

Comprehensive Evaluation of Businesses Innovation and E-commerce in Small and Medium-sized Enterprises: An Empirical Analysis

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Abstract

E-commerce as a new way of enterprise marketing ,it plays an important role in promoting small and medium enterprises to develop new markets, reduce production and management costs, improve productivity and so on. At the same time, the electronic commerce also helps small and medium enterprises to make full use of the flexible and quick advantages, and complete the upgrade of the flexible production .In this paper, we make a empirical analysis and try to find out the key factors that affect E-business performance in SMEs, the result shows that technical talents, leadership support, government policy, infrastructure and credit environment will have positive influence to E-business performance in enterprises.

Keywords: *Cooperative performance, E-business innovation, SMEs, Marketing strategy*

1. Introduction

Since entering in 21 Century, information has become a feature of the times, and e-commerce as a new marketing tool and business management tools has been more and more attention. For small and medium enterprises, e-commerce helps them to give full play to the advantages of flexible and fast, and promote the upgrading of personalized marketing, providing a platform for fair competition with large enterprises. Small and medium enterprises have become an important contribution to China's national economy. The financial crisis has seriously affected the development of small and medium-sized enterprises in China, and forced the small and medium enterprises to accelerate the pace of transformation and upgrading, and actively explore new modes of production and operation. E-commerce as a new way of enterprise marketing plays an important role in promoting small and medium enterprises to develop new markets, reduce production and management costs, and improve productivity and so on [1]. At the same time, the electronic commerce also helps small and medium enterprises to make full use of the flexible and quick advantages, and complete the upgrade of the flexible production and marketing in the information age from the industrial era. E-commerce in the increase of small and medium enterprises operating income, promote business efficiency, to achieve the effect of the enterprise upgrade. 2014, the total turnover of small and medium enterprises in e-commerce is an average of 7%, which the annual sales of electronic commerce rose to 20.3%, it is not the use of electronic commerce of small and medium enterprises total turnover growth of 1.35 times [2]. The use of electronic commerce of small and medium enterprises in the small order of profit, product diversification, product innovation ability and so on, higher than the use of electronic commerce of small and medium enterprises 9-15. Expected in the next few years, by the natural development cycle of small and medium enterprises, the growth rate remained at around 8%. The size of B2B e-commerce transactions in China's small and medium enterprises accounted for

19.1% of the total transaction size, with the increase of the electronic business awareness of SMEs, it can be predicted that the proportion will reach 30% in the future.

However, in the construction of e-commerce platform, small and medium enterprises lack of adequate business awareness and potential power mechanism, compared with large enterprises, there is a blind choice of electronic business model, platform construction and system platform is not perfect, the electronic commerce is the heterogeneity of enterprise and market competitiveness, and ultimately improve the product or service needs, create profit still has many questions [3-4]. Survey shows that the application of e-commerce in small and medium enterprises mainly concentrated in the purchase and sale link, for different types of enterprises, different regions, different industries, e-commerce application level and performance differences. In front of electronic business, not every business is a winner, and the small and medium enterprises to carry out the process of electronic commerce, there are many confusion: for example, whether the enterprise to implement e-commerce? How do enterprises successfully implement e-commerce, how to achieve the desired effect? What are the factors that hinder the performance of electronic commerce, and the enterprise should improve from what aspects? This paper is based on the above problems, the combination of theoretical and empirical research methods, research issues and solutions.

