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Empirical Study of the Effect of Website Information Architecture on Customer Loyalty

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Abstract: Website customer loyalty is believed to be very important to the success of E-Commerce firms. Based on document review, this study constructs a customer loyalty effect model which chooses organization, navigation, labeling and searching system as dependent variables as well as attitude and behavior loyalty as variables. The sample of the study was drawn from 250 students who have online shopping experience, 202 of usable questionnaires were included in the data analysis. Data analyses using correlation and regression analysis reveal that there was a strong and positive relationship between information architecture and customer loyalty. Also, organization, navigation, labeling and search systems were positively correlated with customer loyalty. The results could be a reference for designing of the E-Commerce website.

Key words: Information architecture, Customer loyalty, E-loyalty, E-Commerce

1. Introduction

With the development of E-Commerce, the customer loyalty of E-Commerce website is very important for improving the business performance and its competitive advantage. In e-commerce environment, customer loyalty is more obvious, companies have to pay more costs than in the traditional business environment (Frederick & Scheffer, 2000). In e-commerce, Website has been as a platform for interaction between customers and online retailers. The quality of a website has effect on customers' purchasing intention and customer loyalty, the confusing website information make people fail to find the needed information among such large amount of information. E-Commerce website building must meet three elements: design, technology and information architecture. An effective website Information architecture can attract customers and make customers finds the information quickly thus will establish and maintain customer loyalty to the website. In the website construction, the impact of defects in information architecture on E-Commerce websites is enormous. A survey shows that, 40% of Loss of customers on e-commerce websites is due to defects in information architecture which bring about loss of billions of dollars. This study is meant to research how the information architecture of E-Commerce website affects the customer loyalty through Empirical approach. Carry out this study, we hope to provide valuable instructive suggestions and reference to the E-Commerce website building which is to promote the customer loyalty.

The paper is organized as follows. The results of a literature review on related subjects are presented in the next section. In Section 3, the research model defining the constructs and hypothesized relationships is depicted, and this is followed by an explanation of the research methods in Section 4. Data analysis and the findings are reported in Section 5. Section 6 concludes the paper with a discussion of the implications of this study, research directions, and concluding remarks.

2. Literature review

The information architecture in website literature is a question related to issues such as website quality, website designing, information effectiveness and website availability et al. Many authors have reiterated the importance of website quality, particularly information architecture to e-business enterprises if they want to

succeed in E-Commerce.

Information Architecture(IA) was first proposed by Richard Saul Wurman who is the president of American Institute of Architects in 1975, He describe the criteria of Information Architect include "making the complex clear", "information to be understood" and the science of the organization of information. The Information Architecture Institute defined that Information Architecture is an art as well as a science to organize and identify Internet website, intranet, online communication and website availability. In the mid-1990s, due to widely application of internet, information explosion and deterioration of information ecological environment, the concept of information architecture began to be introduced to the website development process. Information Architecture could be an effective solution to the expression, display, understanding and application of information content, which can help web designers build an effective interface. It is very important to website construction and management. Louis Rosenfeld (2006) in its pioneer work named "Information Architecture for the World Wide Web" pointed out that Website Information Architecture is Information Architecture that a website system design including organization, navigation, labeling and searching system, which help the users find information more successfully while realizing the value of website. Most of the authors agree on this opinion.

According to the results of "U.S. Online Retail Forecast 2005-2010", the key factor of on-line sales growth is no longer to expand the target customer, but to change the customer's spending habits, improve their level of consumption, increase the frequency of consumption after 2006. Customer loyalty in the network environment is called E-loyalty first by Frederick and Scheffter (2000), E-loyalty is defined as "A feeling or attitude that can drive customers to repeatedly visit to a website or online to buy a specific product or service, the purpose of customer repeatedly visit to the website often to get information, entertainment or communication". Smith (2001) also considered that customer loyalty is essentially the same for online and offline customers, but suppliers must convert customer loyalty to electronic loyalty through effective digital tools and building sustainable customer relationships. The network consumer loyalty also includes the number of website visits within a certain time, time spent per visit and the depth of information (Gillespie et al., 1999). Srinivasan and Anderson (2002) define E-loyalty as "Online consumer loyalty to the marketing business is a good attitude of consumer towards electronic retailers, this attitude will lead to repeat purchase behavior". This definition combines the meaning of the traditional customer loyalty contains two dimensions of attitudes loyalty and behavior loyalty.

