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Exploratory Study and Empirical Study on Critical Website Success Factors of Chinese Publishing Enterprises*

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ABSTRACT

The study on the critical success factors (CSF) for electronic commerce systems has been a hot topic in both academe and industry. On the basis of reviewing papers on CSF and analyzing their problems, this paper designs the initial assessment indictors and website features and functions influencing EC success. Using Delphi survey and data analysis, we get the five important assessment indictors and seven important web features and functions. Furthermore, the hypothesis of CSF model is proposed. Finally, we conduct a survey on the Chinese Publishing Industry to test the hypothesis. The result shows that the hypothesis is partly supported, which means useful and understandable information, complete and timely information, credible and accurate information, all product-related information are the critical success factors for EC publishing industry. This research not only impels EC research in China, but also has instructional effect on the implementation of EC for enterprises to increase the success rate of EC.

Keywords: EC success, EC assessment indicators, EC success impact factors

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1. INTRODUCTION

E-commerce (EC) is both opportunity and challenge to traditional companies. Only a few Chinese companies can achieve success. Most companies face many difficulties when they try to implement EC. What are the factors affecting EC success? How other companies can learn from the successful ones? These are the frequently asked questions from the companies.

At the beginning of 2000, Benbasat, Ives and Piccoli conducted a survey in ISWorld Community and got several "Electronic Commerce Top Research Questions". The result of the survey shows that "EC critical success factor (CSF)" is one of the important issues. Many researchers are now studying factors affecting EC success [1, 2, 8, 11, 24, 25]. They hope to improve the successful rate of EC adoption by controlling and managing important factors, especially the websites features and functions. Academicians in China also begin to pay attention to this issue and put forward some factors [16]. But most of these studies have no data support.

This research tries to identify the indicators of EC success and websites factors that influence EC in traditional companies. The indicators and factors are tested to be suitable for companies in China, and can help companies establish proper plan for EC adoption. Our research method includes exploratory and empirical studies. In the exploratory study, we gather initial indicators and factors from relevant literatures and conduct two rounds of expert surveys to identify important indicators and factors that may be suitable for Chinese companies. Furthermore we suppose that the assessment indicators are affected by the impact factors. In the empirical research, survey questionnaires are sent out to Chinese publishing companies and analyses are made to test the hypothesis of CSF model.

2. LITERATURE REVIEW

Delone and Mclean introduce a comprehensive taxonomy to present an integrated view of the concept of IS success [4]. Many authors in the field regard Delone and Mclean's work as a major breakthrough [11]. They validate, challenge, or propose enhancements to this model. Ten years later, Delone and Mclean propose an updated D&M IS success model and discuss the utility of the updated model for measuring e-commerce system success [3].

Barua et al. present a framework of electronic business value that enumerates linkages between performance drivers, operational excellence and financial metrics [1]. They design and test a comprehensive survey instrument, and gather data from over 1000 organizations. Data provide overall empirical support for the conceptual business value model. The study shows that drivers have strong impacts on operational excellence measures and that the level of operational excellence influences financial performance.

Chatterjee et al. study the institutional enablers of the organizational assimilation of web technologies [2]. They define web assimilation along two dimensions (dependent variables) and explain the importance of three factors (independent variables) in achieving higher levels of web assimilation. Using survey data, they prove that there is a nomological network of relationships among these independent variables and dependent variables.

Zhu and his research team have been investigating drivers of EC value resent years. One of their researches focuses on the value of e-commerce in the manufacturing sector [24]. Zhu employs multiple financial measures of firm performance. He uses a composite index generated from a set of variables related to customers and suppliers. Data are collected from manufacturing companies to verify the hypotheses. Another study of Zhu is to investigate differences of EC value across country [25]. Zhu puts forward three dimensions of EC value and develops a research model for assigning the value of EC at firm level. The research gathers survey data of 612 firms across 10 countries in the financial services industry in order to testify the relationship between drivers and EC value.

Madeja and Schoder study the empirical evidence on features of corporation web pages that influence EC success [8]. They investigate fifteen indicators of eight features of company's web site that impact corporation website success and use thirteen indicator variables to evaluate firm performance. The result shows that six web features positively impact corporation website success.

