



# Research on User Needs of Digital Consumption Services in Communicating Vehicles Context

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**Abstract.** In trend of communicating vehicles, user needs become a central issue for automobile companies. Vehicles as digital mobile devices, users will not only have more comfortable driving experience, but also more efficient life. This paper main concern is about user needs, touch points and potential scenarios based on digital consumption services in communicating vehicle context. Several practical and innovative UX research and design methods and techniques were applied. We found 22 user needs clustered under 4 main themes. These findings suggest that in general vehicles satisfy possessive, create a sense of belonging and security. Vehicles create an independent space, can vent users' emotions, also can drive far away from an unpleasant situation, or experience a new world. In the future, we should design more directly and efficiently way to interact with users, and consider the long-term problems of users.

**Keywords:** User needs · Digital consumption · Communicating vehicles

## 1 Background

From the Internet to Internet of Things, world connected by different approaches. China holds the world's second-largest vehicle holdings. As Fig. 1 shows concept of connected vehicles, at the end of 2017, there are over 200 million vehicles in China having yet to be connected to the Internet. At the same time, technologies to build Internet of vehicles have matured to a point in which mass deployment is both possible and feasible (Barros 2014). Mobile Internet is evolving towards Internet of Things through enabling technologies (Vermesan et al. 2013). This allows vehicle to share Internet access with other devices both inside as well as outside the vehicle.

Many automobile companies noticed that a growing trend and a significant business opportunity for connecting their cars. And China is globally pioneering a new wave of digital lifestyles through its hyper-connectivity, rapid smart phone adoption, centralized service ecosystems by BAT and most importantly, people's openness to adopt new technologies and social behaviors. As such, using context of China today to explore user needs can give us insights of what the rest of the world might require in the future. China is particularly noticeable in e-commerce, the proportion of Unicorn Enterprises and the



Fig. 1. Concept of connected vehicles

speed of the development of the industry, especially in mobile payment popularity as showed in Fig. 2. Chinese payment transaction scale is 11 times than American.

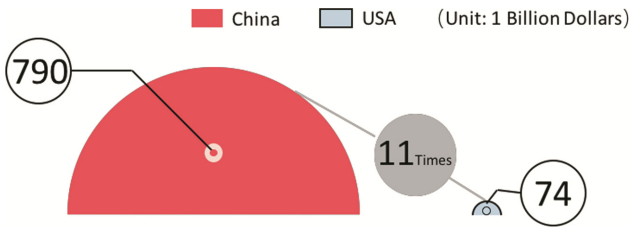


Fig. 2. China and US mobile payment transaction scale in 2016

Users tend to be individualize and diversify their consumption. Digital Economy Companies are more user-oriented than traditional. On the one hand, enterprises collect users' information through digital mobile platform to estimate their preferences, so as to accurately advertise and encourage users to buy more things for electronic payment such as Alipay and WeChat pay. On the other hand, diversification and individualization of new products and services provide more possibilities for digital consumption in the context of



Fig. 3. Services in communicating vehicles

communicating vehicles (Xu Xu 2017). With the development of technologies, more and more things users can do on vehicle services (Romano 2017). As Fig. 3 shows, it will be more different kinds of services and stakeholders participated in the Internet.

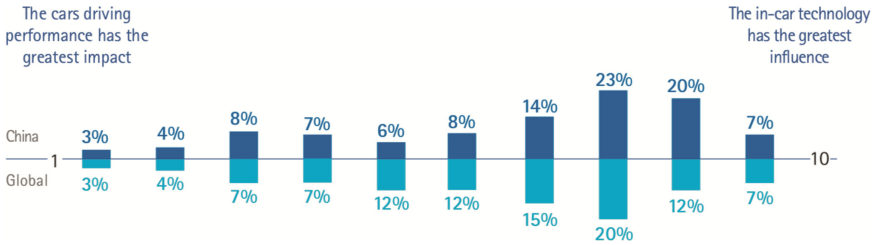
User can buy material goods also tangible services such as car washing and rescuing services. And more recently digital virtual space such as websites, virtual worlds and video games has emerged that may allow for an actualization of consumer fantasy beyond what material goods and experience can offer (Denegri-Knott and Molesworth 2010). At present user can buy digital virtual consumption, for instance, a game character, new skin, piece of music and so on. Figure 4 gives some examples of current consumption of the Internet.



