The Research on Human Engineering-based Design of Website Interface of Smart Cellphone

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Abstract. As the performance of smart cellphone improves constantly, the design of website interface of cellphone becomes more and more diversified and is constantly optimized and updated. The construction of cellphone website is the currently most popular website construction way in market and the design of website design of smart cellphone can embody the advanced technology of cellphone terminal. The research has analyzed the perceived quality and degree of satisfaction of users according to the current situation of design of website interface of smart cellphone in the current period. And it also has analyzed and studied the tone, layout and interactive mode of website interface of cellphone. Other than prospective design thought, the paper aims to propose convenient, humanized and highly efficient methods regarding design of website interface of cellphone and improvement and optimization methods through human engineering theories to enable users to finish the operation of cellphone website through the simplest way. The paper adopts examples and data analysis method to analyze and solve problems. The sense of convenience and fastness and operation habits while using cellphone website will become the mainstream demands. And the design of website interface of cellphone also should conform to the aesthetics of people. The reasonable and scientific layout of website interface and information structure will raise the perception and experience of cellphone website by users to a higher level.

1. Introduction
In the whole globe, smart cellphone like other mobile devices is closing the distance among users constantly and brings more advertising revenue and shared information. The owning rate of smart cellphones is increasing year by year meaning the contact and interaction between cellphones and users are more frequent. According to the analysis of data report of App Annie Company in 2017, common users of smart cellphones each have 80 App in their cellphone and use about 40 App each month. But the data are different in different countries and regions. For example, Chinese and Japanese users each have more than 100 App in their cellphone and use less than 40 App in one month. And common Indian users of cellphone each have about 80 App in their cellphone and use more than 40 App every month (see figure 1). These data can be used as the criteria of satisfaction degree of users and use value.
According to these data, people are more and more dependent on smart cellphones and use cellphone software more and more frequently. The use rate of cellphone shows that only a handful of cellphone software are used frequently which is related to the functionality, convenience and habits of cellphone software. In the construction of cellphone website, some designers have not deliberated the features of smart cellphone, different use ways and environmental limit. Smart cellphone develops fast, but the resolution ratio and size of smart cellphone need to be considered and different smart cellphones are different in use. In the era of information data, users don’t feel the barriers in obtaining information and use cellphone to hand aground in internet space and feel the convenience brought by the era of science and technology. Large screen, multiple touch spots and smooth operation become the development of smart cellphone. And the design of website interface of cellphone needs to conform to users’ use habits and value to the aesthetics, practicability and high efficiency of design of website interface of cellphone.

2. The relation between human engineering theories and smart cellphone

2.1. Outline of human engineering theories
Human engineering theory is a comprehensive research method combining psychology, physiology, behavior, body mechanics and other disciplines. Human engineering has wide influences on modern products and interactive products. Human engineering theory is an essential principle for the research of features and structure of human body to obtain the weight, size and area of different human parts and relevant feature parameters of different skills [1]. Effective data can analyze the metal and physical changes of human under different behavioral models, the influencing factors of mental state and the changing factors of external information for user reflection and judge the use efficiency and frequency of different products. For products, human engineering theory requires design scheme to be simple and easy to understand and device operation to conform to human’s use habits from the angle of human use. On the other hand, it focuses on enabling users to use device with facility and considers safety, convenience, high efficiency and other factors.

2.2. Analysis of interactive mode of smart cellphone
Smart cellphone has a different human-machine interactive mode from keypad and mouse of traditional computer. Users only need to finish operation tasks by touching and clicking screen. And cellphone doesn’t have much environmental limits and can be used in any environment. In modern life, more and more users surf the internet on cellphones. And they choose different operation modes according to different environments. Namely, users use single hand or both hands according to different environments for the sake of convenience (see figure 2). Environmental changes bring uncertainty to human-machine interaction, so the design of website interface of cellphone will
influence users’ use experience. And users also choose different gestures according to their operation habits on different cellphone websites. Owing to the influences of many factors, the design of website interface needs to appropriately consider the use environment and purpose of users to balance website goal and users demands to improve the degree of satisfaction of users and make them finish their use purpose of cellphone website easily.