Saaksjarvi and Saeed conduct empirical study to test the relationship between web features and firm performance [18, 19]. Motiwalla and Zhuang study EC success in the retailing industry [12, 26].

The Treasury Department of China promulgates "The Performance Evaluation Indicator System of Chinese Enterprise". This system evaluates the performance of a company in qualitative and quantitative ways. Each aspect includes many indicators, such as "customer satisfaction", "proprietor quality", "gross profit rate", and "expense/ profit rate" [9].

The National Informatization Evaluation Center (NIEC) of China investigates the evaluation indicator system for the enterprise's informatization. This

system involves six aspects: IT strategy, IT infrastructure, IT implementation, human resource, information security, and IT benefit [13]. NIEC used the system to evaluate and elect the "Top 500 Informationalized Companies in China" in 2003 and 2004.

3. LIMITATIONS OF THE CURRENT RESEARCH

All the studies above are valuable for this study, but they have some limitations. Firstly, most of the studies focus on either assessment indicators or impact factors. There are few studies investigate on both sides and the relationship between them. Secondly, the methodology of CSF research in China is immature. There is a lack of quantitative analysis to support the conclusions [21]. Only one empirical study of ERP success factors and two studies of EC success factors can be found [16, 23]. Thirdly, empirical studies conducted by most of the researchers are based on data from countries other than China. Although their findings would be referenced to Chinese firms, they must be further tested.

Considering the situation of Chinese enterprises, this research uses canonical method to present general assessment indicators of EC success and web features and functions as impact factors. Data from Chinese enterprises are used to prove the validity of the indicators, factors and their relationships.

4. IDENTIFICATION OF INITIAL ASSESSMENT CONSTRUCTS AND VARIABLES

We suggest that the study of CSF should include two parts: one is to study assessment indicators of EC, which is to define indicators that can describe and measure EC success (we evaluate EC success from the degree that EC impacts corporation performance); the other is to study impact factors, which is to define web features and functions that can influence EC success. The assessment indicators and impact factors can also be regarded as dependent variables and independent variables respectively in this research.

The taxonomy of EC assessment indicators is developed first. Based on the Performance Evaluation System for Chinese Enterprise (PESCE) [9], the assessment indicators are divided into two groups, i.e. quantitative (financial) indicators and qualitative (nonfinancial) indicators. According to Porter's value chain

theory and the definition of EC mentioned above, EC contains customer-oriented activities (including marketing, sales and service) and supplier-oriented online procurement [14]. Thus, EC influences the performance in terms of marketing/service and procurement/synergy. In addition, EC has impact on the general performance of an enterprise. For each kind of influence, two kinds of indicators, i.e. qualitative and quantitative, are used to measure the effect. To summarize, assessment indicators can be divided into six constructs, i.e. marketing (service) qualitative construct, procurement (synergy) qualitative construct, comprehensive performance qualitative construct, marketing (service) quantitative construct, procurement (synergy) quantitative construct, comprehensive performance quantitative construct (as shown in Figure 1).

