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Search Engine Marketing, Financing Ability and Firm Performance in E-commerce

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Abstract

This paper explores the relationship of search engine marketing, financing ability and e-commerce firm performance by the empirical research on China's B2C e-commerce firms. Results show that search engine marketing and business model has a strong positive relation with firm performance while financing ability has a negative effect on firm performance. It verifies the low returns to inputs in e-commerce and enlightens the managers should concentrate on business model innovation and consumer relation management.

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Keywords: Search Engine Marketing; E-commerce; Financing ability; Firm performance

1. Introduction

Spurred on by information technology and network development, e-business has become a new economic mode and gradually played an important role in people's daily life, especially with the rise of online shopping, more and more consumers search for information and order goods by internet, in other words, internet has become an important carrier of information. Research shows that more than 80% of internet users through the search engine to search for information. However, in the face of massive information, users often are only interesting in the top list of search results, therefore, it is very necessary that the webpage can be ranked top and

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searched first by some optimization techniques, such as search engine optimization (SEO) and PayPer Click (PPC). SEO is based on the end-user online behaviour while PPC depends on the time on site and end-user page hits [1]. Both can improve website performance and online marketing effects. IResearch, an online media concentrating on China's e-business research, reports that there are 42% internet users hitting the advertising by search engine, and 37% of purchase decisions are supported by search engine [2]. As a result, search engine marketing (SEM) is increasingly more and more popular. The purpose of SEM is to promote the sales by increasing the specific keyword exposure. Search engine is a kind of software which collects data or information about websites [3]. The collected data or information enable a web page to appear in top result lists of search engines by using some necessary optimization rules, such as increasing some certain keywords exposure or website design. Ghose and Yang [4] find that keywords at the middle positions are usually the most profitable due to their higher click-through or conversion rates.

Previous studies in SEM literature discussed the SEM effect on website rank or traffic acquire [1], and also concerned on how to improve page view/page rank or how to do website design [5]. It is well known that a firm will gain many benefits from well-designed websites, the study on how SEM affect e-commerce firm performance is economic significant.

E-commerce is characterized as scale expansion and technology innovation, and hence massive capital and labour inputs are necessary. Most e-commerce start-up firms seek for the monopoly advantage by Initial Public Offerings (IPO) or getting the venture capital. The ability of getting capital is defined as financing ability, which is critical for e-commerce development. In general, financing has two ways: external financing and internal financing. Guariglia and Liu [6] document that the innovation activities of Chinese firms, especially private firms, are constrained by the availability of internal financing while [Colombo and Grilli [7]] find that firms usually have greater start-up size by external private equity financing. Chang [8] points out venture capital financing and strategic alliances can affect a start-up's performance. Specially, by gaining cash and complementary resources, a startup will go to IPO more quickly than others. Therefore, financing ability plays a key role in gaining critical or rare resources. It is important for e-commerce firm to get adequate capital from the venture investment or the bank due to the nature of emerging industry.

Though much research explore the importance of SEM in gaining website traffic and the impact of internal financing and external financing on firm performance, few research explores the relationship of SEM, financing ability and firm performance.

This research tries to answer the following questions:

1. Whether SEO can improve the e-business enterprise performance?
2. Whether SEO can increase page view and then strengthen financing ability?
3. Whether there is correction between e-business enterprise financing ability and performance?

The aim of this research is to explore the SEM effects on performance and financing ability of online retail companies, and try to find their correlation and influence path. At the same time, this research also tries to provide some references and guidance for e-business enterprises strategy and operations management.

2. Methods

2.1. Sample and data

This sample is mainly from China's B2C online retailers TOP 50, the products of online sales cover network group purchase, mobile phone & digital product, household appliances, clothes & shoes, cosmetics, luxury goods, food and drinking, etc.. The reason why choose B2C website as the research sample is that China's B2C market scale is booming in recent years. Data shows, in 2012 the Chinese B2C market size is 470 billion yuan, a 95.8% rise over that of 2011, the pace of growth is far higher than the C2C market, and it

predicts B2C model will gradually become the dominant mode of China's online retail market. Under this background, this research aims to provide some suggestion for enterprises strategy development.

It needs to note that performance is measured using operating revenue, and the data is mainly from the news and iResearch Report named as "China's Top50 B2C online retailer". iResearch (www.iresearch.cn) is a famous Internet research and consulting company in China.

Financing ability is measured using capital from venture capital, IPO and others. Financing data mainly comes from the news and "China's e-commerce market investment and financing data monitoring report", released by China's Electronic Commerce Research Center (www.100EC.cn).

SEM information, including the load time (T), the number of backlinks (BL), PageView (PV) and Page Rank (PR), is mainly from a software（seo.chinaz.com）from CNZZ（http://www.cnzz.com). It is the largest China's internet data analysis and service provider.

2.2 Model and indicators

Generally speaking, the indicators of SEM evaluation include Page Rank (PR), Page View (PV), the load time (T) and Back Link（BL）.