![Figure 2. Smartphone operating gestures classification figure.](image-url)

2.3. Analysis of perceived quality and satisfaction degree of users for website interface of cellphone

Interface originates from Grace meaning face-to-face communication among two or more faces. The modern definition of interface is a media between human and objects, namely a new face designer gives to object. Modern smart cellphone has its own operating system and operation space and can work like a computer through broadband network and mobile network. Different websites on smart cellphone can help modern people to achieve their daily demands highly efficiently and fast. Websites on cellphone are divided into work and study websites, food and amusement websites, shopping websites, social contact websites and movie and TV websites by application category.

2.3.1. Perceived quality. Perceived quality is an abstract and subjective assessment of one product or service by customers according to their use purpose and demands of products. Perceived quality has direct influences on behavioral intention. Users operate cellphone through human-machine interactive mode while browsing cellphone website. They have different feelings and recognition for different websites. The services in cellphone website are intangible, so cellphone service management is different from the management of common products. Users’ perception for cellphone website depends on its convenience, simpleness and controllability. Cellphone websites are recognized by users also owing to the reasonableness of interface layout of cellphone website. Those are all users’ inner perception of cellphone website. Service quality is related to customers’ behavior reaction. Good experience decides users’ recognition degree of cellphone website (see figure 3).

2.3.2. Analysis of satisfaction degree. Users’ satisfaction degree decides that users are satisfied with cellphone website, embodies consumers’ mental state and is users’ emotional experience about commodities, services and relevant factors. The emotion expresses consumers and others’ consumption behaviors. Now, users’ satisfaction degree has become an important basis assessing the quality of products and services. Users’ expectation and perceived value of cellphone website and service quality are a long-term accumulation process. Users’ satisfaction degree and loyalty are influenced directly influenced by service quality. The higher users’ satisfaction degree and loyalty are, the higher service quality is [2]. Interface design of cellphone website is users’ first feeling for website and stimulates users’ consumption desire. And the controllability, convenience and fastness decide users’ satisfaction degree and loyalty for cellphone websites (see figure 4).
3. Analysis of users’ experience of website interface of smart cellphone

Abraham Maslow, an American psychologist, once raised five demand hierarchies (see figure 5) in A Theory of Human Motivation in 1943 which also apply to cellphone website design field [3]. For users, it should first consider their use demands of cellphone website, then consider their visual perception of interface design of cellphone website. Reasonable layout and functions can bring good experience to users and users have good impression and feelings about such websites. Good interaction experience can make users have a certain of trust and dependence. Namely, smart cellphone websites not only meet use demands but raise new demands on interface interaction (see figure 6). Namely, they not only meet use demands but meet users mental demands.

3.1. Users’ sensual experience of smart cellphone websites

The interaction between users and smart cellphone website is achieved through perception, namely using sense organs to feel the style, features and uses of interface of cellphone website. Sense organs are divided into visual organ, hearing organ and touch organ. Different interface styles can bring different perceptions and recognition to users and prompt their corresponding sense feedback. Those feelings about interface are not a result of thinking but the reflection behaviors of natural feeling [4]. The feedback of such feelings is generally the first feeling or impression on cellphone websites. The cellphone websites with different purposes and positioning bring different visions to users. For example, most e-commerce websites adopt fresh warm tone because warm tone can stimulate consumers’ purchase desire in their bottom of heart and attract consumers more easily. On contrary, some professional or technical websites generally adopt cool tone which brings a calm and professional feeling to users (see figure 7).
3.2. Users’ interactive experience about smart cellphone website