**Fig. 4.** Examples of current consumptions through the Internet

In the trend of communicating vehicles, user needs have grown up to be a crucial issue for automobile companies. Vehicles as digital mobile devices, users will not have more comfortable driving experience, but also more efficient life. Until now, many researches already got user needs from smart phones, tablets and smart TVs, etc., but companies cannot directly apply those in the context of communicating vehicles. Users will prefer different interactions in different context. More than 54 percent of Chinese drivers prefer customized Internet services—higher than that of any other country as showed in Fig. 5. With far more big cities than in Western countries, China is currently under a rich variety of Internet services and a large number of active Internet users. Besides, an average Chinese works longer hours a day than his or her Western counterpart. This among others, explains the Chinese desire to stay connected with their families and friends by using technology (Väänänen-Vainio-Mattila 2011). China has more mobile phones and social media users than any other country. The combined active WeChat accounts crossed 468 million in September 2014, with a monthly increase of 39 percent over the same period last year. The aim of this paper is to determine present

user needs, touch points and potential scenarios based on communicating vehicle for digital consumption services (Tencent 2014).



**Fig. 5.** On a scale from 1 to 10 (10 meaning that in-car technology has the greatest influence over the car purchase decision and 1 meaning that the vehicle’s driving performance has the greatest impact on the car purchase decision), what score would you assign for your view?

## 2 Settings

This paper is based on Communicating Vehicle Project of PSA and BNU. As a first collaboration between OpenLab Design at PSA Groupe and UX Master Program (BNUX) at Faculty of Psychology at Beijing Normal University (BNU). The UX design project will be conducted to equip students with UX theory while gaining practical experience in a real project setting, and to provide designers, researcher, and developers at PSA with first-hand data, insights, and mockups on new ways of interacting with future communicating vehicles in a Chinese Context. This project belongs to the Open Innovation network between PSA Groupe and a number of great schools of design and engineering worldwide, and it is intended to compare the results and specificities between Europe, America, and China. This project will last from September 2017 to June 2018 (Zhou 2015).

As Fig. 6 demonstrates that the core research team is consisted of 3 PSA OpenLab experts, 2 BNU faculty members, and ca. 10 BNUX master students. After the kick-off meeting held with ca. 69 master students at BNU in Beijing. They were split into 12 groups to explore the topic for 2 months. From the beginning of November 2017, as the second-year students, we take knowledge from the exploration and carried on our own work as graduation projects. This paper main concern is a question of user needs, touch points and potential scenarios based on digital consumption services.

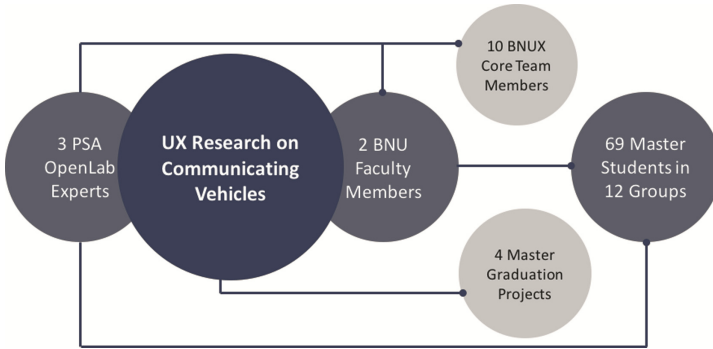


Fig. 6. Settings of communicating vehicles project

Several practical and innovative UX research and design methods and techniques will be applied as shown in Fig. 7, such as context-mapping, collage, mind-map, interviews, sketching, data analysis, etc.

