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Analysis of the Use of Interaction Design in the Interface of In-vehicle Multimedia Platform

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Abstract

Aiming at the interface design of in-vehicle multimedia platform, with interaction design as the core, this paper analyzes the important role played by interaction design in the interface design of in-vehicle multimedia platform. By analyzing the definition of interaction design and the characteristics of in-vehicle multimedia platform, this paper proposes how to use interaction design in the interface design of in-vehicle multimedia platform. The advantages of interaction design in user experience, usability and efficiency of in-vehicle multimedia platform are analyzed in detail with examples, and the corresponding solutions are proposed for the problems in the interface design of in-vehicle multimedia platform.

Keywords

interaction design, in-vehicle multimedia platform, interface design, user experience, usability, efficiency

1. Introduction

With the continuous development of technology, in-car multimedia platform has become an important part of modern cars. In the in-car multimedia platform, the importance of interface design is self-evident, and a good interface design can improve the user's experience and use efficiency. Interaction design, as an important part of interface design, can have an important impact on the interface design of in-vehicle multimedia platform. This paper aims to explore the use of interaction design in the interface design of in-vehicle multimedia platform, hoping to provide some reference for the design of in-vehicle multimedia platform.

2. Definition and Characteristics of Interaction Design

Interaction design refers to the process of designing products, services or systems by considering the process and method by which users interact with them, in order to improve user experience and efficiency. The core of interaction design is the user. By deeply understanding the needs and behaviors of the user, interfaces and interaction methods that fit with users' habits and cognitive patterns are designed to improve usability and user experience. Interaction design usually includes information architecture, interface design, user research, user testing and other aspects. A good interaction design requires a combination of knowledge from several areas, including human-computer interaction, psychology, cognitive science, visual design, information architecture, and user testing (Jiang, Jang & Pan, 2023, p. 13). The basic principles of interaction design include visibility, feedback, constraints, flexibility, consistency, simplicity, ease of learning, and controllability. By considering these principles, designers can create products with high levels of usability, reliability, and user satisfaction. In the modern world, interaction design has been used in a wide variety of technology areas and products, including software, websites, mobile applications, smart homes, automotive cockpits, and smart wearables. A good interaction design can improve the market competitiveness of a product, make users like and rely on the product more, and generate more value and meaning in the process of using it. Therefore, interaction design has become an indispensable part of modern technology product design (Jayaraj, Sriram, Sudharsan & Ranjith, 2009). The general flow of interaction design is shown in Figure 1:

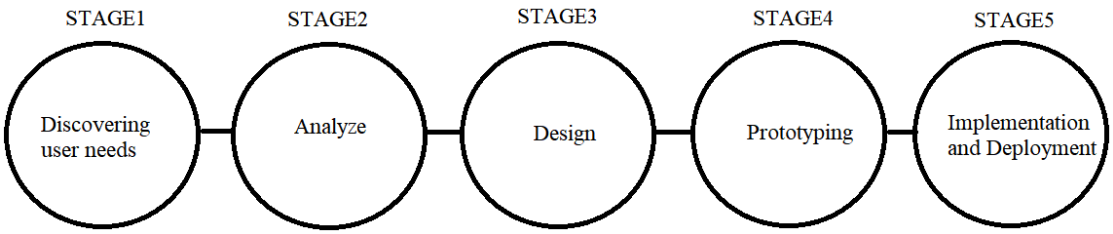

Figure 1. General Flow of Interaction Design

A car multimedia platform is a multimedia system installed on a car, including audio, video, navigation, communication, etc. Unlike traditional multimedia systems, car multimedia platforms have unique usage environments, such as use during driving, restrictions on driver operation, and so on. Therefore, in the interface design of car multimedia platforms, interaction design is particularly important.