2. Literature Review

2.1. E-commerce in SMEs

1970s, EDI application has opened the prelude to e-commerce, the 90's, based on the Internet of e-commerce began in the global proliferation. Electronic commerce has no unified meaning, scholars have different opinions. As a pioneer in the study of E - commerce, in 1996, the "electronic commerce" in the forefront of the view that e-commerce is through the existing computer networks as well as the future of the information superhighway network sales information, products and services. Electronic business model is the way to get the income of the enterprise through the network channels, such as marketing, management and other activities, and to achieve this way of specific programs. Mohamad (2012) believes that there are four kinds of electronic business model [5], that is, the buyer control mode, the seller control mode, the third party control mode and hybrid control mode. In different mode, the buyers and sellers in the transaction process of the initiative, cost, efficiency, marketing and other aspects of the advantages of large differences, to adapt to different industries and scale of the enterprise. Shoki (2012) put forward mode of electronic commerce in the small and medium-sized enterprises [6], it is important for electronic commerce website construction and management of outsourcing to e-commerce service providers, by their responsible for electronic commerce website construction, operation and maintenance, commerce, capital flow, information flow, logistics services, the program provides.

Djelassi (2013) believes that China's small and medium enterprises due to funding, technology and personnel limitations need to provide low-cost, high performance [7]. Platform oriented e-commerce services, outsourcing will become the mainstream of the development of e-commerce in small and medium enterprises, which is the core of the third party e-commerce service platform for the construction and development. On the one hand, small and medium-sized enterprise capital, lack of funds, small scale, management mechanism, lack of professional development, business website IT talent, third party e-commerce service platform for SMEs is the most realistic; on the other hand, with the development of e-commerce, the supplier began to focus on the entire supply chain e-commerce, management, sales, logistics, payment and customized services for small and medium enterprises. The third party

e-commerce service platform site B2B mode to provide domestic alibaba, made in China, the B2C model of Suning Tesco mall, Jingdong Mall as the representative of the group purchase website. Therefore, the third party e-commerce platform is the main mode of e-commerce in small and medium sized enterprises. This paper is to study the performance and problems of the third party B2B e-commerce platform in the small and medium sized enterprises.

2.2 Electronic Business Performance

Performance refers to the work performance and business results of the enterprise and its subsystems, such as department, process, work team and employees, is an objective, measurable results and benefits. With the development of electronic commerce, it is necessary to understand the relationship between the investment and the output of the electronic commerce, analyze the process of the electronic commerce activities, and the process of tracking the value, so as to provide decision support for the enterprise. On the basis of summarizing the theoretical foundation and the development of performance evaluation, the evaluation method is summarized into four categories: the theory based on the value of money, the production function based on the theory of investment, the theory of the formation process and the competitive advantage based on the IT value and the evaluation system based on the theory of comprehensive integration. Gebauer (2012) pointed out that the electronic commerce performance evaluation from a single financial evaluation to the non financial comprehensive index system development[8], the new management concept and operation mode to make non-financial index evaluation, process evaluation, customer evaluation, enterprise innovation evaluation and so on. At present, the balanced scorecard is a more mature evaluation method.

On the basis of domestic and international evaluation index system of e-commerce system, a performance evaluation index system for the implementation of the electronic commerce system of China's manufacturing enterprises is put forward based on XXX. The index system is divided into: system quality, information quality, service quality, customer service, customer satisfaction, six indicators of interest. Janita (2013) uses the idea of the key factor model to design a set of indicators to evaluate the performance of e-commerce system, and applies the BP neural network method to evaluate the performance of e-commerce system [9]. Zaridis (2014) pointed out several kinds of performance evaluation methods and China's current e-commerce performance evaluation of the overall situation of analysis and research [10], mainly including evaluation index, index weight, performance evaluation method, etc., he believes should be based on the characteristics of the object itself, in accordance with the principle of objectivity, operability and effectiveness of the choice of several methods to evaluate. Sinem (2013) analyze the domestic enterprise e-commerce performance evaluation system lack of objective and quantitative standards of the status quo [11], summed up the 16 enterprise e-commerce performance evaluation index, and based on rough set theory proposed the use of information entropy on the characteristics of the index to reduce and realize the weight set of effective method, Manjit (2013) pointed out based on the IT value, the electronic commerce value framework is built, which is connected with the performance drivers [12], the Internet application, the process and the customer and supplier. The three main driving factors and the business performance (Performance Operation) are the three main driving factors and the business performance.

