

# Human-Computer Interaction in Web-Store Design Based on Psychology:

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## ABSTRACT

Human-computer interaction (HCI) plays a significant role in the interaction between the user and the system, which can be a variety of machines or computerized system and software. Generally, the interface refers to the user-visible parts, and users communicate with the system through the interface. Usability evaluation is a process for systematic available data collecting, then making corresponding evaluations and improvements. The main methods include heuristic evaluation, usability testing, cognitive walkthrough and action analysis.

In the past decades, research in technology and culture has got a great progress, however, users' demand for interface has also come to a high level, which means the user experience on the pursuit of feeling becomes more and more important, in addition to the pursuit of functionality and technology. So based on this precondition, psychology principles have been introduced to HCI and help analyze how those applications interact, and gain a better user experience and satisfaction.

By studying the relationship between the psychology and the system, we focus on conceptual framework of web-store, which aims to provide amenable concepts for design.

**Key Words:** HCI, Psychology, Web-Store

## 1 Introduction

Human-computer interaction (HCI), a complex of technique science developed with the birth of computer and investigating the communication and interaction between the system and the user, aims for processing and services, information management to the utmost extent. In the modern and the future society, human-computer interaction is the eternal theme as long as people use communication, computer and other information technology, making contributes to the society, economy, environment and resources. Given its significance to the technology development, research on how to implement a natural, convenient and ubiquitous human-computer

interaction is one of the supreme goals in the fields of Artificial Intelligence and modern information technology, at the same time, it also become new combination of mathematics, information science, intelligence science, neuroscience, as well as physical and psychological science, leading to popular direction of computer research in 21 century.

In 1969, Simon predated HCI entirely in the book *The Science of Artificial*. Although many claims have been identified as lack of authority, there are two themes maintaining through the history of HCI and guiding the continuing development. Simon took an ant traversing a beach as an example. In this case the beach plays a role of the world which could be abstract to technology created by human beings. And the goal for the ant is similarly like the demand for an application design. The relationship between goals and methods is the proper reflection of human-computer interaction design.

The development process of HCI, as an important part of computer science filed, has gone through half a century and made an advanced step and improvement. Commonly we think that the period for HCI could be divided into four stages:

- (1) Interactive stage based on the keyboard and character display. This could be called the first generation of human-computer interaction, in which the content mainly contains character, text, and commands. So interaction appears dull and monotonous.
- (2) Interactive stage based on the mouse and graphics display. The mouse, invented in 1970s and widely used as the input device today, greatly improved the human-machine interaction. Actually, the appearance of mouse and window system is a technological revolution and lead to the second generation of human-computer interaction.
- (3) Interactive stage based on the multimedia technology. In the late 20<sup>th</sup> century, multimedia technology made a great contribution to the computer industry and welcomed unprecedented prosperity. The appearance of the sound card, graphics card and other hardware devices made the machine interaction technology transit to the sound and videos. Besides, microphone, camera, speaker and other multimedia input and output devices, is gradually being used as human-computer interaction. Moreover, the content of HCI has become more abundant, especially the development of voice signal processor, making it possible to communicate with computers through sound, graphics, images, text and other media information, thus expanding the field of application of the computer. Based on this background, machine interaction walked towards a natural and harmonious direction and finally come to the stage of the third generation of human-computer interaction.
- (4) Interactive stage based on multi-mode technology. In the third generation of human-computer interaction, the development of multimedia provides possibility for information processing, but it's still the independent media storage as for the current status. And the merging between the editor and media

has not involved the integrated process for multimedia information. Although human-computer interaction through multimedia information has greatly enriched the means and contents, it's still far from the common communication in daily life. As we all know, human interact with the environment in a multi-mode which means they could talk, point and see one object at the same time, and identify his mood by listening to the tone, watching his facial expressions and arm movements simultaneously. To have a better understanding of the surrounding environments, people use sight, sound, touch, and smell, which demonstrates the multi-mode. In addition, the interaction among human beings is based on knowledge, and mainly communicate through languages. Thus, interaction based on multi-mode will be the theme for the fourth generation of HCI technology.

Since the involvement of human factors, HCI is not just a technique design, but also refers to psychology. Therefore, we should take user feelings into account when doing usability evaluation.

