

The Integration of Personal and Public Transportation in Creating Seamless Experience

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Abstract. Seamless experience has becoming a major focus in industrial design, including transportation design. It can be argued that to create this kind of “seamless” feeling calls for consideration from three levels: product, system and service, as product being the carrier, system being the logic lying beneath while service being the process of co-creation with users. It is also proposed that the integration of personal and public transportation become crucial in creating a seamless experience with the process of urbanization and complexity of transportation system. Then, the different nature of personal and public transportation is analyzed and four possible design models, or design methods, are proposed. Furthermore, a design case is illustrated as an initial design attempt in application. It is shown that the integration process involves complicated design elements and calls for deep collaboration.

Keywords: Seamless experience · Personal transportation · Public transport · Integrated innovation

1 Introduction

Experience has been a major focus in product design—both physical and internet product. Also, as experience seems to become increasingly diversified, to create a seamless experience become a crucial issue. In general, seamless experience comes from a variety of aspects. (1) Among different products. This part contains two aspects: the appearance of products and the interaction of product. The former one focuses on the appearance of the product. For example, car companies have been trying to maintain some key features in car styling. BMW's “Double Kidney” grille and “flaming surface” are classic representatives. This is called “brand DNA” [1, 2], which uses specific styling features to create a similar cognition and further to form a seamless experience. For the latter one, apple devices are good examples. Although iphone, ipad and Macbook have similar system and interaction model, one still have to reopen a task or an app when he/she changes to another device. What Apple tries to do is, besides keeping continuity across multiple devices by interface and apps, to “jump” for one device to another while continuing the same task. For example, If one is reading a web

site on MacBook, he/she can walk over to iPad, swipe up, and continue reading the same site. If one is writing an email on iPhone, he/she can hand it off just as easily to Mac and finish typing it on a real keyboard. This is to create, as Tim Cook said, “an integrated and continuous experience across all Apple products” [3]. (2) Online and Offline experience. Since multichannel retailing is becoming widespread and popular, how to create seamless experience for customer has been a major concern. For example, companies should correspond between their online and offline channels in terms of convenience and availability, customer comprehension and uniform company identity [4]. (3) Web and mobile experience. Since many software applications are available in both web and mobile version, some gaps of interacting show as the app is designed first or only for one of these two platforms. Thus some approaches have been taken to mitigate such an issue and create seamless experience when users shift between platforms [5].

Whereas daily travelling is always a huge part of human life, this kind of seamless experience is also gaining more attention in transportation design. For example, some car companies have adopted smart operating system in their cars, so the drivers can mirror the content of their mobile phone onto the in-car screen and use those apps such as map or music player in a manner which they are familiar with. However, as the current and changing nature of society and lifestyle patterns generate diversified travel needs [6], a more holistic way of creating this seamless experience is needed, integrating personal and public transportation being one of the feasible solutions. Also, from the cases above it can be seen that, all of those seamless experiences seem to have something in common—to keep some key factors such as styling, interface, manipulation in certain continuity while the user transit among various platforms. So the importance is the existence of platforms and to have something continuous in between. In transportation design, the platform can be product, system and service.

2 Experience of Transportation

2.1 Interrelationship of Product, System, Service and Experience

According to the new definition of Industrial Design by WDO, “Industrial Design is a strategic problem-solving process that drives innovation, builds business success and leads to a better quality of life through innovative products, systems, services and experiences.” The definition shows the trend that industrial design is now way beyond function and form [7], but is an integration of product, system, service and experience. From certain perspective, this integration can be understood as—product is the carrier, tangible or intangible; system is the logic lying beneath; service is the process of co-creation with user [8]; while experience is the pursued value, as shown in Fig. 1.

The implication of this figure is that, to gain a valuable experience, the design should take product, system and service into consideration at the same time. This is especially the case when it comes to transportation design.

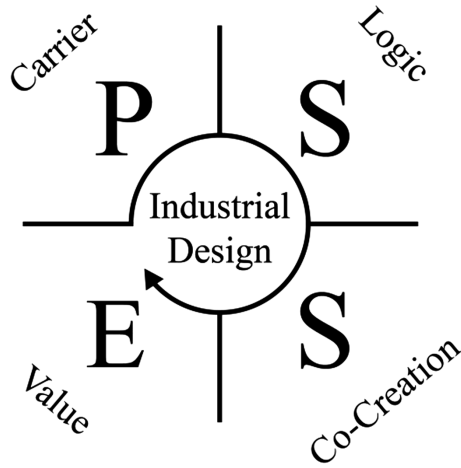


Fig. 1. The hierarchy of industrial design

2.2 Product, System and Service of Transportation Design

Generally, transportation includes personal transportation and public transportation, which seems mutual exclusive. Due to their nature, the different characters of these two can be summarized as below (Fig. 2).

