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Effect of Business Model on Financial Performance of Information Technology Industry Based on Securities Analyst's View

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Abstract

We propose a multi-dimensional typology of business model based on information technology industry. In order to study the effect of business model on financial performance, we analyze public companies data of information technology industry by variance analysis method. The empirical results show that business model is the important influence factor of financial performance and business model has different effect on different aspect of financial performance. The final evaluation results show that the effect of business model has relation with its elements and some models have better financial performance than others.

Keywords: *business model, financial performance, variance analysis, information technology*

1. Introduction

Peter F. D., a famous management expert, has said that the companies now compete not only through products and services, but through the business model. That means that every company forms its unique business model in its business activities by the use and allocation of various resources, and business model will directly affect the financial performance.

Many scholars believe that the business model plays an important role in interpreting the enterprise performance [1]. Afuah and Tucci (2001) propose the business model as a unifying construct for explaining firm performance [2]. Markides and Charitou (2004) think that business model is the potential source of competitive advantage [3]. Afuah (2004) focuses on firms' profitability and introduces a strategic framework in which the business model corresponds on the determinants of firm profitability [4].

These works are conceptual, while some authors have conducted empirical analyses. Amit and Zott (2001) explore the theoretical foundations of value creation in e-business by examining how 59 American and European e-businesses that have recently become publicly traded corporations create value. They observe that in e-business new value can be created by the ways in which transactions are enabled. Grounded in the rich data obtained from case study analyses and in the received theory in entrepreneurship and strategic management, they develop a model of the sources of value creation. The model suggests that the value creation potential of e-businesses hinges on four interdependent dimensions, namely: efficiency, complementarities, lock-in, and novelty. They propose that a firm's business model is an important locus of innovation and a crucial source of value creation for the firm and its suppliers, partners, and customers [5].

IBM (2006) interview 765 corporate and public-sector leaders worldwide and find that firms that financial performance are better emphasize much more on business model innovation [6].

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Zott and Amit (2008) examine the fit between a firm's product market strategy and its business model. They develop a formal model in order to analyze the contingent effects of product market strategy and business model choices on firm performance. They investigate a unique, manually collected dataset, and find that novelty-centered business models—coupled with product market strategies that emphasize differentiation, cost leadership, or early market entry—can enhance firm performance. The data suggest that business model and product market strategy are complements, not substitutes [7].

Sumaiyah and Rosli (2011) study the relationship between business model and performance of the firm, especially on manufacturing small and medium enterprises (SMEs) in Malaysia, using mail survey questionnaire. The study initiates that the firm's business model plays significant roles in determining the firm's performance [8].

Based on these review, we find that the business model is the important driving factor of enterprise performance. With the rise of the related research, business model get more securities analyst's favor. Many analysts consider the business model as a kind of new analysis tools and predict the performance of the listing companies with the aid of this tool. The public companies are classified according to the business model by securities analysts. By analyzing the different business model, securities analysts can judge the investment priority of companies. The purpose of classifying business model is to distinguish the systematic difference of business models, judge which company has potential value.

Overall, the typologies of business models mainly are two categories, one is universal typology for all companies, and another is local typology for a special industry.

Malone, *et al.* (2006) develops a comprehensive typology of business models. They hypothesize that this typology can be used to classify any for-profit enterprise. As partial confirmation of this hypothesis, they classify the business models of the 10,970 publicly-traded US companies in COMPUSTAT from 1998 through 2002. Finally, they analyze six measures of financial performance for the different kinds of business models to determine whether some models perform better than others. They find that some business models are much more common than others, and that some do, indeed, perform better than others. These findings are robust to a large number of robustness checks and alternative interpretations [9].

Many scholars have tried to propose a universal typology of business model, but there is no one really has established a practical, clear, comprehensive typology of business model. Researchers need to consider very many factors when they study business models. The universal typology of business model lacks practicability. This universal typology cannot contain the features of an industry, so some scholars design typology of business model for a specific industry.