Usability is one of the key indicators to evaluate user interface, which relates to how users interact with computer products. Good usability allows users to access the interface system more effectively, while poor one will result in the difficulty to complete the tasks for users. Usability has a considerable influence on lowering the cost for system support, improving the customers' satisfaction and even the success of the system. Currently, the technology for human-computer interaction and usability evaluation methods have a certain amount of research results, but past methods for the pursuit of technological and functional design, have been difficult to meet the growing needs of users with the continuous improvement of the user interface requirements. User experience has become an important element of today's human-computer interaction and usability evaluation.

## **2 Related Work**

Psychology of design, a branch of psychology, has been a guide for human-computer interaction, and the principle still influences on the design in the future. It is always connected to HCI intemperately, and the usability evaluation of interface is the significant part of software psychology. Current evaluation methods are derived from the design of applying psychology into human-computer interface, such as walkthrough, referring to the cognitive psychology.

Psychology of design turns the users' mentation, especially the demand for applications, into the practice through consciousness. At the same time, to reflect and satisfy the users' feelings, it studies the designers' mentation and the reaction to society or single ones during the period of creation, which acts on the design in turn.

In the process of using machine, people often produce intuitive awareness through

the visual perception of the man-machine interface and make prediction for the result based on the cognitive rules, then go to the next step. However, due to the instinctive behavior or long term learning and imitation, people accumulate a wealth of experience so that the perception and movement form a chain and it does not need to undergo a complex cognitive process and planning stage, perception obtains information then lead to behavior, which forms a direct “perception-behavior” chain. Both the planned behavior and the “perception-behavior” chain demonstrate the visual and behavior characteristic. Thus it should regard the human-computer match as the start, adapt the users’ characteristic and follow the tradition to form good design genes, so that the design will be easy to use and provide better user experience.

The Alto system, born in 1973, is the first one with basic elements of the modern graphic user interface. Between 1980s and the 1990s, graphics digital interface language gets more and more diverse from logic plane pattern to three-dimensional mechanical graphic style. Especially in the past decades, delicate materialized design often makes users immersed in them, and bring good user experience. In recent years, flat design trend becomes popular, of which the simple and intuitive visual language is applied widely. Moreover, the visual form of interaction changed a lot with the progress of science and technology: multimedia, virtual reality, artificial intelligence and HCI have great influences on the visual design, the trend of which would walk towards dynamic, multi-dimension and integration. However, the characteristic of the variability of visual forms need to match with the constant rules so that it enable interface consistent with cognitive rules and meet the users’ emotion.

In recent years, the appearance and the function of mobile phones get frequent iteration, but the limited size of the phone screen requires the interface remain clear and reasonable. Simple and beautiful vision forms the basis of visual interface design. The interface design always follows the squared form, which enable users quickly find the entrance and the display of more contents is beneficial for classification polymerization. Therefore, visual elements with similar functionality or concept will be categorized into one kind of class and adopt relatively short distance layout, which meets the nearest-rule, similar-rule and closed-rule of design. For example, designers usually choose warm colors for dining websites, since it fits for people’s color perception psychology towards delicious food. Psychologists point out that each color has a symbolic meaning when we are exposed to certain visual color, the brain will receive signals transmitted by color. Different color combinations will make users generate different emotions in human-computer interface design. Color is one of the elements of artistic expression, and based on the principle of harmony, balance and prominence, combination could form interface to more easily to understand.

As for icon design, we usually find designers choose the image of desk calendar with a tilted corner as “calendar” icon, the shredder as “delete” icon, the camera lens as “camera” icon, and envelope as “inbox” or “outbox” icon. The thoughtful design are closed to the users’ psychological model since its demonstration is derived from user

experience, so that users' memory load is minimized. In interface design, closer to the real life the demonstration is, easier to use and understand the user is. On the contrary, it will undermine the users' ability to learn and use the software.

### **3 Psychology in Web-Store**

With the rapid rise of the Internet in recent years, the Internet has become the fastest way to collect the information, and access to traditional circulation quickly. The interactivity and transmission has made it irresistible competitive compared with the traditional media industries in the trade. More and more people prefer to shop online, to buy daily necessities, food, and clothes and so on. The merchant shipped merchandise directly to the consignee through online ordering, which saves the time to go out for picking gifts personally so that customers can buy their own homes satisfied with the goods. Therefore, designers would apply psychology factor into web-store design to earn the users' attraction.

The usability and understanding of design should follow four rules:

1. Visibility.

The correct operation of the site must be obvious, and also convey the right message to the users. Visibility reflects the match between intention and practice, and make the user find the key differences among items.