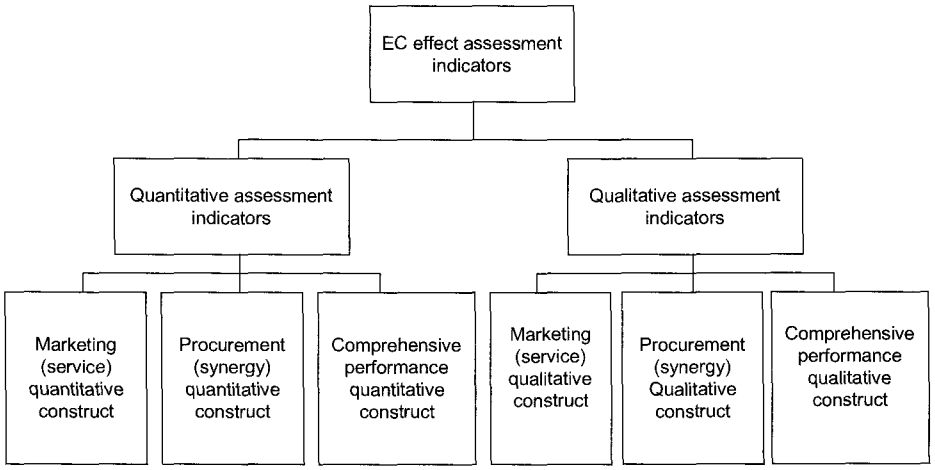

Figure 1. Initial EC Success Assessment Indicators

Assessment indicators in the existing literature are analyzed and categorized into the above six constructs. Indicators are first selected from PESCE according to the possibility of EC's contribution to the enterprise. For example, online procurement may lead to the reduction of the price of the raw materials. Another example is online sale which may raise the price by directly facing the consumers and reducing the distribution channels. Therefore, EC system may cause the increase of net profit. In addition to PESCE, indicators from other literatures are also classified and 14 initial assessment indicators are obtained. They are "marketing cost" [8, 10, 18, 26], "more service to customer" [2, 8, 10, 18, 26], "customer satisfaction" [3, 8, 9, 11, 18, 25], "customer loyalty" [8], "procurement cost" [10, 20, 24, 25], "enterprise supply chain efficiency" [10, 20, 25], "current

capital turnover" [9, 13], "sales cost" [8, 10, 18], "average sales revenue" [1, 3, 8, 17, 24-26], "gross profit rate" [1, 9, 12, 24, 25], "expense/ profit rate" [4, 9], "enterprise image" [2, 8, 18], "enterprise value" [4, 8], "market share" [2, 3, 8, 9, 13, 17, 18].

5. IDENTIFICATION OF INITIAL WEB FEATURES AND FUNCTIONS CONSTRUCTS AND VARIABLES

In EC system, all users like employees, customers, and suppliers have to obtain information or services and transact business through a corporation website. It is very important for a website to have enough functions required by users. This research classifies web features and functions into three constructs, i.e. overall features and functions, functions for customers, and functions for suppliers. Based on literature review on EC and IT/IS impact factors, we propose one variable of overall features and functions construct, i.e. "powerful search function" [11 19, 24], nine variables of functions for customers construct, i.e. "useful and understandable information" [3], "comprehensive FAQ section for customers" [1, 11, 19], "online service" [1, 19, 24], "online forums or communities for customers" [1, 19], "customize orders" [1, 19, 24], "personalized content" [1, 3, 5, 6, 19, 24], "online orders submission and modification" [1, 18, 24], "online payment" [1, 18], "automatically notified order status" [1, 15, 24], and eight variables of functions for suppliers construct, i.e. "online shared customer feedback" [1], "online shared inventory information" [1, 24], "online shared production schedules and capacity information" [1], "online shared product demand information" [1], "online communities for suppliers" [1, 24], "comprehensive online FAQ section for suppliers" [1, 24], "supplier evaluation reports" [1], "electronic payment to suppliers" [1].

In a word, we suggest 18 variables of web features and functions belonging to three constructs.

6. EXPLORATORY SURVEY

6.1 Exploratory Questionnaire and Survey

In order to select out the variables that are suitable for Chinese enterprises, we

enquire experts' opinions by two rounds of surveys. The two rounds of questionnaires are spread to 28 experts in EC field. They are either researchers of EC/IS in universities or leaders of companies that implemented EC.

The first round of questionnaire includes questions to explore the respondent's opinion of the importance of the indicators and factors gathered from relevant studies. Each item is measured on a five-point Likert scale, which represents five options respectively: "extremely important" (=5), "important" (=4), "not sure" (=3), "unimportant" (=2), "extremely unimportant" (=1). In order to better differentiate the importance of items, the second round of questionnaire is measured on a seven-point scale.

All the 28 questionnaires are returned in the first round of survey. Cronbach's ranges from 0.76 to 0.87. Hence, internal consistency appears to be high. Some basic statistic analyses are made. Many experts also provide some new indicators and factors from their own perspectives. We carefully analyze all theses newly raised items and assimilate some of them into the second round of questionnaire.