Interaction design occupies an important position in modern technology product design, and its main features include the following aspects: (1) User-oriented: The core of interaction design is user-centered, incorporating user needs and behaviors into the design process. Interaction designers need to understand the needs and behavioral characteristics of users and design products with good user experience through in-depth user research and testing. (2) Multidisciplinary integration: Interaction

design needs to combine the knowledge of several disciplines, including computer science, psychology, visual communication and so on. Therefore, interaction designers need to have multidisciplinary background and skills and understand the knowledge and methods of different fields in order to design excellent products that conform to the principles of ergonomics, cognitive theory, etc. (3) Using creativity: Interaction design requires innovative thinking, and through continuous experimentation and innovation, finding the most suitable interaction methods and interface design. At the same time, interaction designers need to use various tools and techniques flexibly in order to create products with unique personality and creativity. (4) Pay attention to details: Interaction designers need to pay attention to every detail, from the whole to the local, from the interaction method to the interface design, all need to be carefully scrutinized. Only when every aspect is fully considered can the usability and ease of use of the product be ensured. (5) Objective evaluation: Interaction design requires objective testing and evaluation to continuously optimize the product design. In addition to quantitative and qualitative testing, interaction designers should also listen to users' feedback and suggestions in order to promote continuous improvement and upgrading of the product. In short, interaction design is a new design mindset in technology product design, whose core features are user-oriented, interdisciplinary, detail-oriented and creative, and continuous optimization of product design through objective evaluation (Feng, Deng, Lau, Cauffman, Johnson, Cunningham & Kaber, 2023, p, 93).

3. The Use of Interaction Design in the Interface Design of In-vehicle Multimedia Platform

3.1 Information Architecture Design

Information architecture design refers to the process of classifying, organizing, and presenting information, which is the foundation of interface design. In the interface design of car multimedia platforms, the rationality and clarity of information architecture will directly affect users' use experience of platform functions. Therefore, when designing the information architecture of car multimedia platforms, it is necessary to comprehensively consider factors such as users' usage scenarios and needs, as well as the platform's functional characteristics and usage processes. Firstly, based on the usage scenarios and needs of car multimedia platforms, the information architecture should be clear, easy to understand, and operate (Pohl & Oehm, 2022, p. 10). Considering the special identity of vehicle drivers, the interface design of car multimedia platforms should be as simple and clear as possible, so that drivers can quickly find the desired functions while driving. Additionally, because car multimedia platforms have multiple functions, in order to facilitate users' quick access to the desired function, various functions should be classified, such as audio, video, and navigation functions, etc., so that users can quickly find the desired function. Secondly, based on the functional characteristics and usage processes of car multimedia platforms, the information architecture should be reasonable and clear, so that users can quickly understand and master the platform's functional usage methods. When designing the information architecture, it is necessary to have a deep understanding of

the usage processes of various functions of the car multimedia platform, and reasonably set the positions and layouts of various functions and operation interfaces based on users' operating habits and cognitive rules. For example, in the navigation function, the destination search, route planning, and vehicle navigation functions should be classified, and each function interface should be set in a relatively uniform location to enable users to quickly find the required operation interface. Furthermore, in information architecture design, attention should be paid to the hierarchical nature and integrity of information (Yi, Huang & Yu, 2022, pp. 14-23). In the information architecture of car multimedia platforms, there should be clear hierarchical relationships between various functions and operation interfaces to facilitate users' understanding and mastery of platform usage methods. At the same time, integrity is also an important aspect of information architecture design for car multimedia platforms. There should be certain connections and links between various functions and operation interfaces to avoid fragmentation and incoherence, making the platform's overall usage process more smooth and natural. Lastly, information architecture design needs continuous optimization and improvement through actual testing and user feedback. When designing the information architecture of car multimedia platforms, user research and testing should be conducted to understand users' understanding and usage of the information architecture, and corresponding optimization and improvements should be made based on user feedback and needs, making the platform's information architecture more in line with users' needs and usage habits (Li, Zhang, Court, Kearney & Braithwaite, 2022, p. 92).