Many authors have pointed out that the website quality, website design, information content and other aspects would affect the customer loyalty. Zeithaml, Parasuraman and Malhotra (2002) proposed five dimensions of electronic service quality, including the effectiveness of information and content. Fu Shengting (2008), in his empirical research, conclude that the website quality including website design, customer service, reliability, security have a significant effect on the E-loyalty. Wolfingbarger and Gilly (2003) have found that website design in creating a positive customer satisfaction is very important. Rice (1997) has found that the two most important factors which encourage customers to visit the website again are the website design and online emotional experience. Gommans, Krishnan and Scheffold (2001), in their theoretical framework of online loyalty, propose that website and technology, and online services have an impact on customer loyalty, such as the first impression of the website, easy navigation, quick open, service reliability, quick shopping and payment systems, personalized interface and convenience, etc. Gregory R. Heim and Kingshuk K. Sinha (2001), through empirical analysis conclude that the navigation and product information is the factors that drive online customer loyalty. However, several scholars focus on the effect of information architecture to customer loyalty.

3. The research model

In this study, a research model was presented and empirically tested. Fig.1 depicts a model that the four

elements of website information architecture, including organization system, navigation system, labeling system and searching system have influence on customer loyalty including behavior loyalty and attitude loyalty.

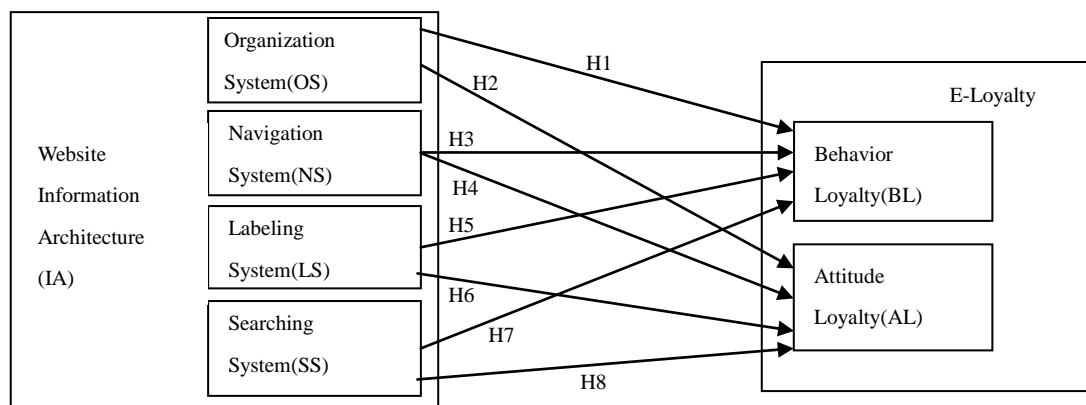


Figure 1. The hypothesized model

It has been confirmed that website design and E-loyalty have a positive correlation. Therefore, the hypothesis can be rephrased as follows:

H1: The organization system (OS) of E-Commerce websites has a positive influence on the behavior loyalty (BL) of customers.

H2: The organization system (OS) of E-Commerce websites has a positive influence on the attitude loyalty (AL) of customers.

Navigation system is the outer expression which provides users with the contents and structure of the website, while a bad navigation system will have a bad effect on the humanization of a website. We have formulated the following two hypotheses:

H3: The navigation system (NS) of E-Commerce websites has a positive influence on the behavior loyalty (BL) of customers.

H4: The navigation system (NS) of E-Commerce websites has a positive influence on the attitude loyalty (AL) of customers.

The labeling system is the reflection of a website image. An exquisite labeling system is also where the soul of the website rests. It has been confirmed by many experts that website design has a direct influence on customers' loyalties. It is, therefore, supposed that

H5: The labeling system (LS) of E-Commerce websites has a positive influence on the behavior loyalty (BL) of customers.