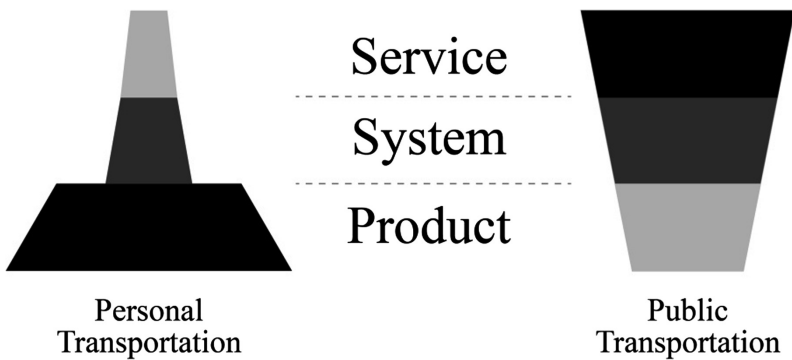


Fig. 2. The different nature of personal transportation and public transportation

For personal transportation, product itself is the most important, because it is closely related to the mobility of single person. On the basis of product, related system is constructed and service provided. It is kind of bottom-up hierarchy. As for public transportation, according to its definition, “a shared passenger-transport service which is available by the general public”, means that it is a kind of service in the first place. Then certain system has to be built in order to serve the general public rather than single person. As long as this purpose is achieved, the form of the product varies. So it

is more like up-bottom structure. The nature of personal and public transportation determines that they have different starting point and focus in designing.

2.3 Transportation Design Strategy of Creating Seamless Experience

Due to those aforementioned distinctions, it is necessary to get insights of the basis of transportation in order to create seamless experience. On one hand, the essential purpose of transportation is to move people from location A to location B. On the other hand, with the development of technology and change of lifestyle, people now have higher expectation of the transportation experience. For these reasons, the purpose of “seamless” should include two basic sources: physical and perceptual, as shown in Fig. 3. The former one can be fulfilled by the design of product and system which enable a smooth transition of physical body. While the perception of “seamless” comes from product [9], system and service, as each piece triggers perceptual reactions. For either situation, the design elements which lie beneath are closely interrelated.

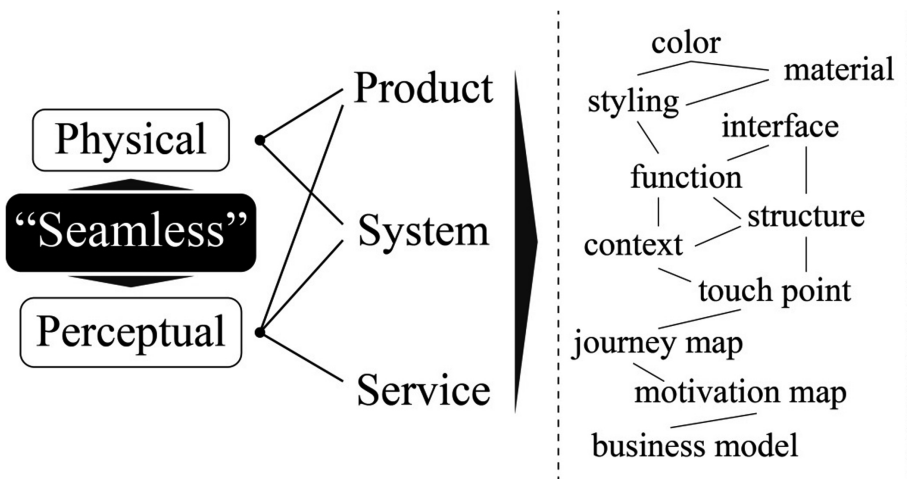


Fig. 3. The “sources” of seamless in transportation design

Down to the operational level, there are four models of integration which serve the purpose of creating “seamless”. The first one is “Product+Product”, or product-leading. This is the straight-forward way of integrating, which requires the “combination” of product, so that users can transit from one product to another conveniently. A simple example would be a subway with special scooter or bicycle which can be used for “one last mile” after passengers get off. The second one is “Product+System”, or system-orienting, which calls for a systematic way of organizing products to make the transit smoothly. This may be seen in future cities with all autonomous cars running on the streets, in which all the cars are controlled by the intellectual system. The third one is “Product+Service”. In this case, service can be used as a supplement or even

substitution of some products. Nowadays, all kinds of car sharing or car pool services are using this kind of concept. This model also influence some car manufactures directly. “Xiaopeng Motors”, a Chinese startup car company that aims at providing electric cars for the youth, takes “half selling and half renting” strategy and encourage long-term renting, which means users don’t necessarily have to buy a car, while having the service instead. Last but not least, the fourth model is “Product+System+Service”, which is the most comprehensive way of integration (Fig. 4).