3.2 Interface Design

Interface design refers to the process of designing the interaction process and method between users and products, services or systems to improve user experience and efficiency. In the interface design of car multimedia platforms, it is an important component of user experience and needs to be consistent with the visual habits of drivers, as well as being clear, concise and easy to operate. Firstly, in the interface design of car multimedia platforms, the color should be bright but not overly colorful to avoid distracting drivers. Drivers need to concentrate on driving at all times, so the interface color design should mainly use bright colors to increase drivers' alertness to the vehicle status. In addition, for some emphasized functions, eye-catching colors can be used to highlight them for easier access by drivers. Secondly, in the interface design of car multimedia platforms, buttons and labels should be clear and understandable, avoiding using too many icons that users may not understand. As drivers cannot take their eyes off the dashboard for long periods, the interface buttons and labels should have simple and clear text explanations for drivers to understand. The size and position of the buttons and labels should also conform to the drivers' habits to avoid inconvenient operation. Lastly, in the interface design of car multimedia platforms, the interface should be concise, clear and easy to operate. As the usage scenario of car multimedia platforms is special, drivers need to operate them during driving. Therefore, the interface design should be as simple and clear as possible for easy operation. For commonly used

functions, they should be placed in an easily accessible position for quick access. In addition, to avoid driver distraction during operation, the layout and design of the interface can reduce the number of operations a driver needs to switch, thus improving operation efficiency.

3.3 User Research and Testing

User research and testing are important components of interface design for car multimedia platforms. By understanding user needs and habits, interface design can be optimized to improve user experience. When conducting user research and testing, multiple factors need to be considered, including user groups, testing environments, and testing methods. Firstly, it is necessary to accurately identify the user group when conducting user research and testing. As the main users of car multimedia platforms are drivers, their special identity and usage needs must be taken into account during the research and testing. Additionally, because different drivers have different ages, genders, occupations, and driving experiences, their usage needs and habits for car multimedia platforms may also differ (Rong, 2022, pp. 19-22). Therefore, research and testing should be conducted for different user groups. Secondly, the testing environment must be considered when conducting user research and testing. Car multimedia platforms are used inside vehicles, so the testing environment should closely resemble the actual usage environment. Testing can be done using simulators or in actual vehicles. During testing, factors such as lighting, noise, and vibration inside the vehicle, as well as the effects of different vehicle models and driving conditions, must be taken into account. Lastly, testing methods need to be considered when conducting user research and testing. Methods such as surveys, interviews, and observations can be used to understand user needs and habits. During testing, data collection and analysis methods such as user behavior recording, eye tracking, and physiological indicators can be used to evaluate usability and user experience. Through user research and testing, a large amount of user feedback and data can be obtained, which can be used to improve the interface. For example, based on user feedback and data analysis, interface colors, button and label sizes and positions can be adjusted to optimize the layout and design of the interface, improve user experience, and enhance product usability and user satisfaction. Additionally, through user research and testing, problems that users may not have noticed before, such as inconvenient operation and unclear information, can be discovered and addressed in a timely manner to improve product usability and user satisfaction (Cauffman, Lau, Deng, Cunningham, Kaber & Feng, 2022, pp. 12-20).

4. The Advantages of Interaction Design in the Interface Design of In-vehicle Multimedia Platform

4.1 Improve User Experience

Improving user experience is one of the important goals of interaction design. User experience refers to the subjective feelings that users have when using a product or service. Good user experience can increase users' willingness to use products or services, reduce complaints and return rates, and thereby increase the market competitiveness of products or services. Interaction design can design interfaces and interaction methods that are easy to understand and operate based on user needs and behavioral patterns, thereby enhancing user experience. Firstly, interaction design needs to consider user needs. When designing products or services, it is necessary to clarify user needs and goals in order to determine the direction and focus of the design. For example, in the interaction design of car multimedia platforms, it is necessary to consider that drivers need to quickly find the required functions while driving, so commonly used functions should be placed in an easily accessible location, and simple and clear buttons and labels should be designed so that the driver can clearly understand their meaning. Secondly, interaction design needs to consider user behavior patterns. When conducting interaction design, user behavior patterns and usage habits should be considered in order to design interaction methods that are easy to understand and operate. For example, when designing the interaction of a car multimedia platform, it is necessary to consider that the driver needs to operate while driving, so simple and clear interaction methods such as gestures, voice, and physical buttons should be designed to allow the driver to quickly find the required function while ensuring safe driving. Finally, interaction design needs to consider user emotional needs. When conducting interaction design, it is necessary to consider user emotional needs in order to design products or services that have emotional resonance. For example, in the interaction design of car multimedia platforms, elements such as interface colors, sound effects, and animations can be used to enhance the emotional color of the product, thereby increasing users' emotional involvement and satisfaction.