Wang Xiang, *et al.* (2010) establish a new systematic, multi-dimensional and balanced, quantitative business model taxonomy, and use the ANOVA statistical analysis method to examine the performance implications of business model based on the sample of all Chinese public nonferrous metals companies in 2008. They have found strong support for the suggestions that the design and selection of a business model has the greatest impact on profitability, then on growth and market value, and least on operational efficiency. This deepens their understanding of business model taxonomy and provides a new alternative for explaining sources of competitive advantage and superior performance, in addition to industry and firm effect [10].

Xiang Guopeng, *et al.* (2013) establishes a business model structure, based on the perspective of customer value creation. They develop a system of business model classification index, and conduct an empirical research on the effect of business model on the performance of Chinese 64 retail listed companies. The result reveals that there are 14 kinds of predominant business models, the business models adopted by retail listed companies are greatly different, and the impacts on corporate performance are also very divergent. In order to improve corporate performance, it suggests that enterprisers should

make business models innovate by changing customer segment, market scope, operating mode, customer contact method and profit model [11].

Some scholars have studied the relationship between the business models and firm performance, but the empirical re-search in this area is relatively deficient. The information technology (IT) industry is the pillar industry in China, while the study on its business model is very deficient. We put forward the multi-dimensional business model typology based on IT industry. Public companies data of IT industry will be empirically analyzed to study the effect of business model on financial performance by variance analysis method. The empirical results will test whether business model is important influence factor of financial performance and business model has different effect on different aspect of financial performance.

2. Business Model

With the supports of government and the efforts of society, Chinese IT industry has developed very rapidly. The industrial scale is fleetly expanding, enterprises' strength is continuously increasing, services ability is significantly improving, and industrial area is constantly widening. Now China is in the critical period of economic structure adjustment and development mode change. Merge together with informatization and industrialization provides a huge development space for the IT industry.

IT industry covers very wide. It includes computer, network, communications and other information fields. With the rapid development of IT industry, the different areas of sub-sectors develop with uneven speed. How to distinguish different areas of IT industry and analyze the performance of listed companies in different fields?

We hope to use the business model theory to solve the above problems. The fundamental purpose of this paper is to clarify the systematic differences of different business model type, provide the reference for business model design and innovation, and enhance the value creation potential and market value of the firm.

In order to enhance the business model typology's rigor and accuracy, we propose the basic requirements of business model typology.

(1) Business models should be classified from a multiple point of view, which means business model typology has multi-dimensions.

(2) Business models should consider the special nature of IT industry.

(3) Business models should not only take into account the firm's revenue, earnings mode but also reflect the business value creation process.

2.1. Independent Variables

The independent variable in this paper is the enterprise business model type. We need to define business models and distinguish different types. According to the characteristics of the IT industry in China, this paper construct business model based on three dimensions. The three dimensions are the industrial chain, the market scope and the R&D (Research and development) intensity.

2.1.1. Industrial Chain: The industrial chain of the IT industry is divided into upstream, midstream and downstream. The upstream mainly includes hardware (such as servers, personal computer, network communication equipment, storage equipment). The midstream mainly includes software (such as operating sys-tem, database, and software in other fields) and system integrators. The downstream mainly includes various kinds of applications (such as e-commerce, online games, instant messaging, video service, search engine) and content producers.

2.1.2. Market Scope: We distinguish the market scope by three indexes: the proportion of regional sales income, the proportion of domestic sales income, and the proportion of

foreign sales income. If the proportion of regional sales income of the firm is more than 50%, the firm belongs to the regional leading type. If the proportion of foreign sales income is greater than 50%, then the firm belongs to the international leading type. Other firms belong to the domestic leading type.

2.1.3. R&D Intensity: The R&D mainly reflects the ability of technological innovation, and the R&D plays an important role in enhancing the competitiveness and improving the economic efficiency. Because IT industry has the features of intensive technology, we select the R&D intensity as a dimension of business model typology.

But the calculation of the R&D intensity is not unified in many reviews. There are four methods: R&D scale/the sales income, R&D scale/the corporate profits, R&D scale/the stock market value and R&D scale/the total assets. Because the sales income, corporate profits, stock market value are instable, these methods will enable the R&D intensity greater than the actual value [12-13]. Because the total asset is relatively stable, we use the R&D/the total assets as the R&D intensity. If the R&D intensity is less than the average, the firm belongs to the conservative type; otherwise, belongs to the aggressive type.