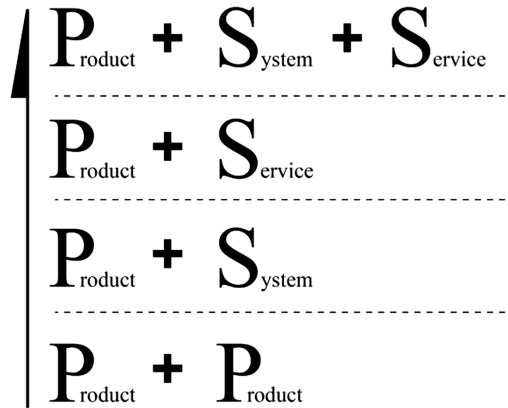


Fig. 4. Four models of integration

3 Design Case

In order to put the research into practice, some designs are done and reflections are made. Here is one of the design case which tries to combine the advantages of personal transportation and public transportation on the basis of H-Bahn.

3.1 Research and Concept

A general research is conducted in order to get a broad look on the current situation of personal and public transportation in the city. It is concluded that with the emerging of environmental and economic problem, more environmental-friendly, comfortable and convenient way of transporting are in demand. New energy vehicles and smart public transportation system have become popular, among which, rail transportation has regaining popularity in recent years, especially in China. It is reported that by the end of 2016, there are 43 Chinese cities whose constructing plan of rail transportation system have been approved by the government, and the trend has extended from first-tier cities to second-and third-tier cities. The whole planned mileage reaches 8600 km, and the expecting yearly subsidy is estimated \$130 million from 2016 to 2020. Therefore, rail transportation is chosen as starting point of the design.

As there are several kinds of rail transportation for passenger such as tram and H-Bahn, a comparison is made. Several criteria are used such as construction cost, operating cost, land occupation and line coverage. It can be seen that high punctuality, high security and “green” are the general advantages of public transportation. While, some features such as low flexibility are the disadvantages, which can be used as the starting point of problem-solving (Fig. 5).

Project	Construction cost	Operating cost	Occupied area	Line coverage	Bearing capacity	Operating speed	Flexibility	Punctuality	Security	Green
Tramcar	●●●	●●●	●●●●	●●●	●●●●	●●●	●●	●●●●	●●●	●●●●
Metro	●●●●●	●●●●●	●●	●●	●●●●●	●●●●	●	●●●●●	●●●●●	●●●
Light Rail Transit	●●●●	●●●●●	●●	●●	●●●●●	●●●●●	●	●●●●●	●●●●●	●●●
H-Bahn	●	●●	●	●●	●●●	●●●●	●●	●●●●●	●●●●●	●●●●
Passenger cableway /Elevator	●	●	●	●	●	●	●	●●●●	●●	●●●●

Fig. 5. Comparison of different rail transportation

A quick user research is conducted and the dissatisfaction and major expectations for public transportation are collected. Then four personas are constructed including daily commuter, retired people, housewife and tourist. Based on their demands, the concept of this design is defined as “a transportation system based on public railway which have personal features and can be used as personal transportation at certain circumstances, also some services should be provided to meet special needs”.

3.2 The Design

Three groups of designers collaborate on the design, focusing on product, system and service respectively. The final design is named “AirPT”.

System

The rail network consists of two parts: the main lines and the branch lines. Main lines go across the main part of the city, like the aorta of human body, while the branch lines go deep into communities even buildings, just like capillaries. Accordingly, there will be two kinds of cabins: large one and small one. Large ones are like regular H-Bahn cabin, having the capacity of 50 to 70 people and running only on the main lines. Small ones have capacity of 1 to 4 people, which run both at the main lines and the branch lines. Some platforms are incorporated with office or residence buildings. Different route situations have also been considered and designed in order to make the system adaptive for complicated urban layout, such as single track with three directions and double track with four directions (Fig. 6).