4.2 Improve Availability

The usability of a product refers to the convenience and efficiency with which users can use it, and is a very important aspect of product design. Interaction design can optimize interfaces to enable users to quickly find the desired functions and improve the usability of products. Here are several aspects of how interaction design can improve product usability: Clear information architecture: Information architecture is the backbone of product design, covering all information in the product. A good information architecture needs to consider user habits, organize related information, form a clear hierarchical structure, and reduce users' search time. Simple navigation: Navigation is the process by which users search for information in a product. Simple navigation can help users quickly find the desired information and functions. A simple navigation needs to consider user scenarios and design concise navigation bars so that users can quickly understand the structure and functions of the product.

Clear labels: Labels are important elements in a product that can help users understand and identify functions. Labels need to be simple, easy to understand, and not overly complex (Zhu, Cai & Zhang, 2022, pp. 11-20). At the same time, the position and size of labels also need to consider users' usage habits, and important labels should be placed in easily accessible locations.

Simple operation: Simple and user-friendly operation can help users quickly complete tasks and improve product usability. When designing operations, it is necessary to consider user scenarios and usage habits, design simple operation processes and interaction methods, and minimize the number of steps for users to operate. Consistent design style: Consistent design style can help users quickly understand the structure and functions of a product, thereby improving product usability. When designing the style, it is necessary to consider user habits and psychological expectations, maintain consistent design elements such as colors, fonts, and icons, and allow users to quickly understand the structure and functions of the product.

4.3 Improve Efficiency

Improving user efficiency is an important goal in interaction design. User efficiency can be improved by designing interfaces and interactions that conform to user habits and cognitive rules. The following are several aspects of how interaction design can improve user efficiency: Design interfaces that conform to user cognitive rules: When users use products, they have some cognitive rules and habits. Interaction design needs to be designed based on user cognitive rules so that users can quickly understand the product's structure and functions. For example, organize relevant information to form a clear hierarchical structure and reduce a user's search time. Design clear and concise interaction methods: Interaction methods directly affect user efficiency. Interaction design needs to be designed with clear and concise interaction methods based on user scenarios. For example, in the interactive design of a car's multimedia platform, consider drivers need to operate in a driving state, so it requires easily understandable interaction methods such as gestures, voice commands, or physical keys so that drivers can quickly find the desired features and ensure driving safety. Provide shortcuts: Shortcuts can help users quickly access needed functions and improve user efficiency. Interaction design needs to consider user habits and provide customizable shortcuts so that users can quickly access commonly used functions. Use automated functions: Automated functions can help users quickly complete tasks and improve user efficiency. For example, in the interactive design of a car's multimedia platform, use voice control and automated navigation functions so that drivers can quickly find the required functions while ensuring driving safety. Provide feedback and help: Feedback and help can help users quickly understand the product's structure and functions and improve user efficiency. Interaction design needs to provide intuitive feedback and help so that users can quickly understand the product's structure and functions and solve problems during use (Zhao, Jiang & Song, 2022, pp. 55-58).