2. Conceptual model.

A good conceptual model allows us to predict the effect of the operating results. Without a good conceptual model, we would only blindly remember a lot in operation, behave as what others tell, and be confused with the reasons for doing so or how to do in case something goes wrong.

3. Natural match.

Design should apply the analogy of physical environment and cultural criteria concept, which enable users to understand how to use the product quickly.

4. Feedback.

The application provide information to the users, allowing users to know whether an operation has been completed and the results generated by the operation.

That is to say, a web-store site with good usability should take the following aspects into account: different constraints factors ensure that users can identify what is feasible operation; focus on the visibility of product including the conceptual mode and optional operation; build natural match between information and assessment of the state of the system.

Psychology model could be divided into three categories: design model, user model, and system image as figure 3-1. Design model is the conceptual model of the product,

user model is what the user get from conceptual model, which is operation method, and the communication between the product and the designer is implemented by system image. Thus, designers should keep the consistence of system image and design model to convey their design to users precisely.

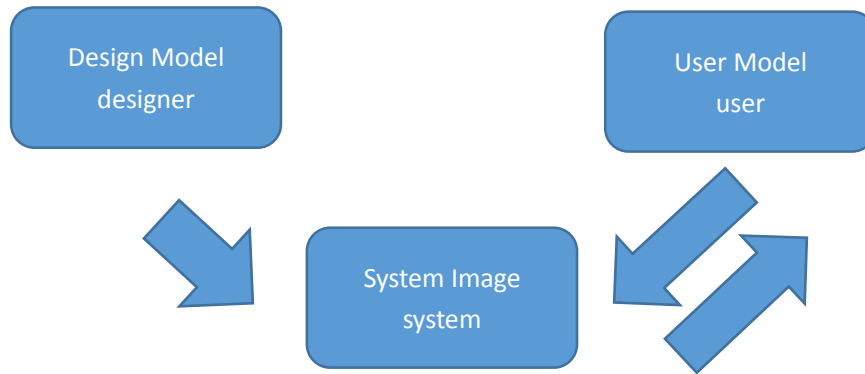


Figure 3-1 Three Factors of Psychology Model

Jesse James Garrett has proposed a series of general development flow and the significance of user demand in 2000, like figure 3-2.

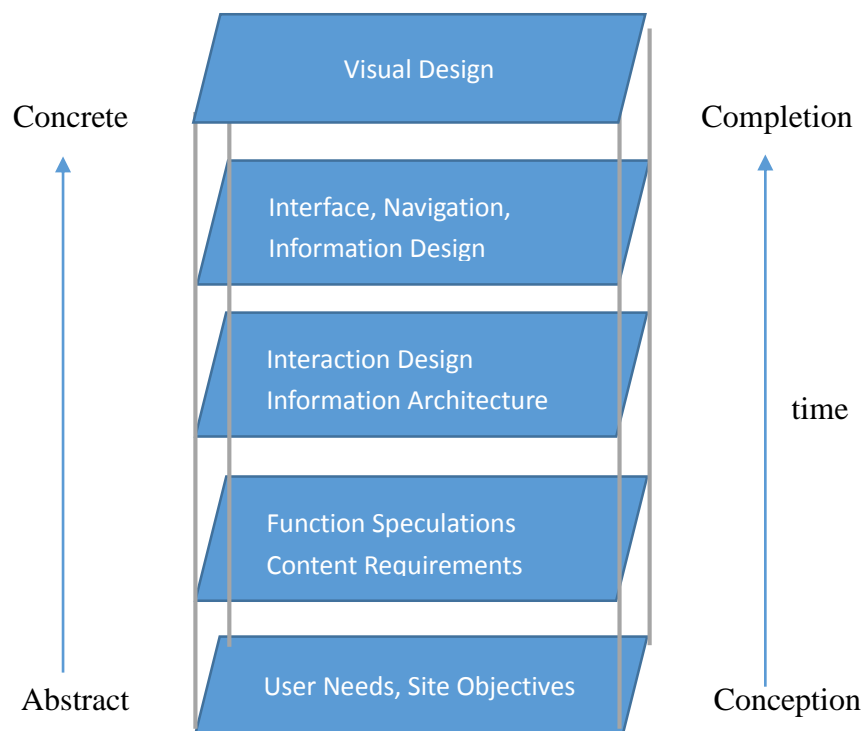


Figure 3-2 flow of web design

Strategy design (User needs, site objectives):

Strategy Design is to define the goals of websites according to the wishes of the developers.