The Figure below shows the information flow of this system. The information among control center, user, station and vehicle is carefully examined and systematically controlled so that the information exchanging is smooth (Fig. 7).

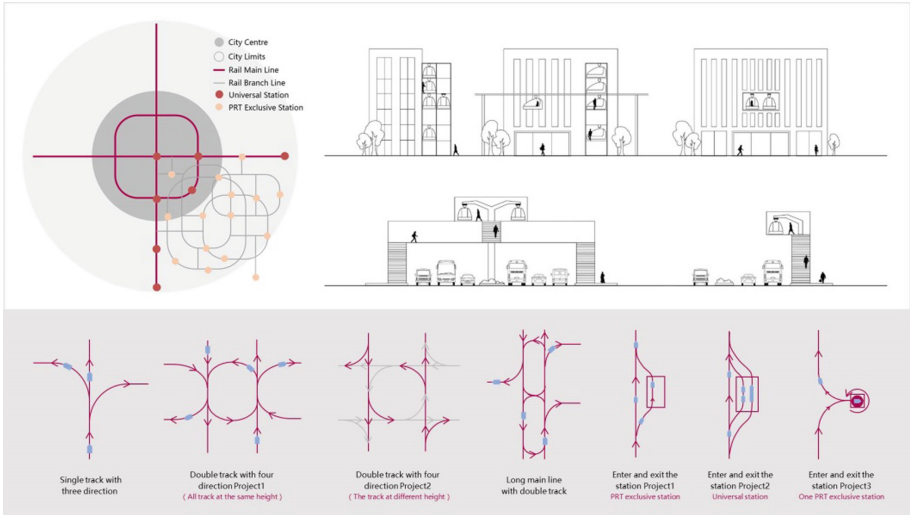


Fig. 6. Line distribution system

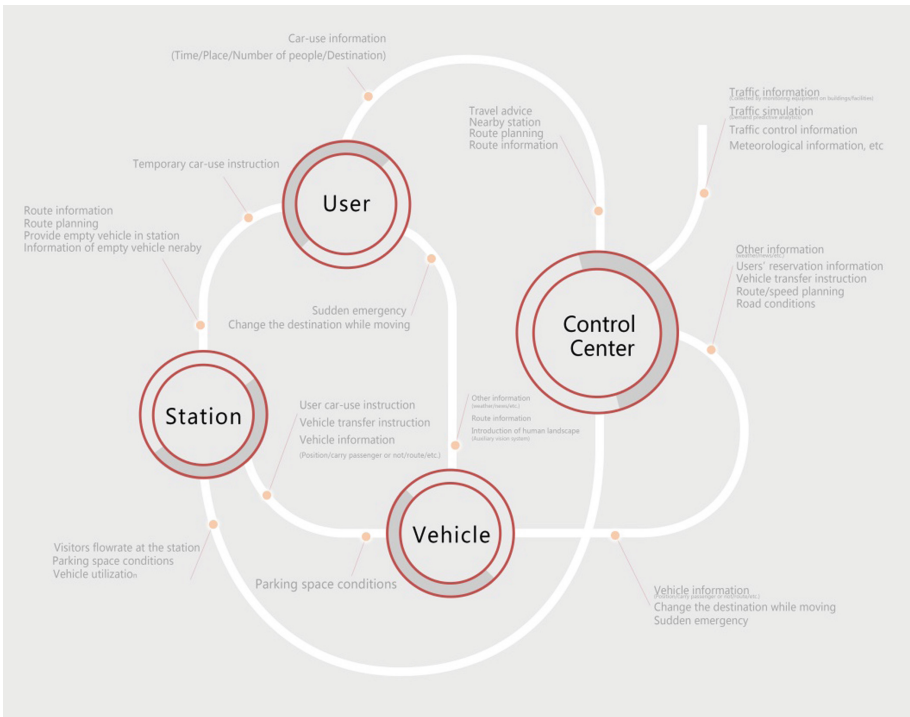


Fig. 7. Information flow diagram

Service

There are various kinds of service that can be applied in this system. According to user research, the core service would be reserving and booking. As shown in Fig. 8, users can use apps to reserve a cabin conveniently, including having a choice of taking a private cabin or shared one. Another important service is city logistics service. Users can reserve a cabin to deliver a parcel or have the cabin fetching a parcel at the logistics center before picking him/her up. Furthermore, there are also some in-car services as the cabin can be used for tourism. For example, with the help of augmented reality, tourists can enjoy explanation service while sightseeing.

