The Application of System Theory’s Thinking Principle in the Design of Shared Parking Service

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Abstract. This paper studied how can shared parking services create a better service and user experience from the system theory's thinking perspective, analyzed the model differences between traditional parking services and shared parking services, analyzed the existing problems of shared parking services, and proposed the application of system theory's thinking principle in the design of shared parking service to make the designed shared parking service better meet the needs of users and improve the parking experience of users.

Introduction

With the rapid development of society, the number of cars in China has increased year by year, and the parking spaces are gradually in short supply. According to statistics, as of 2016, the number of cars in China has exceeded 170 million, while the number of parking spaces is less than 68 million. The problem of difficult parking due to fewer parking spaces than vehicles is becoming more and more prominent. Furthermore, in the case that the parking space is in short supply, the utilization rate of parking spaces in China is only about 30%. To alleviate the parking problem, many shared parking service information platforms have appeared in recent years. However, as a service medium for parking, these platforms still have various problems (for example, poor user experience of sharing platforms), which lead to the slow development of existing platforms.

In order to improve the service experience of a shared parking platform, we should design the entire parking service as a system, to organically link people, objects, processes, values, and environments into the system where they can interact with and depend on each other.

Concept and Thinking Principles of System Theory

The concept of system theory appeared in 1948. The word “system” originated in ancient Greek. “System” refers to the sum of complex things, that is, the whole composed of parts. The idea of modern systems theory was first proposed by the Austrian biologist Bertalanffy, who defined system as a complex of interacting elements. System theory reflects the complexity of problems in real life and reflects the development trend of modern society. Therefore, the concept of system theory has inspired people to solve complex problems with the idea of integration. Furthermore, system theory with comprehensive characteristics has certain guiding significance for various research fields and practical significance for solving practical problems. System theory is widely used in military, economic, political, design and other fields. In design, the basic idea of system theory is to consider the object of research as a system, in which elements such as people, objects, processes, values, environment are organically linked to form a whole where they can influence and depend on each other, to study the relationship between the various elements, and study problems from a systematic point of view. The design of a product or a service can be derived to the design of a system. The design elements in the design of a system not only includes the design object itself, but also includes the social factors associated with it and the natural environment in which it is located.

System thinking refers to a mode of thinking based on system theory. Its principles include the principle of integrity, relevance principle, level principle, dynamic principle, and objective principle. This paper discusses the application of system theory’s thinking principles in the design of shared parking services based on the principles of integrity, hierarchy and relevance.
Traditional Parking Service Mode and Parking Service Mode under Sharing Economy

Parking service in the shared economy has a completely different delivery model with that of traditional parking service. In the traditional parking service, the parking lot management system controls all process of service delivery. There are contact points with the parking users in the process of entering and leaving the parking lot and parking payment; In shared parking mode, there is only a parking space sharing platform where the parking space owners share their own parking spaces, and parking service users rent parking spaces according to their own needs. The real service providers are the parking space owners, and the service recipients are the parking users. The link between the two occurs on the shared parking platform, as shown in the figure.

1. Figure 1. Comparison of traditional parking service mode and shared parking service mode.

In the traditional parking service mode, the parking lot serves as a service provider to control the parking experience of the user, and to control the entrance and exit and parking payment, etc. In the shared parking service mode, the shared parking platform is only a bridge connecting the users sharing the parking space and the users renting the parking space, and is only responsible for part of the parking service processes, such as parking payment, parking spaces release, parking space reviewing, parking space booking, parking spaces information managing. They are different not only in their roles, but also in the operating profit model. In traditional parking service, all the fees paid by parking users belong to the parking lot; while in the shared parking service mode, the distribution of benefits is involved. The fees paid by parking users are partly owned by the owner of the parking space, partly owned by the Shared parking platform, and partly owned by the residential property.

The Existing Problems in the Development of Shared Parking Service

At present, in Chinese urban, the number of cars is far greater than the number of existing car parking spaces, so parking space supply cannot meet the growing demand for parking. Furthermore, the low utilization rate of the parking space has intensified parking contradiction. With the rise of the sharing economy, shared parking has attracted the attention from many parties. However, due to the difficulty in integrating social resources and the imperfect government policies, the shared parking is still in the initial stage of development. The development of shared parking service is fast but on a small scale. According to the investigation and analysis, the following problems commonly exist in shared parking service in residential areas:

(1) Poor APP user experience: The rise of the major shared parking App was originally designed to make it convenient for users to find shared parking spaces, to make parking space reservations,
and to reach the parking space via GPS. However, when using Apps, many problems appeared in the process of finding a parking space. For example, after booking the parking space in a residential area, the user couldn't find the entrance after driving several times around the residential area by following the GPS, so it wasted a lot of time.