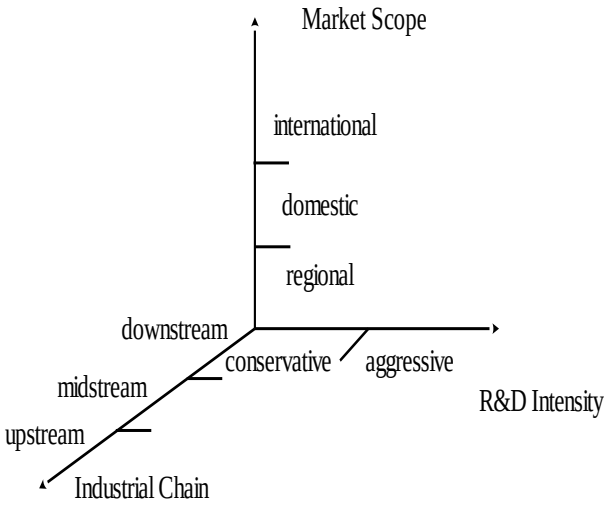

Figure 1. The Typology of Business Model in IT industry

According to these three dimensions, there are 18 (3×3 × 2=18) business model types, as shown in Figure 1.

2.2. Dependent Variables

The dependent variable in this paper is the financial performance. There is no universally or even commonly used set of measures for evaluating the financial performance of firms. A wide range of measures has been used in previous research. We think the measures should comprehensively and systematically evaluate the financial performance. Based on previous reviews [9-11], considering the data availability, we focus on four categories of performance: profit ability, development ability, operating efficiency and market value. For each category, we use measures commonly used in the literature. Specifically, for profitability, we use return on assets (ROA), rate of return on common stockholders' equity (ROE), operating profit ratio (OPR), basic earnings per share (BEPS). For development capacity, we use operating profit growth rate (OPGR), operating income growth rate (OIGR). For operating efficiency, we use return on total assets (ROTA), working capital turnover (WCT), and inventory turnover (ITO). For market value, we use Tobin'Q.

3. ANONA

The method in this paper is the analysis of variance (ANOVA). The goal of ANOVA is to test whether different types of business model have a significant impact on the financial performance.

In statistics, ANOVA is a collection of statistical models, and their associated procedures, in which the observed variance in a particular variable is partitioned into components attributable to different sources of variation. In its simplest form, ANOVA provides a statistical test of whether or not the means of several groups are all equal, and therefore generalizes t-test to more than two groups [14].

ANOVA has been studied from several approaches, the most common of which use a linear model that relates the response to the treatments and blocks. Even when the statistical model is nonlinear, it can be approximated by a linear model for which an analysis of variance may be appropriate. The introduction of ANOVA is mainly from [14] and [15].

ANOVA has three assumptions [14]:

(1)Independence of cases – this is an assumption of the model that simplifies the statistical analysis.

(2)Normality – the distributions of the residuals are normal.

(3)Equality (or "homogeneity") of variances, called homoscedasticity — the variance of data in groups should be the same.

Model-based approaches usually assume that the variance is constant. The constant-variance property also appears in the randomization (design-based) analysis of randomized experiments, where it is a necessary consequence of the randomized design and the assumption of unit treatment additivity. If the responses of a randomized balanced experiment fail to have constant variance, then the assumption of unit treatment additivity is necessarily violated.

Based on these assumptions, we judge whether there is a significant influence of business models on the performance, which is actually to inspect whether *n* normal population means is the same.

If the *n* population means are equal, we can expect an *n* sample mean will be very close to each other. The closer *n* sample means are the more full the evidence that *n* population means are equal is. The more different *n* sample means are, the more sufficient the evidence that *n* population means are different is.

Let the null hypothesis be H_0: $\overline{x}_1 = \overline{x}_2 = \cdots = \overline{x}_n$. If the hypothesis can be supported, enterprise performance means of *n* business mode are equal. That means all sample is a continuous probability distribution parameter $\overline{x}$ is the mean or expectation and σ^2 is the variance [15].