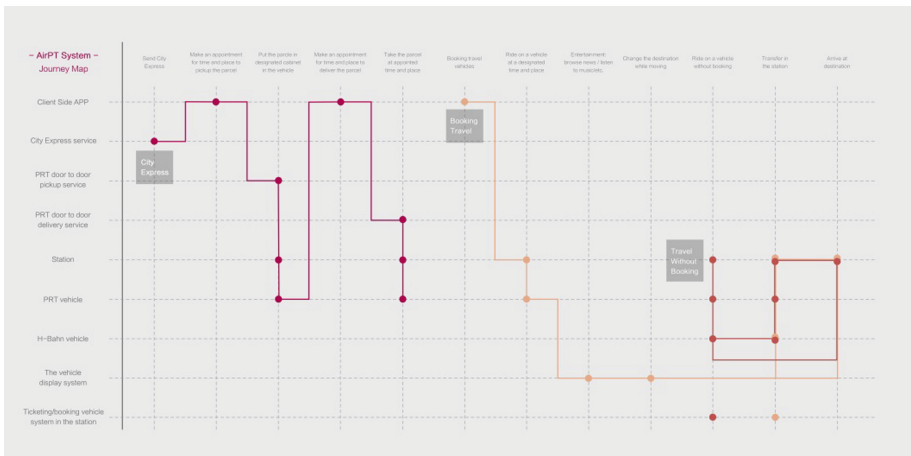


Fig. 8. User journey map

Product

The main consideration of product is that to make the two sizes of cabins consistent in styling. Also the interior design matches the requirement of service (Fig. 9).

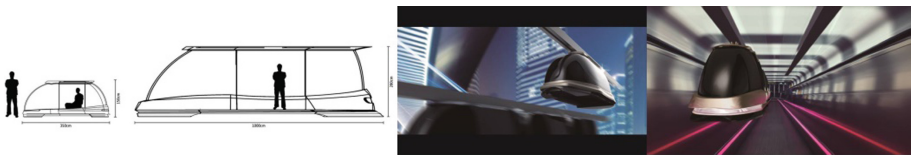


Fig. 9. Product design

3.3 The Application

As public transportation is closed related to and limited by the city planning, a survey is done to understand kind of city structure, such as “concentric zone” or “multiple nuclei”. Also, some basic development models like Transit-Oriented Development (TOD) and Joint Development (TJD) [10] are also studied. Then the Chinese city

Xiamen is chosen as an ideal location for application. It is thought that the AirPT system would be a good supplement of public transportation there due to the character of this city. By field survey and desktop research, the geography, the functional layout and the general situation of residence are understood. Then the predicted traffic situation and demand is estimated by setting the community, the population of each district, the situation of commuting and travelling. On this basis, the line distribution of AirPT is designed (Fig. 10).

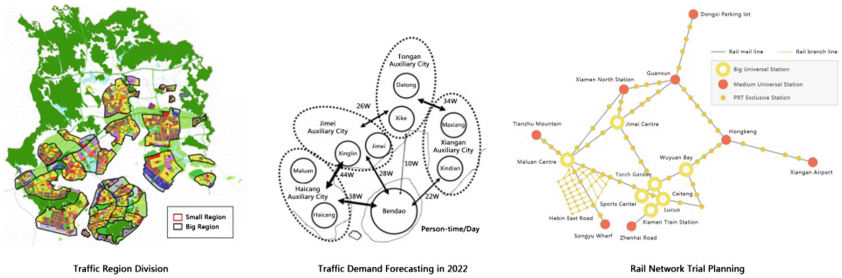


Fig. 10. Attempt for application

4 Discussion

With the accelerated process of urbanization, the way of commuting and travelling become diversified, and people have higher expectation for transportation experience. In this context, the integration of personal transportation and public transportation seems to be a necessary and effective way for creating a seamless experience. In general, there are two ways of doing this. The first one is to make personal mobility “sharable”, just like car pool or car sharing. Meanwhile, to make public transportation more personalized is also feasible. According to the analysis and design case above, product, system and service all have the potential to do so, “product leading”, “system orienting” and “service guiding” are all possible ways, and there is no clear boundary among them, and all three factors are co-dependent. Actually, integrating personal transportation and public transportation is such a big topic and complicated one, inter-discipline knowledge such as urban planning and architecture design are needed. What design can contribute most is that to understand the problem comprehensively and do the problem-solving holistically. Also, the design case here is a concept design which needs further perfection and testified. But to consider how the elements of product, system and service should be integrated is the right way of problem-solving here.

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