The conclusion is that after the use of electronic commerce, the enterprise sales change is more obvious, different regional culture, the establishment of

communication mechanism, customer's support ability and regional competition efficiency can reflect the effect of the use of electronic commerce.

3. Model Design and Research Hypothesis

3.1. TOE Model

Based on the criticism of the classic innovation diffusion model, most of the researchers have extended the innovation diffusion theory and put forward the TOE model. TOE model considers that the adoption of an innovative technology is influenced by the three factors, which are the characteristics of the technology itself, the organizational characteristics and the external environment. Among them, the characteristics of the technology itself mainly focus on some of the characteristics of the technology itself, such as: relative advantages, compatibility, complexity, and can be tested and so on. Organization characteristic is the organization of the application of technological innovation, the size of the organization, the organization's economic type, scope and organization of the existing information technology infrastructure, *etc.*, External environment refers to the organization of the market (industry, competitors), the degree of competition, government policies, *etc.*

- 1) **Technical level factor:** the technology factor is the main factor that influences the diffusion of individual, enterprise or industry. Innovation diffusion theory provides a theoretical framework for the study of innovation and diffusion. The framework of this research summarizes five characteristics of technological innovation: the relative advantages, the complexity, the compatibility, the observability and the experimental nature. In the field of information technology, many scholars use them to study the diffusion of information technology. According to the previous research literature, there are three characteristics which are considered to be significantly affected by the diffusion of information technology, they are: the relative advantages, complexity and compatibility. For the observability and the experimental nature, some scholars believe that it will significantly affect the diffusion of technology, while some other scholars hold the opposite view.
- 2) **Organizational level factors:** the organization's characteristics will affect the adoption decision of the organization. At the organizational level, three types of organizational characteristics, organizational size, organizational structure and organizational innovation have been identified. The scale of the organization has been proved to have a tendency to influence technology adoption. Extensive research has found that the size of the organization is positively related to innovation, because the size of the organization in order to maintain and improve performance, the need to adopt innovation; and the small size of the organization with the flexibility and innovation, and strengthen the organization of the adoption of innovation tendency. This apparent contrast to results can be explained by the relationship between organizational size and other variables, such as: structure, strategy, and culture.
- 3) **Environmental factors:** environmental factors, including the organization of the industry, competitors, resources, industry rules and the relationship with the government. Many scholars have studied the impact of environmental factors on the adoption and diffusion of technological innovation, such as the pressure of industry competitors, the pressure of business partners, the pressure of customers, government policies and regulations, macro regulation

and policy guidance. In the highly competitive market, it is necessary to adopt the market position of the maintenance organization. In such an environment, the adoption of innovation that is not adopted by the competitor may cause the organization to be in a disadvantageous position in the competition. When to adopt the innovation technology, it depends on the strategic significance of the innovation and the application prospect in improving the efficiency and effect.

3.2 Research Hypothesis

We combine the innovation diffusion theory, the theoretical analysis of TOE model, the influence factors of the electronic business performance, to construct the theoretical model, and study the influence of the technical level, the organizational level and the environmental factors on the performance of e-commerce in small and medium enterprises. Technology factors have chosen the enterprise information foundation; the enterprise has the IT technology talented person, but is not the traditional innovation diffusion theory to consider the relative superiority, the complexity, the compatibility. We take the technology to prepare as a technical factor, that the enterprise information foundation, IT personnel, *etc.* directly determine whether the enterprise can smoothly carry out electronic commerce, and further affect the performance. According to the above analysis, the following two hypotheses can be put forward:

Hypothesis 1: Website has a significant impact on E-commerce performance

Hypothesis 2: IT technology is positively related to the E-commerce performance

The organizational factors, such as the manager's support, enterprise financial strength, enterprise scale and enterprise type, all reflect the characteristics of small and medium-sized enterprises, the managers support and enterprise capital strength have obvious positive influence on the performance of e-commerce. At the same time, the large enterprise complex organization system has hindered the internal communication, and it has a negative correlation with the electronic commerce performance, but even the small and medium-sized enterprise, the organization system is relatively simple, so it needs further discussion with the electronic commerce performance. According to the above analysis, the following two hypotheses can be put forward:

Hypothesis 3: leadership support is positively related to E-commerce performance

Hypothesis 4: business scale is positively related to E-commerce performance

Generally speaking, environmental factors include policy environment, infrastructure construction. In this paper, the theoretical model of government policy guidance, network infrastructure, credit conditions as a factor, can be put forward the following two assumptions:

Hypothesis 5: Credit environment is positively related E-commerce performance

Hypothesis 6: Infrastructure has a significant impact on E-commerce performance

4. Empirical Analysis

4.1. Variable Description

Enterprises to implement e-commerce starting point is the investment in the electronic commerce drive drivers focus to promote the business contribution rate (operational excellence) settled in to improve financial performance, financial performance, that is to say, the ultimate value is still of e-commerce by such as per capita income, Maori, return

on assets, investment rate of return of the traditional four financial performance assessment. Therefore, this paper studies the use of electronic commerce to measure the turnover of e-commerce, it is the enterprise can observe an objective data, but also the enterprise implementation of electronic commerce after the performance changes of the intuitive reflects. That is, the Perform is interpreted as: the transaction volume of online transactions in e-commerce. As shown in Table 1.

Table 1. Selection of Explanatory Variables

classification	Influence factors	selection
Technical Factor	Enterprise information	Website, ERP system, etc.
	Technical talents	IT technical personnel
Environmental Factor	Leadership support	Leader support
	Enterprise scale	Enterprise asset size
	Enterprise type	Enterprise type
Environmental Factor	Government policy	Government support policy
	Infrastructure	Internet usage
	Credit environment	Local credit environment

This paper uses the website, ERP system has the rate to measure the enterprise information foundation, for small and medium enterprises, the modern information technology and equipment, mainly in the enterprise whether to use ERP system to carry out the effective transformation of production, management process, whether self built website to open exhibition product promotion and marketing. In this paper, we use Its member to measure the technical talents, enterprises have the IT technology knowledge, or the number of IT technical staff, it will reduce the complexity and the non compatibility of the business system. The evaluation of leadership support is adopted in the form of expert scoring, and the evaluation parameters are set as follows: good, good, general, not good. In the model, three groups of virtual variables, Evaluate 1, Evaluate 2 and Evaluate 3, are expressed as well, and they are not good at 1. Set up 4 sets of virtual variables comtype1, comtype2, comtype3, the value of 1, respectively, for the state-owned enterprises, collective enterprises, private enterprises, and the basis of other business types. Total assets refers to the total assets of the enterprise owned or controlled, including current assets, long-term investments, fixed assets, intangible and deferred assets. The total assets of the enterprise, to a certain extent, represent the ability of the enterprise to control the idle assets.

4.2 Questionnaire Design

For the study, the sample selection criterion of this paper is strict, and the selection criteria are as follows: the enterprises must be small and medium enterprises, that is, 1000 people, 40000 of business income, ten. The specific areas include: food manufacturing, textile and garment industry, metal products processing and manufacturing industries; the questionnaire is anonymous, and is filled by the senior management of the enterprise. Through the above methods, the data are guaranteed; the accuracy and the reliability of the data are guaranteed. The sample data of this paper comes from the questionnaire. In the form of electronic questionnaires, the questionnaire survey time is concentrated in 2014; the small and medium-sized enterprises are based on the assistance of the small and medium sized enterprise bureau of Tangshan City. A total of 2000 questionnaires were distributed, 1894 questionnaires were collected, the recovery rate was 94.7%, and the data was 1666. Sample structure characteristics are shown in Table 2.