The most important feature for cellphone website is human-machine interaction process, which is also the most important criteria embodying the reasonability of interface layout of cellphone websites. It conforms to the interface design of human engineering, makes cellphone operation faster and makes users understand the function of cellphone website more easily. Therefore, each operation of cellphone website will influence users’ inner experience [5]. The screen of smart cellphone is smaller than that of computer, so most users like the websites with brief interface, clear icon orientation and fast interactive operation which make users feel relaxed in different environments. Facing repeated page information, most people feel bored about the cellphone websites with fussy operation. The design of interface needs to consider different situations which may happen in the use and tries to avoid the inconvenience in interaction. For example, when one user browses one website, if the layout and structure of page is not reasonable or can’t guide him, the user facing a strange webpage structure can’t find the relevant content he wants which will waste his time and make him unhappy. On the other hand, when one user clicks one button to enter next webpage, the design should avoid the webpage not convenient to operate, webpage turn errors or irrelevant page information.

4. Design of website design of smart cellphone and human-machine interaction principle

Design of interface design of cellphone website and human-machine interface are subject to a certain of design principle. First, interface design of cellphone website should provide users with a feeling of easy operation and its whole operation logic and interaction way need to be in line with users’ thinking. Second, reduce complex operation steps and unnecessary interruption, improve users’ experience and efficiency and finish users’ experience demands in the shortest time or at the closest location. Third, the interface layout of cellphone website should avoid overmuch information in the same interface which will disturb users’ experience and may cause wrong operation. At last, ensure general performance and environment and meet users’ real-time operation and use.

4.1. The influences of whole layout of website interface on users

The whole interface design can provide users with uniform visual recognition and same interactive operation in the interaction among different pages. For example, all design elements including typeface, tone and icon should adopt same standards (see figure 8). Such interface designs of cellphone website with uniform style not only provide users with whole visual perception but make users feel comfortable norms and standards in the interaction with websites [6]. The whole design can combine visual design, interactive behaviors and website functions and convey whole aesthetics of website design to users. Though users have an initial knowledge of the functions of websites, they will be influenced by intuitive design style and interactive operation in the use process of users. Designers can consider beautiful design elements, good operation interactive control and uniform interactive
behaviors from the angle of whole style in order to make users finish human-machine interaction process smoothly.

Figure 8. Holistic design model of the mobile website.

4.2. Reasonable setting of website information layout
For the experience and use of cellphone website, the operation habits of cellphone website by users decide the reasonability and scientificity of interface design of cellphone website. In human-machine interaction process, design should cater for users’ thinking to set the corresponding operation steps, clues and other important information. Cellphone websites need to provide feedback and hints for users’ operation and practical and reasonable website interface interaction, avoid redundant operation procedures and let users learn about the functions and use ways of websites in the shortest time. First, designers should optimize the functions of cellphone websites. Second, they should handle the styles of website interface of cellphone and convenience of operation, learn about and master users’ mental state, analyze the goals and purposes users need to finish in use and optimize users’ operation interaction process to improve whole experience level of cellphone websites [7].

In the process of interaction between users and cellphone websites, the page browse procedures of cellphone website is the most key part and decide the layout of cellphone website and reasonability of information frame. The logic and information frame of the operation need effective analysis and processing by designers. The design of page procedures are the designated tasks users need to finish in the use of website. Users put their wills and demands in the hierarchical relations of webpages to build a series of interactive behaviors. Therefore, designers not only need to optimize the operation procedures of cellphone website but make the layout of interface easy to operate, provide clear goal for users’ operation and analyze tasks targetedly to achieve better effects. The interaction procedures satisfactory to users can be designed only by mastering users’ ultimate purpose (see figure 9).

