User Interface Design of Cross-border E-commerce Mobile Terminal Research Based on Mental Model

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Abstract: This study investigates the interface design of the domestic cross-border e-commerce mobile APP, and measures the user's mental model of the interface. The research finds that only the 'educational' factor and the subject's preference in the interface layout mode are related. Through interviews, the participants' preferences for user interface layout, interface elements and their placement were investigated, and the optimal interface layout mode for cross-border e-commerce mobile terminals was constructed.

1. Background

People receive information from the outside world. Through the continuous experience training, the thinking model formed by the brain to describe and portray the world gradually rooting in people's minds. It can not only affect the way people understand, explain and face the world, but also influence various assumptions, stereotypes and impressions of actions. This model is defined as mental models (Kenneth Craik, 1943). Mental model helps users understand the meaning of the controls of the information system interface and find the controls at the desired location according to the desired characteristics.

To use mental guide for mobile client development, we need to know users' preferences for the e-commerce mobile APP interface layout and design style. Therefore, this study chooses the cross-border e-commerce mobile APP as the research object to investigate the users' mental model of its inter face. Surrounding the mobile terminals of several major B2C cross-border e-commerce in China, the research intends to investigate the design problem of the user interface through use the empirical research. We use the actual user interface elements of the mobile APP as comparation, and propose optimization suggestions for the existing one.

2. Experimental Design

2.1 Experimental Task

(1) Research on the interface design of mobile clients of B2C cross-border e-commerce in China: statistical analysis of interface layout and placement of interface design elements.

(2) Interface layout preference survey: According to the result, we summarize the interface layout type, design and distribute the questionnaire, communicate with the participants, and ask the participants to choose the layout type according to their own understanding and preferences.

(3) Interface design element location survey: According to the results in (1), summarize the most common website interface elements, design and distribute the questionnaire, and ask the participants to choose the best placement position of each element.

2.2 Experimental Hypothesis

We assume that users' influence on the layout of the interface and the placement of the design elements are: ①gender, ②education, ③professional background, ④information system using background.

2.3 Investigation Result

(1) The following is the survey results of the homepage interface layout of the domestic cross border e-commerce mobile terminal:

Interface layout patterns that may appear on the front page of a cross border e-commerce mobile: ①gallery style, ②list, ③tab

The interface elements that may appear on the cross-border e-commerce mobile end are ① search box, ②primary category bar, ③sweep, ④photo, ⑤message, ⑥shopping cart, ⑦user, ⑧collection.

The statistics of each APP interface element are as follows:

Table 1 Domestic cross-border e-commerce mobile APP interface elements statistics

APP	Layout	Interface Element	Amount
Tmall	Tab + gallery style	search box, primary category bar	2
NetEase kaola	gallery style +list	sweep, search box ,message, primary category bar	4
JD Worldwide	Tab + gallery style	shopping cart, primary category bar, search box	3
Xiaohongshu	gallery style	user, photo, search box, primary category bar ,message, shopping cart	6
Ymatou	Tab + gallery style	search box,message,primary category bar	3
Vipshop	gallery style + list	search box, primary category bar, user, collection, shopping cart	5
Mia	gallery style + list	search box, message, primary category bar	3
Daling	Tab + gallery style + list	search box, primary category bar, shopping cart	3
			Avg≈4

The statistical layout mode is as follows:

Table 2 Layout mode survey statistics

Serial Number	Layout Pattern	Appearance percentage(%)
①	Tab + gallery style	37.5
②	gallery style + list	37.5
③	gallery style	12.5
④	Tab + gallery style + list	12.5

The percentage of each element appears and the optional location of each element (see the appendix for the questionnaire in the appendix):

Table 3 Interface elements and their location survey statistics

Serial Number	Interface element	Appearance percentage(%)	Appearance location
①	search box	100	a. Upper row 1 middle,b. Upper row 3 middle,c. Upper row 2 middle,d. Upper row 1 left,e. Upper row 1 right
②	primary category bar	100	a. Upper row 2 middle(tab),b. Upper row 3 middle(display type)
③	sweep	12.5	a. Upper row 1 left b. Upper row 1 right
④	photo	12.5	a. Upper row 1 left b. Upper row 1 right
⑤	message	37.5	a. Lower row 1 left b. Upper row 1 right
⑥	shopping cart	50	a. Upper row left b. Upper row 1 right c. Lower row 1 left,d. Lower row 1 right
⑦	user	25	a. Upper row 1 left b. Lower row 1 left
⑧	collection	12.5	a. Lower row 1 left b. Upper row 1 right

(2) Design a questionnaire based on the results of (1) to obtain a mental model about the user's mobile terminal for cross-border e-commerce:

● Investigate participants' gender, education, professional background, and experience of the information system.