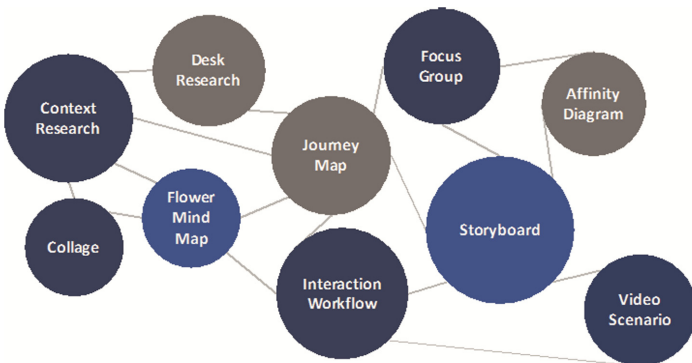


Fig. 7. Methods in project

### 3 Research Process

This paper takes iterated process to explore and define user needs of digital consuming in communicating vehicles context as showed in Fig. 8. It is composed with quantity and quality research methods.

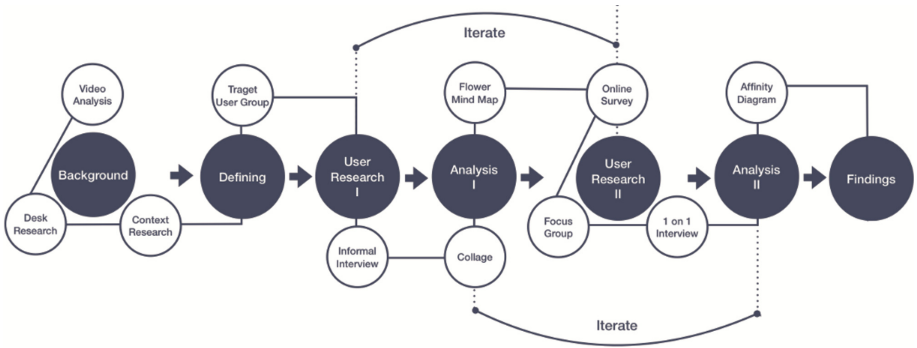


Fig. 8. Fully process research step

### 3.1 Background

In order to understand development status and trends of the automobile industry and the Internet of Vehicle, so that we can generally understand this field and explore target user groups (Macaulay and Busse 2009).

**Video Analysis:** By watching and analyzing concept video of automobile companies, understanding trends of human-vehicle interaction, which can inspire following design work.

**Desk Research:** Through reading papers, we can master the basic situation of IOV, know Current research in China and abroad and explore potential user groups.

**Context Research:** Through field observing, experiencing automotive products, interviewing with staffs and buyers, can deeply understand human-vehicle interaction and verified that the potential user group is researchable (Fig. 9).



Fig. 9. Interview target user group

### 3.2 User Research I

Then we did informal interviews to understand users’ lifestyle and attitude towards digital consumption, etc. It is a time effectively method to know about users.

**Informal Interview:** We had several informal interviews with target user group and preliminary understood target user groups’ daily life, hobbies, interpersonal communicating and so on.

### 3.3 Analysis I

Further discussed and analyzed target user groups’ concerns based on previous research, and clarified scope of further research.

**Collage:** As Fig. 10 shows, it can help you to define for whom and for what problem or challenge you plan to design (Delft et al. 2013). Through previous understanding of target user group, divergent thinking and summarizing several key points of target user group (Cross 2008).



**Fig. 10.** A collage of target user group

**Flower Mind Map:** Based on keywords from collage, continuing divergent thinking and making points specifically.

So, we can define target user group, built basic demographic and psychological information of target user groups.

### 3.4 User Research II

In this phase, based on the result of former research, further digging out target user’s pain points and needs of communicating, mobility, consumption, and target user’s respective concerns.

**Online Survey:** Through clusters from collages and flower mind maps to set up an outline of the questionnaire and sending it to target user groups. Then we did cross-analysis and correlation analysis to explore target user group’s behaviors and connection between behaviors and demographic factors.

