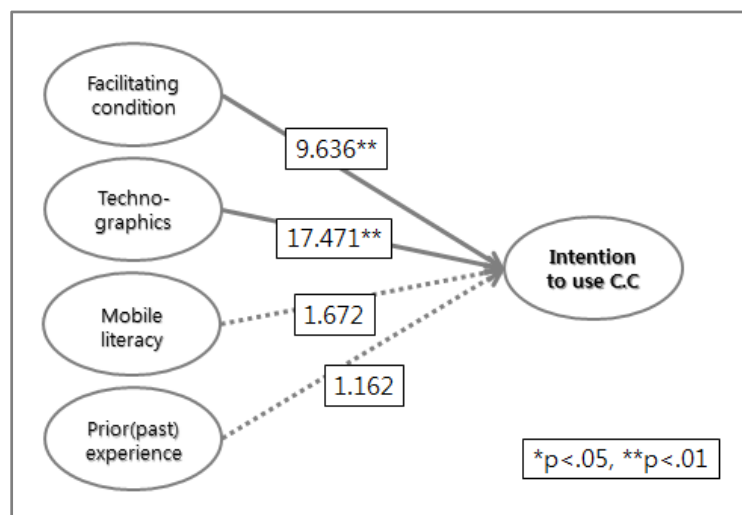


Fig 1. Research model (result)

## 6. DISCUSSION

It was examined that facilitating condition and technographics positively affected drivers' behavioral intention to use car connectivity functionalities. Technographics construct, in particular, showed the strongest relationship among 4 constructs with the intention. From the result, we can draw a point that drivers who are interested newly released technology or excited about purchasing or using new technology first are expected to have high intention to use car connectivity service. Also, facilitating conditions turned out to be an important factor influencing drivers' behavioral intention. From this, we



can predict that as more people become smartphone users and the speed of wireless internet becomes faster thanks to technological development, a greater number of drivers who feel higher facilitating condition, can be more interested in using car connectivity service.

On the other hand, the other two constructs, mobile literacy and prior similar experience were revealed to have not significant relationship with drivers' intention to use car connectivity. As for prior similar experience, such weak effect on the intention was a surprise to us. Our survey participants' answer shows that over 83% of them have used other types of similar technology such as built-in GPS or in-car infotainment. Seeing other researchers' findings on significant relations with prior experience and intention to use a new technology, we expected a similar result. We view that further research on investigating the relationship of prior experience of similar in-car technology and intention to use car connectivity can be another meaningful work.

## **7. LIMITATIONS AND FUTURE RESEARCH**

This work has a limitation in that it did not look into the linkage between the 'intention to use car connectivity service' to the 'actual behavior of using the car connectivity service'. One of the reasons for this comes from the fact that the connected car service in Korea is in its very early phase at this moment so first, collecting proficient amount of data on the behavior of using the connected car is quite challenging and second, even if we access to the sufficient size of sample group, it must have only been a short period of time that the users actually experienced this service. Thus, examinations on the relationship between the intention and behavior should further be done after users have gained significant experience.

Also, after the execution of survey and analysis, we realized that 'perceived security' or 'perceived safety' issue about smart car and its relationship with the intention to use car-connectivity service. Smart car is an advanced internet-accessed automobile which enables in-vehicle infotainment. As some drivers hope to enjoy such network-based entertainment in smart car but are afraid of safety or security issues, it is possible that they choose car-connectivity services as an alternative. This factor should also be considered as an important factor in the future research.

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