4.4 Improve Driver Safety

The car multimedia platform is a very important component in modern automobiles. It can provide various functions, such as music playback, navigation, and phone communication. However, using the car multimedia platform while driving can affect driving safety. Therefore, designing a safe and easy-to-use car multimedia platform is essential, and interaction design can provide many advantages in this regard. Firstly, interaction design can provide interaction methods that conform to the driver's usage scenario. Drivers need to focus on driving during the driving process. Therefore, interaction design needs to provide simple and clear interaction methods based on the driver's usage scenario, such as gestures, voice commands, and physical keys so that the driver can quickly find the required functions while ensuring driving safety. For example, media platform operation can be achieved through voice control, which allows drivers to focus on driving without being distracted by operating the multimedia platform. Secondly, interaction design can provide clear and concise interface design. Interface design directly affects user experience and safety. A clear and concise interface design can help the driver quickly find the desired functions and reduce the driver's misoperation during use. For example, commonly used functions should be placed in easy-to-operate positions, and simple and clear buttons and labels should be designed so that the driver can clearly understand their meaning. In addition, interaction design can provide customizable functions. Different drivers have different needs and habits when using the multimedia platform. Interaction design can provide customizable functions so that drivers can set them according to their own needs and habits, thereby improving driver's user experience and safety. Finally, interaction design can provide intuitive feedback and help. Feedback and help can help the driver quickly understand the product's structure and functions, thus improving the driver's user experience and safety. For example, intuitive feedback and help can be provided through sound effects or screen prompts, allowing drivers to quickly understand the product's structure and functions, while also resolving issues during use.

4.5 Increase the Market Competitiveness of Products

The car multimedia platform is a very important component in modern automobiles. It can provide various functions, such as music playback, navigation, and phone communication. In today's fiercely competitive market, interaction design can increase the product's market competitiveness by improving its usability and user experience. Here are several aspects where interaction design can increase the market competitiveness of car multimedia platforms. First, interaction design can provide personalized design. Different users have different needs and habits, and interaction design can provide customizable functions and interfaces, allowing users to set them based on their own needs and habits, thereby enhancing the user experience and satisfaction and increasing the product's market competitiveness. Second, interaction design can enhance brand image and awareness. Good interaction design can make products stand out among similar products, enhancing brand image and awareness, and increasing market share. For example, Apple's iPhone has gained high recognition and market

share due to its excellent interaction design and user experience. Interaction design can increase the market competitiveness of the product by improving its usability and user experience, providing personalized design, enhancing brand image and awareness, etc. When designing car multimedia platforms, interaction design needs to consider the driver's usage scenario and habits, providing easy-to-use functions and interfaces, thereby enhancing product usability and user experience. At the same time, it is also necessary to pay attention to the market competition status and provide designs that meet market demands, thereby increasing the product's market share.

5. Existing Problems and Solutions

In the interface design of in-vehicle multimedia platform, there are some problems, such as driver's distraction and inconvenient operation. In order to solve these problems, we can start from the following aspects:

(1) The interface is designed to be simple, clear and easy to operate.

(2) The interface should be colored in bright colors, avoiding overly bright colors that may affect the driver's attention.

(3) The layout of the control buttons should be reasonable to avoid distracting the driver's attention.

(4) The labels and buttons on the interface should be clear and easy to understand, avoiding the use of too many icons that could make the user unaware of their meaning.

(5) User research and testing to understand users' needs and usage habits so that the interface can be improved.

6. Conclusion

In conclusion, interaction design can provide many advantages in the use of the interface of in-vehicle multimedia platforms, such as providing interaction methods that match the driver's use scenario and easy-to-understand interface design, personalized and customized functions, intuitive feedback and help. These factors can not only improve the use experience and safety of the product, but also increase the market competitiveness of the product, improve the brand image and recognition, so as to occupy a place in the fierce market competition. Therefore, when designing the interface of in-vehicle multimedia platform, manufacturers should pay attention to interaction design and follow the principles of user experience and safety to launch more easy-to-use, rich and personalized products. In the future, with the continuous development of intelligence and artificial intelligence technology, the role of interaction design in the field of in-vehicle multimedia platform will become more and more important. We expect manufacturers to pay more attention to interaction design in future product design and actively introduce the latest technologies to provide users with a more comfortable, intelligent and safe car experience.

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