- PageRank (PR) is an important measurement on website importance, and it is a way of marking webpage rank or importance by google. The value of PR is given in a range from 1 to 10. The website importance increases as the value rises.
- Page View (PV) reflects how many users access and view the webpage, and thus it is one of important metrics on user scale and website traffic. In practice, more PV contributes to the increase of sales.
- The load time (T) is the time that a webpage is loaded, which presents the website quality.
- Back links (BL) is the number of links received by a web node. The more is the backlinks, the importance the website is.

Firm performance is measured by financial indicators and non-financial indicators. In view of the availability and measurability of data, we use operating revenue as the metric of firm performance.

Financing ability is the ability of raising money for operations, marketing and management. Bobinaite and Tarvydas [9] analyse financing channels and instruments have an important impact on energy cost. Thus, in order to measure the impact of financing ability on e-commerce firm performance, financing channel is chosen as the control variable. Accordingly, the internal financing is defined as 0 and external financing is defined as 1.

E-commerce operates either as platform model or as self-operation model. The platform model benefits from advertising, marketing and franchise fees while self-operation model benefits from sales revenue. E-commerce business model application can innovate new products and promote the competitive advantage. According to the report of IResearch, platform model accounts for 60% market share in China's B2C e-commerce. Therefore, it is necessary to measure the impact of different business model on e-commerce firm performance. Accordingly, firms with platform model is given 1 and others are given 0.

Table 1：Variable Description

Variables	**Name**	**indicator**	**Meanings**
Independent variables	Performance	Sales	Economic performance
Dependent variables	SEM	Page view (PV)	Traffic or user scale
		The load time (T)	Website quality
		Back Link（BL）	Interactive with other sites
		PageRank (PR)	Website importance
	Financing ability	The amount of capital from	Financing ability

Control variable		financing	
	Business model	Platform=1 Self-operation=0	Business model
	Financing channel	External financing=1 Internal financing=0	Financing channel
	Enterprise age	The age of e-commerce	Enterprise age

The model which measures the relationship of SEM, financing ability and firm performance is constructed as follows:

$$Financing_i = \beta_0 + \beta_1 PV_i + \beta_2 PR_i + \beta_3 BL_i + \beta_4 T_i + \mu \quad (1)$$

$$Sales_i = \alpha_0 + \alpha_1 PV_i + \alpha_2 PR_i + \alpha_3 BL_i + \alpha_4 T_i + \alpha_5 Financing_I + \alpha_6 Model_{1i} + \alpha_7 ModeL_{2i} + \varepsilon \quad (2)$$

Eq.(1) represents the impact of SEM on financing and Eq.(2) presents the relationship of SEM, business model, financing ability and firm performance. For any e-commerce firm$i$，$Sales_i$ is the revenue in 2011. $Financing_I$ reflects the financing amount in 2011. $Model_i$ and $Channel_i$, are the control variables, and they defines the business model and financing channel. PV_i, PR_i, BL_i and T_i define the effect of SEM, and reflect the page view, website importance, interactivity and the load time respectively.

3. Empirical results and Discussions

3.1 Correlation Analysis of Indicators

In order to ensure the accuracy of model estimation, the correlation analysis of indicators is first performed, as shown in Table 2. The results show that firm performance has a strong positive relation (0.92) with PV while a slight positive relation (0.58) with financing ability and backlinks(BL). Financing ability has a strong positive relation with firm performance (0.70) and backlinks (BL) (0.81).

Table2. correlation matrix of variables

	(y) Sales	***(x1) Financing***	***(x2) Channel***	***(x3) Model***	***(x4) PV***	***(x5) BL***	***(x6) T***	***(x7) PR***	***(x8) Age***
(y)Sales	1								
(x1)Financing	0.579159	1							
(x2)Channel	-0.17116	0.162876	1						
(x3)Model	0.464411	-0.07063	-0.05697	1					
(x4)PV	0.924982	0.700853	-0.16164	0.369562	1				
(x5)BL	0.584617	0.816148	-0.2062	0.286811	0.776492	1			
(x6)T	-0.17135	-0.15052	-0.21592	-0.08929	-0.18823	-0.2121	1		
(x7)PR	0.331853	0.258772	-0.24028	0.164538	0.462793	0.6947	-0.31772	1	
(x8)Age	0.015621	0.106587	-0.63123	-0.12191	0.122374	0.255466	0.118167	0.126598	1

In addition, we also find that backlinks (BL) has a strong relation with PV and PR, which indicates that

multicollinearity occurs among the dependent variables. In practice, the increase of BL and PR will lead to a rise of PV, it hence can concludes that PV is the result of BL and PR improvement. And finally, we remove the BL and PR variable from the model (1) and model (2). And revised models are given as follows:

$$Sales_i=\alpha_{0+}\alpha_1 PV_i+\alpha_2\, Model_i+\varepsilon \quad (3)$$

$$Sales_i=\alpha_0+\alpha_1 PV_i+\alpha_4 financing_i+\alpha_5\, T_i+\varepsilon \quad (4)$$

3.2 Regression results and analysis

3.2.1 The impact of PV and business model on firm performance

The estimation results of Eq. (3) is reported in Table3. R-squared is 0.873468 which indicates that PV and business model can explain a 87% change of revenue. The P value of PV is 0 which shows PV has a strong positive relation with firm performance at the level of 1%, and the coefficient of business model and firm performance is 7065.785 which the match of business model with e-commerce firms has strong impact on firm performance.