Figure 9. Mobile web interface sample information and layout of the content.
4.3. Design principle of interface layout of smart cellphone website

First, owing to small area of cellphone screen, designers need to try to reduce interface controls (sliding blocks and buttons). Too much screen space will be occupied by external control if designers depend on external controls excessively. In order to make users obtain as much website information as possible, designers should try to lower the occupancy of space and take advantage of gestures to solve the problem in terms of design of website interface. Besides, the interactive behaviors of users with cellphone website are very frequent. Compared with traditional physical keys, gesture interaction is accepted by more users, so the layout of interface content should try to reduce repeated operation. The layout design of excellent cellphone websites should finish users’ goals fast and reduce the fatigue or injury of muscles and fingers. Users have a certain of dependence on excellent cellphone websites and can improve users’ recognition degree of enterprise. Third, gesture is the most direct interaction way. Fingers are part of body, so people know how to click with fingers. If interface design of cellphone website can combine human engineering theory and the prototypes or experience in life, user interface will be natural or intuitive and brain will adjust the operation mode in life automatically. Fourth, people are prone to accept direct experience. For interface of cellphone website, users interact their demands with cellphone website. The interactive behaviors between fingers and website controls are easy to be included in user operation. Users can narrow the distance between human and machine and express their demands and desires without changing their thinking. Of course, all of that requires to constantly optimize and update websites to achieve strong functionality and operability. Fifth, users take advantage of fingers to enter their demands or click the area they want without more interactive attachments to improve the efficiency of human-machine interaction, avoid redundant interaction steps and achieve more humanized interaction experience. At last, in terms of interface design of cellphone website, designers need to constantly expand their thinking and create more designs to make interface of cellphone website more humanized and diversified (see figure 10).

![Mobile web interface layout design principles](image)

**Figure 10.** Mobile web interface layout design principle model

4.4. The development trend of interface design of smart cellphone website

Currently, smart cellphones have different sizes and many factors decide that interface design of many cellphone websites need to be optimized and updated constantly. Operation gestures and habits vary with screen sizes. And constantly improving interface design of cellphone website based on human engineering theory and with making better human-machine experience as a goal to create more fast, convenient, reasonable and highly efficient operation environment of cellphone website is the essential trend of interface design of cellphone website. The purpose of construction of cellphone website is to
strengthen website propaganda, so cellphone website generally embodies the core competitiveness, features and culture of enterprise. But current cellphone websites face the restriction of interface and screen, so content construction of cellphone website needs to be processed scientifically and reasonably. Cellphone websites should not lose the functionality of websites but improve the functionality and practicability of websites in limited space, convey the best website information to users and constantly improve human-machine interaction experience, which is a problem the future designers need to solve. Simplesness, practicability and convenience are the mainstream demands of cellphone websites. Of course, interface design of cellphone websites also needs a certain of sense of beauty to meet the aesthetic demands of current users.

5. Conclusion
With the constant development and advancement of communication technologies and mobile internet, the number of smart cellphones in the world increases constantly and smart cellphone users have higher and higher experience demands on cellphone websites. The has analyzed and studied interface design of smart cellphone website, studied the features of interface design of cellphone website, wholeness of page layout and reasonability of information frame based on human engineering theory and user experience and combining the knowledge in design psychology, cognitive psychology and other fields, and put forward the design principle of interface layout of cellphone website and information frame. The research conclusions include: first, the mental analysis of users shows that beautiful visual sense, brief interface layout, controls with clear orientation and pages easy to operate are the main requirements of current users for interfaces of cellphone website. Second, the research on user experience shows that finishing operation tasks fast and highly efficiently is the assessment criteria of users’ satisfaction degree with cellphone website, so user-centered design is the goal of design. Third, based on human engineering theory, users’ perception, information feedback, mental changes in interaction process, tone in interface design of cellphone website, wholeness of layout and logicality of information frame are the important criteria assessing the reasonability and scientificity of interface layout of cellphone websites. As users value the functionality, reasonability and practicability of cellphone website and raise higher requirements for interface design of cellphone websites, users’ aesthetic demands and experience demands can be met only by continuing to learn about users’ demands and updating and optimizing cellphone websites.

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