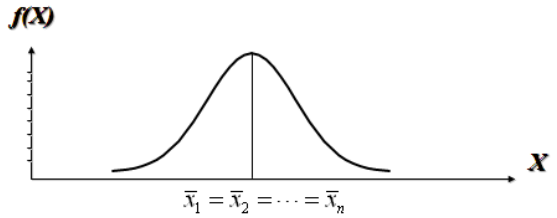

Figure 2. The Figure of Null Hypothesis

If the alternative hypothesis is supported, then H_1: $\overline{x}_i$ (i=1, 2,…) are not equal. At least one of population means is different or all population means are different from each other [18].

Figure 3. The figure of Alternative Hypothesis

The closer *n* sample means are the more full the evidence that *n* population means are equal is. The more different *n* sample means are, the more sufficient the evidence that *n* population means are different is.

If the change of *n* sample means is small, then H_0 is supported; if the change of *n* sample means is large, then H_1 is supported.

The model is

$$x_{ij} = \bar{\bar{x}} + \alpha_j + \varepsilon_{ij}, \tag{1}$$

where x_{ij} is the observation *i* under level *j*, $\bar{\bar{x}}$ is the mean of all sample, α_j reflects the difference of $\bar{x}_j$ with $\bar{\bar{x}}$, ε_{ij} is assumed to be a normally distributed error term. In this paper, *j* is the business model type, x_{ij} is a measure of firm *i*'s performance.

$$\bar{x}_j = \sum_{i=1}^{n_j} \frac{x_{ij}}{n_j}. \tag{2}$$

where n_j is the number of the observations under level *j*.

The expression of the all sample mean is

$$\bar{\bar{x}} = \frac{\sum_{j=1}^{k} \sum_{i=1}^{n_j} x_{ij}}{n}. \tag{3}$$

We should note that sample sizes are the same.

SST (Sum of Squares for Total), SSE (Sum of Squares for Error), and SSA (Sum of Squares for variable A) are

$$SST = \sum_{j=1}^{k} \sum_{i=1}^{n_j} (x_{ij} - \bar{\bar{x}})^2, \tag{4}$$

$$SSE = \sum_{j=1}^{k} [\sum_{i=1}^{n_j} (x_{ij} - \bar{\bar{x}})^2], \tag{5}$$

$$SSA = \sum_{j=1}^{k} \sum_{i=1}^{n_j} (\bar{x}_j - \bar{\bar{x}})^2 = \sum_{j=1}^{k} n_i (\bar{x}_j - \bar{\bar{x}})^2. \tag{6}$$

The relation of SST, SSE, and SSA is

$$\sum_{j=1}^{k} \sum_{i=1}^{n_j} (x_{ij} - \bar{\bar{x}})^2 = \sum_{j=1}^{k} [\sum_{i=1}^{n_j} (x_{ij} - \bar{\bar{x}})^2] + \sum_{j=1}^{k} n_i (\bar{x}_j - \bar{\bar{x}})^2, \text{ or } SST = SSE + SSA. \tag{7}$$

The F-test is used for comparisons of the components of the total deviation. For example, in one-way or single-factor ANOVA, statistical significance is tested for by comparing the F test statistic [14].

$$F = \frac{Variance - between - items}{Variance - within - items} = \frac{SST/(k-1)}{SSE/(n-k)}, \quad (8)$$

where n is the number of samples and k is the number of items.

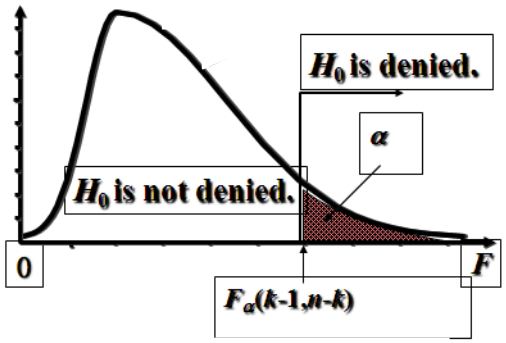

Figure 4. The Figure of *F* Distribution

Figures 2-4 are referenced from [15].

We compare F and F_α.

If $F > F_\alpha$, then null hypothesis is denied and alternative hypothesis is supported. That means the difference between sample means is remarkable, the independent variable (business models) have significant influence on the dependent variable (financial performance).