● Investigate the user interface layout, interface elements and placement preferences of the participants.

3. Result

After the interviews and questionnaires were completed, we used SPSS 20 for statistical analysis. In this experiment, a questionnaire survey method combined with interview methods was employed. A total of 38 questionnaires were distributed and 38 questionnaires were returned, of which 38 were valid questionnaires.

3.1 Interface layout pattern preference correlation analysis

In order to study the influencing factors of the interface layout mode preference, the bivariate correlation analysis of the layout preferences of the mobile client of B2C cross-border e-commerce will be carried out:

Table 4 Interface layout pattern preference bivariate correlation analysis statistics

	gender	Education	Professional background	Experience with information systems
Pearson	0.282	-0.345*	-0.270	-0.169
Significance	0.086	0.034	0.101	0.312
N	38	38	38	38

Where * represents a correlation at a significance level of 0.05 (two sides).

Only the 'educational qualifications' has a correlation on participants' interface layout mode of the homepage (0.345), appearing dominantly related. The 'gender', 'professional background' and 'information system use experience' have no obvious correlation with our tested object.

3.2 Interface layout pattern preference analysis

Exploring the user's favorite interface layout mode, the frequency and percentage analysis of the choice of the interface layout will be performed:

Table 5 Interface layout mode preference analysis result

	Layout			
	Tab + gallery style	gallery style +list	gallery style	Tab + gallery style +list
Frequency count	20	13	4	1
Percentage	52.6%	34.2%	10.5%	2.6%

It can be seen that the most popular interface layout mode is 'tab type + gallery style', followed by 'exhibition hall type + list type'.

3.3 Interface element preference analysis

The interface element investigation link has two parts. One is to let the subject select the interface element that he expects to appear on the corresponding page, and the other is to select the placement position for the selected interface element. The following is the interface element preference analysis result:

Table 6 Interface element preference analysis result

	Interface element							
	search box	primary category bar	sweep	photo	message	shopping cart	user	collection
%	100%	100%	26.3%	34.2%	44.7%	47.4%	39.5%	44.7%

Therefore, users think that the home page should generally have two elements: 'search box' and 'first-level classification bar'. Secondly, it needs to have 'shopping cart', 'collection' and 'message', then follow 'user' and 'photographing'.

3.4 Interface element location preference analysis

Next, the frequency and percentage analysis will be performed on the placement of the interface elements, and the best layout mode will be obtained:

Table 7 Interface element position preference analysis result

Interface element	Location				
search box	A	B	C	D	E
	42.1%	21.1%	18.4%	7.9%	10.5%
primary category bar	A	B			
	52.63%	47.37%			
sweep	A	B			
	90%	10%			
photo	A	B	C		
	28.6%	28.6%	42.8%		
message	A	B	C		
	29.4%	58.8%	11.7%		
shopping cart	A	B	C	D	
	10.5%	21.05%	10.5%	57.89%	
user	A	B	C		
	27.2%	53.3%	26.6%		
collection	A	B	C		
	62.5%	18.75%	18.75%		

Therefore, combined with the foregoing, the optimal interface layout mode for cross-border e-commerce mobile terminals is as follows:
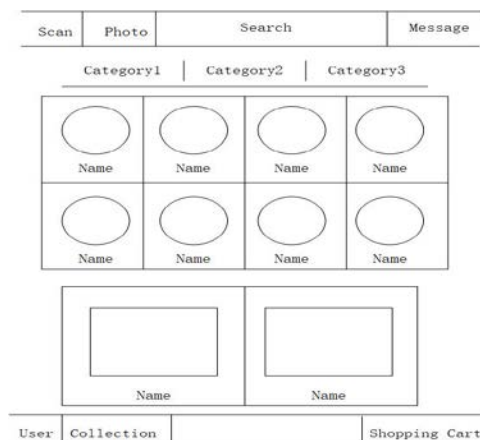

Fig. 1 Best interface layout mode

4. Result

Based on the theory of mental model, designing questionnaires and interview surveys, this paper aims at the interface design of cross-border e-commerce mobile terminal, exploring the mental

model of the interface layout of cross-border e-commerce mobile terminals.

References

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