Function specification and content requirement:

Determine the function and the corresponding content.

Information architecture:

Separate the specific features and content into several levels in accordance with the importance, and the user's habits, and form the structure of all pages.

Interface layout (Navigation design):

A divided page design in terms of the position of buttons, images, text and other content to ensure the highest efficiency.

Visual design:

Design for the color of the page, style, and specific shape of buttons, images, text.

In real life, users prefer web-store sites which will bring them a sense of trust, so the function design should contain four parts: Commodity display; Advertisement; the user management; the user training. Commodity display could be divided as category display and picture display. Similarly, there are dynamic advertisement and static advertisement. User management section includes registration, classification, comments, credit rating management. Security education and demonstration of using tutorial belong to user training section. A better and reliable sense of trust for users requires the accurate and concise content. Therefore, web-store should have following functions based on psychology analysis:

1. Search (Accurate search function allows users to find the goods they need quickly, plus, the search text area should have hint function when users input description)
2. Community management (Categorize the goods into different communities for sellers and administrator to manage, audit, rate, post transactions and handle trade disputes)
3. Comparison (Users could compare the price, quality and other factors when they pick items.)
4. Communication (Communication between sellers and customers related to the details of item, shipping, refund and so on)
5. Memory and Recommendation ( record which goods the users view, like, prepare to purchase and order, then recommend similar items to users)
6. Feedback
7. The Mode of transaction (Users could select the shipping ways and time to receive, etc. )
8. Reminder (Remind sellers and customers the process of transaction)

As for the structure of web-store, it's usually the tiled structure or dropdown structure since the website need to show more content, such as figure 3-3:

Categories in dropdown menu and function in tiled structure.

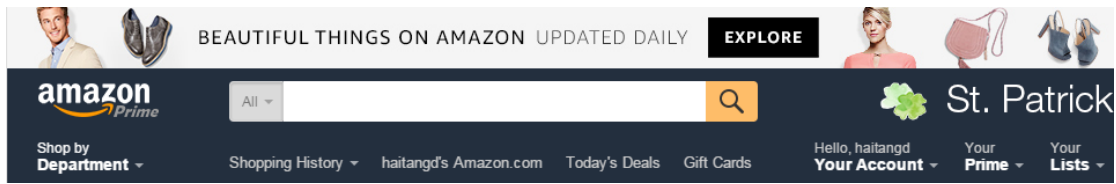


Figure 3-3 Amazon Homepage

To create the sense of trust for users, the main structure design is always accompanied with clear entry, uniform distribution, as well as less ambiguous name. In addition, we need add the contents safeguarding the interests of users, such as: customer service, feedback center in the entry.

In terms of the layout and framework of web-store site, the most conservative approach to recognize the visual center is "nine blocks" method, which is discussed in both the Eastern and Western theories, and the current smart camera viewfinder focus function also refer to this same rule. That is, the screen is divided into nine grid squares, and the visual center is located on the middle of the intersection of four points, like figure 3-4:

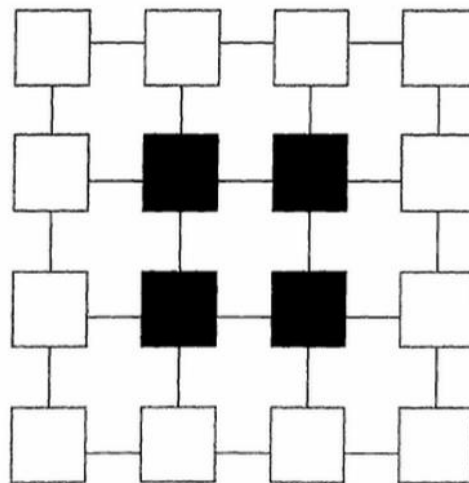


Figure 3-4: visual center of nine blocks

People usually view pages from top to bottom, from left to right, so the upper left, upper right and the central portion of the page is a crucial part. Standing at a rational point, designers arrange the bulletin boards, and other needs of the menu bar in the upper part.

#### 4 Conclusion

We analyze the major significant factors for web-store site based on the psychology of design. The user needs, site objectives, function specification and contest requirement, information architecture, interface layout and visual design have great influences on the website and users' choice. Therefore, following the principles and standing at the user's point is necessary for any profitable websites.



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