Table 2. Sample Structure and Characteristics

Features	criteria	Number	Proportion
Enterprise scale	Less than 20 people	77	4.62%
	20 -299 people	1090	65.43%
	300-100 people	499	29.95%
assets scale	0 -1 million	920	55%
	1 million-5million	424	25.45%
	5 million-10 million	132	7.92%
	More than 10 million	190	16.92%

Evaluation of the use of the electronic commerce type is divided into four levels: very good, good, general, and not good. 1666 small and medium enterprises, the electronic commerce is very good, there are 226, the evaluation of the 591, the evaluation of the general 752, the evaluation is not good there are 97. Evaluation is very good and good business accounted for 49.1% of the total, while the evaluation of the general business accounted for 45.07%, the poor business is only 5.83%. Combined with the text of the questionnaire, it can be inferred that small and medium business leaders to carry out e-commerce attitude is mainly divided into two kinds, one is to support enterprises to carry out e-commerce, two is to hold or not care attitude, a part of the leadership believes that the development of e-commerce has little impact on the business performance, and the other part of the enterprise cannot find effective ways to enhance e-commerce turnover.

4.3 Statistical Test

In multiple regression models, the reliability and stability of the parameters estimation, statistical test and the model estimates have a negative effect on the reliability and stability of the parameter estimation, and therefore, it is very important to test the explanatory variables. In this paper, the correlation coefficient test is used to test the 4 variables of the dummy variable, and the correlation coefficient between the variable and the explanatory variable and the explanatory variable is obtained, as shown in Table 3.

Table 3. Correlation Coefficient Analysis

Correlation	PERFORM	SCALE	ASSETS	ITS
PERFORM	1			
SCALE	0.624	1		
ASSETS	0.203	0.019	1	
ITS	0.894	0.0035	0.00355	1

As can be seen from the above table, e-commerce turnover and enterprise scale, the number of IT technical staff is highly relevant, with the total assets of the correlation coefficient is relatively small. In addition to the correlation between the size of the enterprise and the total assets, the correlation among the variables is less than 0.01. Therefore, it is not required to do the multiple linear processing. The empirical model of this paper may be due to the model function, the error of sample data, the difference of the total units in the cross section data, the random factors, and so on. In the same way, it is only for the variables to be tested outside of the dummy variables. The test method of this paper is the White test method, and the test results are shown in Table 4. The results show that the F-statistic value of Obs*R-squared and P is much higher than 0.05, and there is no difference.

Table 4. Different Variance Test

Heteroskedasticity Test: White			
F-statistic	0.003832	Prob. F	0.9997
Obs*R-squared	0.011547	Prob. Chi-Square	0.9946

4.4 Regression Analysis

Regression analysis is to verify the regression model, which is to investigate the influence of explanatory variables on the performance of the model, the relationship between enterprise scale, enterprise type and the performance of e-commerce is not determined. Analysis results are shown in Table 5.

From the overall model, with the increase of the model variables, the goodness of fit is higher and higher, but it is very convincing for the cross section data. F-measure test showed that the independent variables in Model3, model2 and model1 were significantly correlated with the dependent variables; model1, model2 and DW were 1.764, 1.993 and 2.024, respectively, which showed that the model parameters estimated value was the best, and the model was statistically valid.

Table 5. Multivariate Regression Analysis

Variable	Model-1		Model-2		Model-3	
	coefficient	P value	coefficient	P value	coefficient	P value
Scale	2.160**	0.013	3.107**	0.024	2.007**	0.007
Assets	7.442***	0.002	2.796**	0.049	0.949**	0.033
Its	8.121***	0.005	12.458**	0.000	7.647***	0.002
Comtype1			-11.759**	0.031	-8.701**	0.068
Comtype2			3.558*	0.083	-9.226***	0.004
Comtype3			-15.61***	0.004	-4.652**	0.376
Evaluate1					1.637**	0.689
Evaluate2					0.267***	0.401
Evaluate3					0.489***	0.003
Websites					4.642***	0.002
R2	0.394		0.396		0.398	
Adj R2	0.386		0.395		0.394	
P(F-statistic)	0.008		0.008		0.005	
DW	2.024		1.993		1.764	