In the second round of survey, 26 questionnaires are returned with a response rate of 92.9%. In this round, the internal consistency is also high (Cronbach's ranges from 0.79 to 0.96). Data gathered in this survey are used to identify important indicators and factors for Chinese enterprise.

All the items in the second round of survey including indicators and factors gathered from relevant studies and from experts perspectives are shown in appendix.

6.2 Data Analysis

Content validity ratio (CVR) is used to distill the assessment indicators and impact factors of EC success. CVR=(n-N/2)/(N/2), where n is the frequency count of the number of experts who think the item is important (expert marks the item 7 or 6) and N is the total number of experts. The CVR for each item is evaluated for statistical significance at the 0.05 level according to the table published by Lawshe. Any item that has a CVR less than 0.36 should be dropped [7]. We calculate the CVR of all items, which is shown as Table 1. Finally we get five important assessment indicators and seven 7 important web features and functions that may impact Chinese enterprises EC success.

Table 1. CVR for each item in the second round survey

Item	CVR	Item	CVR
Marketing cost	0.154	Cooperation with partners	0.615
Sales cost	-0.46	Procurement quality	-0.15
More service to customer	0.462	Average sale revenue	-0.38
Customer satisfaction	0.385	Gross profit rate	-0.54
Enterprise image	0.462	Expense/ Profit rate	-0.31
Enterprise supply chain efficiency	0.385	Current capital turnover	-0.15
Procurement cost	0.231	Enterprise value	0
Procurement expense	0.077	Market share	0
Customer loyalty	-0.31		
Powerful search function	0.231	Online service	0.308
Useful and understandable information	0.538	Automatically notified order status	0.385
Complete and timely information	0.615	Comprehensive FAQ section for customers	0.154
Credible and accurate information	0.615	Online forums or communities for customers	-0.31
Security	0.308	Online shared customer feedback	0.154
Trust management	0.308	Online shared inventory information	0.308
All product-related information	0.462	Online shared production schedules and capacity information	0.154
Customize orders	0.231	Online shared product demand information	0.692
Personalized content	-0.08	Electronic payment to suppliers	-0.31
Online orders submission and modification	0.385	Comprehensive online FAQ section for suppliers	-0.31
Online payment	-0.15	Online communities for suppliers	-0.77
		Supplier evaluation reports	-0.38

In conclusion, we get 5 important assessment indicators and 7 important w eb features and functions impact factors.

7. HYPOTHESES

After theoretical literature review and expert surveys, we p ropose the hypothesis as the following:

EC success measured by the five indicators is affected by the seven critical web features and functions (Figure 2).

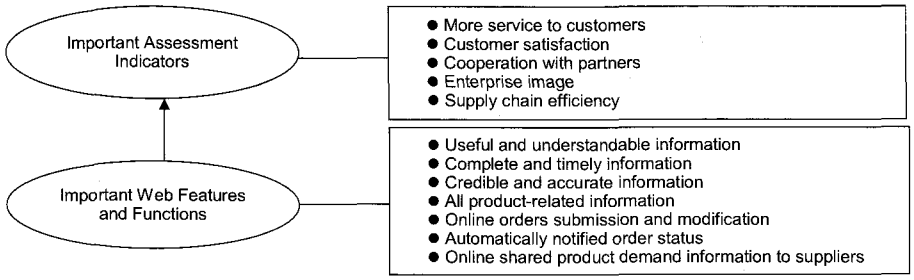

Figure 2. The Hypothesis Model of Critical Success Factors

8. EMPIRICAL STUDY

8.1 Industry Background and the Revised Hypothesis

The empirical study is conducted to test the hypothesis we propose. Data are collected from companies in the publishing industry in China. We choose the publishing industry because of its high level of EC adoption. In this industry, EC is used to trade and share information and services with readers, dealers, suppliers, authors and collaborators through Internet.

Before the empirical survey, the questionnaire is pilot-tested. Using the result of the pilot test, wording of certain items are changed to improve clarity and to minimize ambiguity. A more important finding is that publishing companies in China hardly use Internet to make deals with their suppliers, whose level of EC adoption are still low. Therefore, we exclude some indicators and factors related to suppliers, and revise the hypothesis shown in Figure 3.