(2) The technical transfer is not in place: the shared parking APP is not well matched with the entrance and exit control system of the residential area, causing the user to pay the parking fee twice, one payment on the APP, and another payment when leaving the parking lot, and further causing the conflicts between the parking user and the shared parking service platform as well as the parking management office in residential area, which has greatly increased the communication cost.

(3) Safety issues of shared parking service: Many property management offices in residential areas, especially in some private residential areas with high privacy, are concerned about the security of the community with shared parking service. They believe that foreign vehicles are difficult to manage, and they increase potential risks. For example, who should be responsible for problems such as vehicle collision.

(4) Parking income distribution: Regarding the distribution of income of shared parking in residential areas, three parties including parking space owners, residential property offices and shared parking platforms are involved. If no agreement in terms of revenue distribution was reached, conflicts among the three parties will appear. Therefore, the balance of the benefits of the three is a challenge for shared parking services.

Application of System Theory’s Thinking Mode in the Design of Shared Parking Service

The system theory's thinking principles can be applied in the design of shared parking service. This paper discusses the application of system theory's thinking principles, mainly the principle of integrity, the principle of hierarchy and the principle of relevance in the design of shared parking service, hoping to effectively improve the quality of service and the parking service experience by using system theory's thinking mode in the aspects of parking information service, parking service management, parking resource integration, etc., thus solving the existing problems of shared parking services.

Outputting integral and continuous parking information

System theory emphasizes to treat the design object as a whole or a system. Therefore, we consider the shared parking service as a system, which consists of several subsystems, that is, several parts constituting the whole service, as shown in Figure 2.

![Figure 2. Composition of shared parking service system.](image)
perspectives of the three stages of parking: before parking, parking, and after parking. Before parking, users are provided with parking lot information, parking space information, route to the parking lot and space, reservations information, etc.; during parking, users are provided with navigation and guidance in the parking lot. Users are more concerned about how to find their own reserved parking space in the unfamiliar parking lot and how to park their cars better and faster. Therefore, the parking guidance service inside the parking lot is very important. Parking guidance in the parking lot can be realized by integrating and planning the parking information of the whole parking lot and making visual output. After parking, the users are provided with a reverse car-seeking service. The user's satisfaction level and feedback on the parking service can be obtained online to improve the service quality. In the entire shared parking system, the integration of parking information from the perspective of the entire parking process can effectively improve the quality of parking services and the user parking experience.

Figure 3. The whole process of shared parking system.

Providing orderly parking service

The parking service can be divided into three stages, namely before parking, during parking, and after parking. Before parking, users have a demand of parking and need to know the parking lot situation of the destination when they go out. Parking is a stage where the user is in close contact with the whole system. There are several interaction scenarios between the user and the system, where the user's interaction needs are to be satisfied; the post-parking stage is more about the user's real feelings, which will decide whether to use the parking service again. It is the stage most intuitively reflecting the value of the parking service. The user behavior and service requirements in the three stages are actually coincident. The orderly parking services obtained with the hierarchy principle of system theory can guarantee the user's smooth parking experience from the beginning to the end of the parking service.

Linking multiple parties to effectively integrate parking resources

The relevance principles of system theory can be used to motivate the enthusiasm of all stakeholders to mobilize the participation of various stakeholders in the service designing process. Shared parking services involve several stakeholders including residential property, parking space owners, parking users, and shared service platforms, as shown in Figure 4. In order to integrate the idle parking resources, it is necessary to clearly identify the main roles in the parking service and explore and analyze the pain spot of the main parties, so that the parking experience in the shared parking service can be improved. Only after sorting out the relationship between various stakeholders and the distribution of benefits, can all stakeholders cooperate and actively participate in it, effectively integrate parking resources and create a better environment for shared parking service.
Conclusion
Under the background that the number of cars is increasing day by day, the construction of parking spaces is difficult and the utilization of existing parking spaces is not high, the introduction of effective design methods will help alleviate the current problem of “difficult parking and idle parking spaces”. Shared parking services are correlated to people, parking resources, national government policies, etc. Therefore, it’s necessary to use the system theory’s thinking mode to regard the shared parking service as a large system, and use the system theory's thinking principle to guide the design of whole shared parking services system, provide users with the best system services, and further improve the user's parking experience.

References