**Focus Group Interview:** According to results of online survey, conduct group interviews to further identify causes and significance of these behaviors. In order to understand users’ deep behavior preferences and motivations better as well as quickly shorten the distance between interviewers and participants, we set many toolkits to trigger users’ memory. Focus groups were required to discuss and present the result of discussion with toolkits. As Fig. 11 shows of toolkits to help users to think about what is their work environment preference (Sanders and Jan Stappers 2013).



Fig. 11. Work environment preference toolkits

**1 on 1 Interview:** Based on the overcomes of online survey and focus groups, the semi-structured approach was chosen because we already had some ideas but we cannot figure out everything. In order to dig out valuable points, we conducted in-depth interviews within these points to clarify target user group’s real needs.

### 3.5 Analysis II

When we collected a large number of first-hand user research data. We combined all kinds of results together to analyze user needs of digital consumption services in the context of communicating vehicles. Analysis follows steps as Fig. 12 shown.

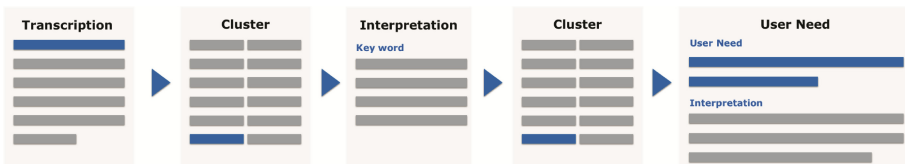
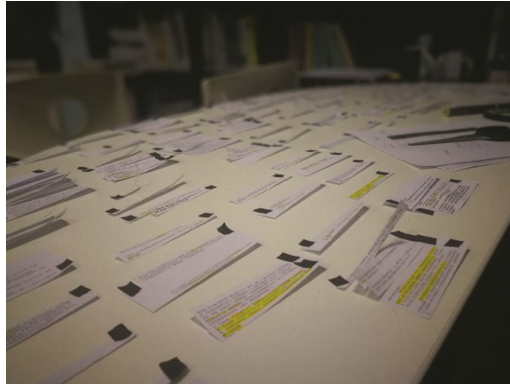


Fig. 12. Analysis interviews’ results steps

**Transcription:** It is the process of transcribing the recording of the interviews and focus group is also a process of familiarizing and rethinking the interviews.



**Affinity diagrams I:** Clustered what participants said (Fig. 13).



**Fig. 13.** Affinity diagram I

**Interpretation:** It is the process of finding benefits and understanding motivation.

**Affinity diagrams:** Clustered by participants' benefits to find the original benefits.

Going down this, we got 22 users' needs from 4 benefit themes.

Finally, we visited 48 4S shops in different district in Beijing to define target user group, interviewed 251 participants to explore motivations, needs and frustration of them, read 327 papers to understand market and technologies, collected 2487 online surveys, finally got 567,592 words transcription.

## 4 User Needs of Digital Consumption Services

This section presents our main findings about user needs of digital consumption services. The findings are clustered under 4 main themes: the third space, purpose, design guidelines and satisfy desire. As a starting point, Sect. 4.1 provides an overview of users' attitude identified in the previous work.

### 4.1 User Attitudes

The attitudes of the users towards digital consumption services in their daily life were quite positive both in focus group interviews and 1 on 1 interviews. They mentioned that they are connected to a careless world, because they can use Alipay and WeChat pay almost everywhere. As the name suggests, they are ways to pay for goods and services online, and majority of transactions processed are conducted on mobile devices. At the same time, more and more merchants across China and around the world are accepting cash less, it will be more convenient. At present, they are enjoying life that connected to the digital world. Besides, they are more rely on digital consumption not

only downloading digital media, using digital facilities, downloading digital applications and buying digital devices, but also buying membership, downloading online resources, asking experts to answer questions.