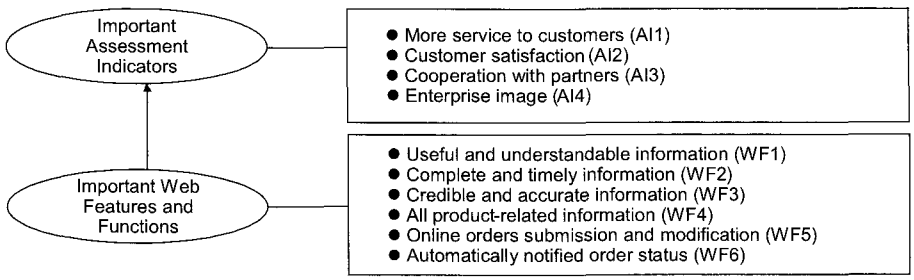

Figure 3. The Revised Hypothesis

8.2 Data and Sample

The formal questionnaire consists of three parts:

(1) The current status of the company.
(2) Four important assessment indicators of EC success.
(3) Six important web features and functions affecting EC success.

Respondents are asked to answer each question on a seven-point Likert scale ranging from "strongly accord with (=7)" to "strongly disaccord with (=1)".

From April to August 2004, we sent our questionnaire to the 305 publishing companies, which had implemented EC. 93 questionnaires were returned and 84 questionnaires were useable. Statistical analysis of basis data is shown in Table 2

Table 2. Statistical Analysis of Basis Data

	Sample	Percentage %
1. Location		
Beijing	52	61.90
Others	32	38.10
2. Percentage of IT employees		
< 1%	18	21.43
1%-5%	58	69.05
5.1%-10%	6	7.14
10.1%-15%	2	2.38
3. Website founded time		
2003	17	20.24
2002	12	13.10
2001	14	15.48
2000	17	19.05
Before 2000	24	27.38

8.3 Instrument Validity and Reliability

Since the indicators and factors are gathered by reviewing related literature and by two rounds of expert surveys, the content validity of the questionnaire is deemed acceptable. We then calculate Cronbach's α to test reliability and use factor analysis to test construct validity. Generally, if Cronbach's α is greater

than 0.7, the instrument is reliable. If eigenvalue is greater than 1, cumulative variance explained is acceptable and factor loading is greater than 0.5, the construct is valid [24, 26]. Only two items, "online orders submission and modification" and "automatically notified order status" have insignificant contribution to the web features and functions construct. After dropping these two variables, all loadings are significant. Cronbach's α ranges from 0.834~0.878, hence internal consistency is high. The result is shown in Table 3.

Table 3. Instrument Validation after Dropping Two Variables

Indicators/ Factors	Loading
Assessment Indicators (Cronbach's α =0.834, eigenvalue: 2.700, Cumulative Variance Explained: 67%)	
More service to customer	0.865
Customer satisfaction	0.847
Cooperation with partners	0.774
Enterprise image	0.798
Web Features and Functions (Cronbach's α =0.878, eigenvalue: 2.959, Cumulative Variance Explained: 74%)	
Useful and understandable information	0.893
Complete and timely information	0.925
Credible and accurate information	0.877
All product-related information	0.733

8.4 Analysis on Critical Web Features and Functions Affecting EC Success

We use SEM to test the hypothesis. In this part we use shortened form of the variables. The explanations of the variable are shown in Figure 5. As the analysis of comprehensive factors, we use SEM to test the hypothesis. We get the following fitted SEM model .

$$\begin{cases} X = \lambda_x \xi + \delta \\ Y = \lambda_y \eta + \varepsilon \\ \eta = \gamma \xi + \zeta \end{cases} \tag{1}$$

Where X= (WF1, WF2, WF3, WF4)'; Y= (AI1, AI2, AI3, AI4)'.

Standardized paths and various model-fit indices are shown in Table 4 and Table 5.

Table 4. Standardized Paths

Assessment Indicators and Web Features/Functions	Standardized Paths λ_X	Standardized Paths λ_Y
AI1		0.83[a]
AI2		0.84***
AI3		0.66***
AI4		0.66***
WF1	0.89***	
WF2	0.93[a]	
WF3	0.80***	
WF4	0.60***	

"a" presents that the number is initialized to be 1.0, so there is no t statistic; ***$p<0.001$.