From the differences of the total of three models, the regression coefficient and P value were not changed, which showed that the effect of the original variables was not big, and the results were not affected. The P values in the model are generally less than 0.01 or between 0.01 and two, but the P values of some variables are greater than 0.1, and the P value is likely to be caused by two reasons. One is that the sample is limited, the sample points are small, and the results show that the variables are not significant. On the specific variables, this paper uses 0.01 and 0.05 of the significant level to determine the level of the variable. According to the regression analysis of the standard and Table 4.7, we can draw the following conclusions: first, the technical level, IT technology talent and the site has a P value of less than 0.01, therefore, the two variables have a significant impact on the electronic business performance, and variable coefficient has a strong explanatory power. The coefficients of the two variables are positive, which shows that the relationship between the electronic business performance and the increase of IT technology will bring about the increase of the performance, and the company has a better performance than the ERP system. Second, the value of enterprise scale, enterprise assets total P value is less than 0.05, the effect of the two variables are significant, and the

variable coefficient has a strong explanatory power. From the coefficient can be seen, the enterprise scale and electronic business performance is positively related, that is, the smaller the size of small and medium enterprises, the less the ideal of e-commerce performance; the total assets and e-commerce performance is positively related, but with the increase of the model variables, the coefficient is becoming smaller and smaller. Third, for the environmental factors, the government supported P value is less than 1%, the level of the 0.01 is significant, the model of the two virtual variables is good, that the infrastructure construction and credit environment for e-commerce performance impact is significant.

5. Conclusion

According to the results of regression model, IT technology talents and enterprise information base and e-commerce performance are significantly positive correlation, confirmed that a new technology and the adoption of past experience, the existing technology is consistent, will give the adoption of innovative technology in the follow-up and absorb the link to bring great impact, and this effect is positive. It is indicated that a large part of the enterprise information foundation is weak, some enterprises have not even experienced online marketing, and the application of information technology is obviously backward. In IT talent, nearly half of small and medium enterprises do not have professional knowledge of IT talent or network marketing personnel, which is leading to nearly half of the number of small and medium enterprises e-commerce turnover of 0 of the most important reasons. According to the regression results of the model, the enterprise scale and electronic business performance are positively related, namely, the scale of small and medium-sized enterprises, e-commerce performance is better, this is mainly because the research object is small and medium enterprises, 95.83% of the sample size is concentrated in small business, there is no large enterprise complex organizational system to hinder the internal communication, and then affect the use of electronic commerce. According to the model of return results, government support effect on e-business performance is positively related, more funding, better performance. The government's position in the society is higher; the government's policy direction usually has a strong guiding role to the social members, so the government's support for the enterprises to carry out the electronic commerce will be a great extent the development of e-commerce.

5.1. Training E-commerce Talents

According to a sample survey, nearly half of the small and medium enterprises have not yet introduced the plan for the relevant personnel of e-commerce. The lack of talent is an important factor to hinder the successful implementation of electronic commerce. Most small and medium enterprises use the third party e-commerce platform mode, do not need to develop and maintain the system, therefore, the small and medium-sized enterprise is the most lack of management and business e-commerce talents. Small and medium enterprises are necessary to develop e-commerce related personnel through the introduction of external and internal training and other measures. External introduction can be divided into two kinds of college graduates recruitment and social recruitment; in addition, the enterprise senior management, general management staff and even ordinary workers, it is necessary to carry out computer knowledge, network knowledge, e-commerce training.

5.2. Strengthen the Construction of Information Infrastructure

Enterprises should follow the following principles: first, to meet the actual requirements of enterprises, to meet the actual requirements of enterprises, to meet the practical requirements of enterprises, to meet the practical requirements of enterprises, to