Table3. The impact of PV and business model on firm performance

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C	-1574.646	953.9233	-1.650705	0.1073
PV***	0.0007	5.05E-05	13.87753	0.0000
MODEL**	7065.785	3113.079	2.269709	0.0291
R-squared	0.873468	Mean dependent var		4439.275
Adjusted R-squared	0.866629	S.D. dependent var		15041.12
S.E. of regression	5493.026	Akaike info criterion		20.13238
Sum squared resid	1.12E+09	Schwarz criterion		20.25905
Log likelihood	-399.6477	Hannan-Quinn criter.		20.17818
F-statistic	127.7082	Durbin-Watson stat		1.687124
Prob(F-statistic)	0.00000			

Note: PV = Page view; MODEL= e-business model. * P < 0.05. ** P < 0.01. *** P < 0.001.

The result of Eq. (3) also shows that more users contribute to an increase of revenue, and thus it is necessary to promote the browse/buy ratios by SEM. And business model plays a key role in strengthening e-commerce firm performance.

3.2.2 The impact of financing ability and SEM on firm performance

The estimation results of Eq. (4) is reported in Table 4. It shows that PV have a strong positive relation with firm performance while financing ability have a strong negative relation with e-commerce firm revenue. The reason that financing ability increases while e-commerce firm revenue decreases is that massive capital inputs are used as extended reproduction. The result identifies the paradox of massive inputs and low returns to

inputs in e-commerce.

The load time have a slight negative relation with firm performance, which indicate that the shorter the load time is, the better e-commerce firm performance is. Thus, one of the ways of SEM is to shorten the load time and improve the website quality.

Table 4. The impact of financing ability and SEM on firm performance

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C	688.2541	335.8199	2.049474	0.0506
T†	-2.449089	1.208265	-2.026947	0.0530
PV***	0.000502	2.28E-05	21.99018	0.0000
FINACING***	-0.038198	0.009357	-4.082135	0.0004
R-squared	0.966579	Mean dependent var		2284.033
Adjusted R-squared	0.962723	S.D. dependent var		5612.278
S.E. of regression	1083.579	Akaike info criterion		16.93749
Sum squared resid	30527715	Schwarz criterion		17.12432
Log likelihood	-250.0624	Hannan-Quinn criter.		16.99726
F-statistic	250.6522	Durbin-Watson stat		2.41939
Prob(F-statistic)	0.0000			

Note: PV = Page view; FINACING =financing ability; T = the load time. † Significant at $p < 0.1$. * $P < 0.05$. ** $P < 0.01$. *** $P < 0.001$.

4. Conclusions and Remarks

This paper explores the relationship of SEM, financing ability and firm performance based on the empirical research of China' B2C e-commerce firms. Some suggestive results are given as follows.

First, PV has a strong positive relation with e-commerce firm performance. It shows that users are the core resource in e-commerce and thus it is necessary to attract users by search engine marketing (SEM). It also gives a sight on the importance of strengthening consumer relationship management.

Secondly, financing ability has a strong negative relation with e-commerce firm performance. It indicates that the low returns to inputs in e-commerce due to the start-up nature. The returns of inputs can not be present immediately because it has a lag effect in time.

Thirdly, business model and SEM have a strong positive relation with e-commerce firm performance. In order to gain long term competitive advantages, it is hence necessary for managers to focus on business model innovation and SEM.

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References

[1] P.M. Fiorini, L.R. Lipsky, Search marketing traffic and performance models, Computer Standards & Interfaces, 2012;**34**:517-526.
[2] N. Abou Nabout, B. Skiera, T. Stepanchuk, E. Gerstmeier, An analysis of the profitability of fee-based compensation plans for search engine marketing, International Journal of Research in Marketing, 2012; **29**:68-80.
[3] N. Yalçın, U. Köse, What is search engine optimization: SEO?, Procedia - Social and Behavioral Sciences, 9 (2010) 487-493.
[4] A. Ghose, S. Yang, An Empirical Analysis of Search Engine Advertising:Sponsored Search in Electronic Markets, Management Science, 2009; **55**:1605-1622.
[5] K. Al-Qeisi, C. Dennis, E. Alamanos, C. Jayawardhena, Website design quality and usage behavior: Unified Theory of Acceptance and Use of Technology, Journal of Business Research, 2014;**67**: 2282-2290.
[6] A. Guariglia, P. Liu, To what extent do financing constraints affect Chinese firms' innovation activities?, International Review of Financial Analysis, 2014;**36**: 223-240.
[7] M.G. Colombo, L. Grilli, Start-up size: The role of external financing, Economics Letters, 2005; **88**: 243-250.
[8] S.J. Chang, Venture capital financing, strategic alliances, and the initial public offerings of Internet startups, Journal of Business Venturing, 2004;**19**: 721-741.
[9] V. Bobinaite, D. Tarvydas, Financing instruments and channels for the increasing production and consumption of renewable energy: Lithuanian case, Renewable and Sustainable Energy Reviews, 2014;**38**: 259-276.