Table 5. Fit Indices

χ^2	df	RMSEA	NNFI	CFI	IFI
30.25	19	0.084	0.95	0.96	0.96

Standardized paths are significant and this model fits well. The construct variable of important factors has significant impact on the construct variable of important indicators with the standardized path of 71%.

Therefore the hypothesis is partly supported. Furthermore, we could say that the four web features including useful and understandable information, complete and timely information, credible and accurate information, all product-related information are the critical impact factors influencing the EC success which is measured by the four critical indicators including more service to customer, customer satisfaction, cooperation with partners, enterprise image.

9. CONCLUSION

Based on PESEC and existing literatures as well as Porter's value chain theory, EC assessment indicators are divided into two groups and six constructs. Based on literature review, web features and functions are identified in terms of overall features and functions construct, functions for customers and functions for suppliers construct. Then two rounds of expert survey are conducted to obtain valid and reliable indicators and factors. Following the experts' opinion, important as-

sessment indicators and impact factors are selected using CVR. The hypothesis is proposed-- EC success is affected by the important web features and functions. In order to test it, the survey is conducted on the Chinese Publishing Industry. The empirical study shows that the hypothesis is partly supported. "More service to customer", "customer satisfaction", "cooperation with partners", and "enterprise image" are the critical assessment indicators. Web features such as "useful and understandable information", "complete and timely information", "credible and accurate information", and "all product-related information" are the critical web factors influencing EC success in Chinese publishing industry.

The contribution of the study is the comprehensive analysis of EC assessment indicators and web features and functions. Furthermore, the important indicators and web features and functions are verified, which lay the foundation for empirical study of CSF for EC. In the feature, researchers may conduct empirical study in different industries and obtain critical indicators and factors for enterprises in different industries. This study can not only impulse the EC study in China but also serve as a guideline for the implementation and improvement of EC systems in Chinese enterprises.

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APPENDIX

Appendix Table 1. Theoretical Support of the 17 Assessment Indicators

Indicators	Sources
Enterprise image	[2, 8, 18]
Enterprise value	[4, 8]
Market share	[2, 3, 8, 9, 13, 17, 18]
More service to customer	[2, 8, 10, 18, 26]
Customer satisfaction	[3, 8, 9, 11, 18, 25]
Customer loyalty	[8]
Cooperation with partners	[20, 25]
Procurement quality	Expert
Current capital turnover	[9,13]
Average sales revenue	[1, 3, 8, 17, 24, 25, 26]
Gross profit rate	[1, 9, 12, 24, 25]
Expense/ Profit rate	[4, 9]
Marketing cost	[8, 10, 18, 26]
Sales cost	[8, 10, 18]
Procurement cost	[10, 20, 24, 25]
Procurement expense	[3, 9, 12, 13, 20, 24, 26]
Enterprise supply chain efficiency	[10, 20, 25]

Appendix Table 2. Theoretical Support of the 35 Enterprise Impact Factors

Web Features and Functions	Source
Powerful search function	[11, 19, 24]
Useful and understandable information	[3]
Complete and timely information	[3, 24]
Credible and accurate information	[3]
Security	[3, 15, 22]
Trust management	Expert
All product-related information	[1, 18, 24]
Comprehensive FAQ section for customers	[1, 11, 19]
Online service	[1, 19, 24]
Online forums or communities for customers	[1, 19]
Customize orders	[1, 19, 24]
Personalized content	[1, 3, 5, 6, 19, 24]
Online orders submission and modification	[1, 18, 24]
Online payment	[1, 18]
Automatically notified order status	[1, 15, 24]
Online shared customer feedback	[1]
Online shared inventory information	[1, 24]
Online shared production schedules and capacity information	[1]
Online shared product demand information	[1]
Online communities for suppliers	[1, 24]
Comprehensive online FAQ section for suppliers	[1, 24]
Supplier evaluation reports	[1]
Electronic payment to suppliers	[1]