H6: The labeling system (LS) of E-Commerce websites has a positive influence on the attitude loyalty (AL) of customers.

A powerful searching system enables users to find what they're looking for, which helps improve the website information value. For these reasons, we add the following two hypotheses:

H7: The searching system (SS) of E-Commerce websites has a positive influence on the behavior loyalty (BL) of customers.

H8: The searching system (SS) of E-Commerce websites has a positive influence on the attitude loyalty (AL) of customers.

4. Research method

4.1 Data source

The questionnaires are released in the two forms of paper and electronic version. The survey targeted the customers who had online shopping experience in the last year, since they are believed to be more suitable to provide reliable multi-dimensional information. In order to maintain the quality of responses, Respondents should have a university education or more in-depth understanding of website design or use. Of the 250 distributed questionnaires, 202 were received, which provides a response rate of 80.8%. Of 202 respondents 52.0% was male. The age of the participants who completed the survey ranged from 20 to 45 with a median of 34 years; 82.3% completed a university education.

4.2 Measurement development and pilot test

To test the proposed hypotheses, we developed measurements for each variable. The constructs and items used to operationalize the research were developed following the generally accepted guidelines of reliability and validity for multiple-item measures. A literature review was conducted for the concepts and definitions of the constructs, on the basis of which items of the constructs were developed. Measures tested in prior studies were adopted with changes in wording to suit the research context.

The question items are listed in Appendix A along with means and standard deviations. The questionnaire used every-day operational words from the website and lay terms to explain theoretical concepts, in order to prevent the instrument being an error source. In order to ensure its face and content validity, the initial questionnaire was subject to a review or pretest by three students and two professors, followed by a pilot test with the participation of 50 evening MBA students who had online shopping experience.

4.3 Validity guidelines and analysis procedures

Cronbach's Alpha coefficient was calculated in both the pilot test and the full survey for each of the four constructs to ascertain the internal consistency of the items in the constructs (Kerlinger, 1973). In the full survey, an exploratory factor analysis using principal components factor analysis with varimax rotation was performed to examine the unidimensionality/convergent validity of each predefined multi-item construct. Hair et al. (1998) argued that loadings greater than 0.50 are considered very significant. To examine the strength and direction of associations among the variables in the study, a Spearman's rank correlation coefficient was used. Correlations were calculated for each of the eight constructs that were considered valid for this study. Linear regression analysis was used to test the hypotheses concerning the relationships of the independent variables to the dependent variable. The analysis of the measurement and structural models based on the sample is presented below.

5. Results

5.1 Reliability and Validity of research constructs

Cronbach's alpha was calculated to examine reliability: for the entire questionnaire the alpha value was 0.887. The alpha values in this study well varied from 0.650 to 0.784. The following names were given to the scales constructed by summing the highest loading items of these six dimensions: behavior loyalty (3 items, in the current study, $\alpha = 0.707$), attitude loyalty (3 items, in the current study, $\alpha = 0.65$), organization system (3 items, in the current study, $\alpha = 0.655$), Navigation system (6 items, in the current study, $\alpha = 0.784$), Label system (2 items, in the current study, $\alpha = 0.661$), Search system (5 items, in the current study, $\alpha = 0.727$).

The results of factor analysis are reported in Table 1. In factor structure analysis of customer loyalty, the KMO value of 0.656 and χ^2 value of the Bartlett sphericity test of 355.599 was significant at level of 0.000, this indicated that indicating that customer loyalty questionnaire was suitable for factor analysis. In factor structure analysis of information architecture, the KMO value of 0.804 and χ^2 value of the Bartlett sphericity test of 1151.368 was significant at level of 0.000, this indicated that indicating that information architecture

questionnaire was suitable for factor analysis. Then using principal component analysis method and the maximum variation implemented the common factor orthogonal rotation data processing, the results shown in Table 1. The loading factor values are greater than 0.5, this means that the measurement model is acceptable in terms of convergent and discriminant validity.