However, criticism of digital consumption was brought up in many interviews. Most information of digital consumption relies on digital information services, they communicate, search details, etc. on the Internet. In the face of the situation of Internet information explosion, the lack of trust, and the promotion of knowledge blocked, reliability has become a serious problem of digital consumption. Many participants said that they were afraid to buy products services online especially expensive product. When they buy products and services online often refer to comments below, but numerical records are easy to forge. So, users will spend more time to considerate which one to purchase. Some questions about the conventional wisdom that the Internet creates a “level playing field” for large and small retailers and for retailers with and without an established reputation. Users recognized differences in size and fame among Internet stores, and those differences influenced their assessments of store trustworthiness and their perception of risk, as well as their willingness to patronize the store.

As they said digital consumption world is convenient but it lacks of trust. Participants mainly wanted solutions to ease their life in certain functions.

## **4.2 The Third Space**

Vehicles as the third space of users, besides home (the first space), company (the second space), give more opportunities to development of digital consumption in context of communicating vehicles. Users need an independent space where users can take a rest and think, and this space is also can protect their privacy. Vehicle is a secluded place, and one of the participants mentioned that he hopes to have a rest when he feels tired during self-driving trip with his friend. Sometimes users want to escape from an unpleasant environment for a while. Some users choose to travel, and some users choose to do something they like. During an interview, a user mentioned that he arranges tourism regularly. It slows him down enough not only to draw attention to where he is in his body, but also to his breath. Some days, it's just what he needs. Users need to vent their emotions. When they are driving, it is a closed and safe environment, and there are many users who choose to talk to their friends or family members about their work and life troubles and pressure. Some users will ease their stress by shopping online.

## **4.3 Purpose**

In order to engage better in the future, there are many participants can choose the way of combining exertion and rest, take a nap, play games, watch variety shows, etc. In this approach, different brain regions can be activated, long-term excited can have a rest. To experience a new environment, many participants choose to reward themselves by traveling. They want to experience a brand-new environment and find out details that they cannot perceive in the previous environment.

#### 4.4 Design Guideline

After the user interviews, we summarized two design guidelines that are required to pay more attention.

**Precise and efficient.** Under the development of the digital age, users expect more direct and efficient way to display information. Information bombing doesn't have the function of the interference user judgment as before. From the perspective of participants, they like to read more precise information, save their time, which allows users to trust in the product or service more.

**Save for a rainy day.** Users already have the basic cognition to a lot of information, according to the situation related to prepare in advance, but because of too much information at the same time, in context of vehicle network, need to use the advantage of network interconnection, under the right circumstances in an appropriate way to remind the user needs.

#### 4.5 Satisfy Desire

As a subordinate of the user, the vehicle satisfies the owner's possessiveness of the item, and also gives the user a sense of belonging. The user feels accepted and accepted by others or the group. When user driving vehicle, there has the feeling of control, the user can control the direction as he wants.

### 5 Discussion

These findings enhance our understanding of users' authentic needs of digital consumption in communicating vehicle context. The main weakness of this study was the paucity of real experience in communicating vehicle context. Future research should therefore concentrate on the investigation of what kinds of information they need and when they need. It helps us to explore more opportunities in context of communicating. It would be interesting to do user test of individuals within target user group.

### 6 Conclusion

In the study of quantitative and qualitative researches found 22 user needs of 4 themes in communicating vehicle context. These findings suggest that in general vehicles satisfy possessive, create a sense of belonging and security. Vehicles create an independent space, can vent users' emotions, also can drive far away from an unpleasant situation, or experience a new world. In the future, we should design more directly and efficiently way to communicate with users, and consider the long-term problems of users.

**Acknowledgements.** The author wishes to thank the mentors of Communicating Vehicle Project for their valued co-operation: Professor Wei Liu, Lecture Yancong Zhu, also wish to thank team members: Meng Zhang, Tianyu Gao, Yuwei Fan, and all first-year master students of BNUX.

**Funding.** The publication of this research project was supported by the Fundamental Research Funds for the Central Universities (No. 01900-310422110).

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