Table 1: Results of factor analysis

Variable	Item	Factor loading				Contribution rate of variance
		Factor 1	Factor 2	Factor 3	Factor 4	
						69.363%
Behavior Loyalty	BL1	.676	.347	-	-	36.463%
	BL2	.834	.148	-	-	
	BL3	.831	-.031	-	-	
Attitude Loyalty	AL1	-.097	.892	-	-	28.659%
	AL2	.301	.536	-	-	
	AL3	.440	.621	-	-	
Organization system	OS1	.677	.181	.349	-.162	13.219%
	OS2	.595	.257	-.134	.111	
	OS3	.670	.058	.229	.146	
Navigation system	NS1	-.188	.716	.140	.154	13.646%
	NS2	.321	.690	-.121	.317	
	NS3	.331	.528	.076	.270	
	NS4	.427	.550	.210	.181	
	NS5	.248	.621	-.057	.282	
	NS6	.115	.503	.248	.141	
Labeling system	LS1	.155	.186	.735	.233	12.510%
	LS2	.115	.157	.790	.106	
	SS1	.111	.071	.189	.830	
Searching system	SS2	.081	.183	.232	.778	19.722%
	SS3	.046	.114	.102	.856	
	SS4	.189	.180	.327	.513	
	SS5	.186	.065	.150	.788	

5.2 Correlation analysis

Independent and dependent variables analysis of the results is shown in Table 2 using Spearman's rank correlation coefficient analysis. By the data in the table we can find, Spearman rank correlation coefficients of organization system, navigation systems and searching systems on behavioral loyalty were 0.565, 0.529, 0.420, and was significant positive correlation at an $\alpha < 0.01$ levels, this indicate that H1, H3 and H7 are supported. Spearman rank correlation coefficients of organization system, navigation systems and searching systems on attitude loyalty were 0.490, 0.528 and 0.519, and was significant positive correlation at an $\alpha < 0.01$ levels, this indicate that H2, H4 and H8 are supported. Although Spearman rank correlation coefficient of labeling system on behavioral loyalty and attitude loyalty is positive, but due to their P values greater than 0.01, so it is not a significant positive correlation, this means that H5 and H6 did not pass the initial validation hypothesis.

Table 2: correlation matrix

	CL	BL	AL	IA	OS	NS	SS	LS
Customer Loyalty(CL)	1							
Behavior Loyalty(BL)	.892**	1						
Attitude Loyalty(AL)	.835**	.495**	1					
Information Architecture(IA)	.557**	.476**	.491**	1				
Organization System(OS)	.614**	.565**	.490**	.651**	1			
Navigation System(NS)	.610**	.529**	.528**	.872**	.530**	1		
Searching System(SS)	.536**	.420**	.519**	.679**	.420**	.537**	1	
Labeling System(SS)	.237**	.210**	.199**	.664**	.302**	.472**	.399**	1

**Correlation is significant at the 0.01 level (two-tailed)

5.3 Regression analysis

The analysis of the structural model is reported in Fig.2 and Table 3. The analysis presented in Fig.2 shows a graphical depiction of the structural model with path coefficients. Fig.2 shows that all paths in the structural model were statistically significant. Using linear regression analysis, the regression equation is:

$$BL=0.421OS+0.366NS+0.144SS+0.684 \quad (1)$$

$$AL=0.223OS+0.295LS+0.263SS+0.133BS+1.346 \quad (2)$$

The regression equations were pasted goodness of fit test, t test and F test. Respectively, behavior loyalty and attitude loyalty were in 41.0% and 41.1% of the variance variation. The regression equation indicate that Organization systems, navigation systems, searching systems and labeling systems have a significant positive effect on customer behavior loyalty and attitude loyalty.

Table 3: Results of regression analysis

coefficients^a

Model		Unstandardized coefficients		Standard coefficients	t	Sig.
		Beta	Std. error	Beta		
dependent variable: Behavior Loyalty(BL)	Constant	.684	.302	-	2.264	.025
	Organization System	.421	.073	.378	5.743	.000
	Navigation System	.366	.090	.301	4.069	.000
	Searching System	.144	.069	.140	2.083	.039
	Labeling System	.119	.074	.102	1.614	.108
dependent variable: Attitude Loyalty(AL)	Constant	1.346	.248	-	5.428	.000
	Organization System	.223	.060	.244	3.712	.000
	Navigation System	.295	.074	.296	3.999	.000
	Searching System	.263	.057	.313	4.653	.000
	Labeling System	.133	.061	.139	2.196	.029

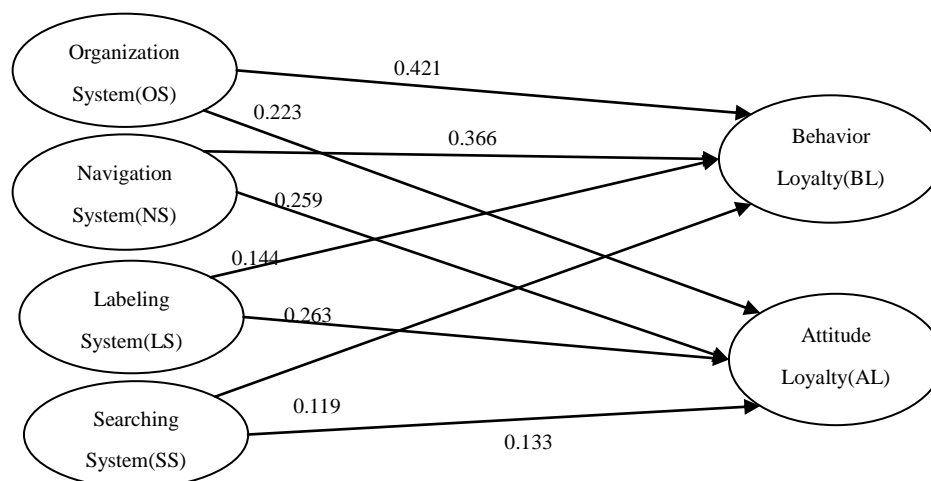


Figure 2. Structural model with significant path coefficients

6. Conclusions

In summary, this study proposed a model that helps to conceptualize the linkages between website information architecture and customer loyalty, and gathered empirical evidence to support such hypothesized relationships. This study has empirically supported the hypotheses that effectual website information architecture would improve customer loyalty in E-Commerce, this indicates that to improve customer loyalty, information architecture of website design has a very important role. Furthermore, it has also demonstrated that the four dimensions of information architecture, including organization systems, navigation systems, searching systems and labeling systems have a positive impact on customer behavior loyalty and attitude loyalty.

The coefficients of organizational systems, navigation systems and searching systems effect on attitude loyalty are between 0.2 and 0.3, which indicate that we should focus more on navigation systems, organization systems and searching systems in website design. Labeling systems has a smaller effect on attitude loyalty (the coefficient is 0.133), the reason may be the level of labeling systems design do not differ in most of the E-Commerce website, in addition the respondents were inadequate understanding of labeling system while them visiting website and shopping.

Organization systems and navigation systems have a greater impact on behavior loyalty (the coefficients are 0.421 and 0.366), the results reflect that the searching behavior of customers buying process is mainly based on browsing behavior to find the information, which is mainly dependent on the organization systems and navigation systems, so respondents attach great importance to the experience of using organization systems and navigation systems. The coefficient of searching systems effect on behavior loyalty is only 0.144, this is inconsistent with the conclusions of many scholars who believe that searching system is very important for visiting website. The reason for this result may be that the main way the respondents finding information is not based on searching, but browsing while they visit the e-commerce website and shopping. This phenomenon is precisely the description of the problems of current e-commerce website searching system design: provide only a limited number of search portal, customers can express finite properties of goods, it does not meet the needs of complex types of goods in e-commerce website; Customers often do not know the specific characteristics of the information they need when they construct the search expression, these not only increase the burden on the customers structuring the search criteria, but also increase their blindness of structuring search criteria, all of which have seriously affected the quality of search. These issues above are fully illustrating the necessity of the E-Commerce Website design based on information architecture theory in order to enhance customer loyalty.

This study focused on the effect of information architecture on customer loyalty. Several areas for future

research have surfaced from the results of our work. Such as, how the organization systems, navigation systems, searching systems, labeling systems effect on customer loyalty, What kind of information architecture, including the organization systems, navigation systems, searching systems and labeling systems design can attract customers, enhance customer shopping experience, improve customer loyalty.

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