If $F < F_\alpha$, null hypothesis is supported. We cannot think the independent variable (business models) have significant effect on the dependent variable (financial performance) [15].

4. Sample Selection and Empirical Analysis

4.1. Sample Selection

We select IT industry as the research object. According to "China Securities Regulatory Commission's Industry Classification Structure and Code", there are 121 publicly traded firms in Chinese IT industry in 2010. During this period, if any firm becomes special treatment, this firm will be removed from samples. If the firm does not publish the R&D scale, the firm will be removed. If in any business model type, the firm's number is less than 2, the firm will be removed. Finally, we chose 88 firms. The data are mainly from the CSMAR database, the remaining data that cannot be found in CSMAR, are from the annual report. The descriptive statistics analysis about samples is shown in Table 1. From Table 1, we can see the profit ability, development capacity, operating efficiency and market value of 88 IT firms.

Table 1. The Result of Descriptive Statistical Analysis

Measures	N	Mean	Std. Deviation	Min	Max
ROA	88	0.07	0.05	-0.08	0.35
ROE	88	0.10	0.11	-0.22	0.84
OPR	88	0.12	0.12	-0.26	0.46
BEPS	88	0.48	0.36	-0.56	1.36
OPGR	88	0.15	2.72	-11.53	18.74
OIGR	88	0.29	0.45	-0.55	2.81
ROTA	88	0.77	0.51	0.20	3.43
WCT	88	8.87	57.45	0.23	540.50
ITO	88	15.33	48.87	0.50	410.91
Tobin'Q	88	2.98	1.81	0.85	9.59

4.2. Sample Classification

According to the typology of business model, based on the public data of listing firms, we classify firms' business model type one by one, shown as in Table 2.

Table 2. The Classification Result in IT Industry

Business Model Types	Representatives of Firms
Downstream, regional leading and conservative type	Cec Corecast Co., Ltd.
Midstream, regional leading and conservative type	Qiming Information Technology Co.,Ltd.
Midstream, domestic leading and conservative type	Shaanxi Fenghuo Electronics Co., Ltd.
Midstream, international leading and conservative type	Shenzhen Kaifa Technology Co.,Ltd.
Upstream, regional leading and conservative type	PCI-Suntek Technology Co.,Ltd.
Upstream, domestic leading and conservative type	Jiangsu Zhongtian Technology Co.,Ltd.
Downstream, regional leading and aggressive type	Anhui USTC iFLYTEK Co.,Ltd.
Midstream, regional leading and aggressive type	China Transinfo Technology Co., Ltd.
Midstream, domestic leading and aggressive type	UFIDA Software Co., Ltd.
Midstream, international leading and aggressive type	Shanghai Hyron Software Co., Ltd.
Upstream, domestic leading and aggressive type	Wuhan Fingu Electronic Technology Co., Ltd.
Upstream, international leading and aggressive type	Zhongxing Telecommunication Equipment Co., Ltd.

From the Table 2, we find that there are 12 business model types in IT industry. In addition, the business model types focus on 4 types: midstream, domestic leading and conservative type; midstream, domestic leading and aggressive type; midstream, regional leading and conservative type; upstream, domestic leading and aggressive type. This result shows that most IT industry firms have taken the competitive strategy of different business model.

4.3. Empirical Analysis

After we input the independent variables and the dependent variable in statistical software SPSS 19.0, we get the empirical result of ANOVA in the Table 3.

Table 3. The Result of ANOVA

Dimension	Measure		Sum of Squares	df	Mean Square	F	Sig.
Profit ability	ROA	SSA	0.14	11	0.01	8.10	0.00
		SSW	0.12	76	0.00		
		SST	0.26	87			
	ROE	SSA	0.66	11	0.06	13.28	0.00
		SSW	0.34	76	0.01		
		SST	1.00	87			
	OPR	SSA	0.33	11	0.03	2.66	0.01
		SSW	0.85	76	0.01		
		SST	1.18	87			
	BEPS	SSA	3.93	11	0.36	3.55	0.00
		SSW	7.66	76	0.10		
		SST	11.59	87			
Development ability	OPGR	SSA	370.99	11	33.73	9.64	0.00
		SSW	258.79	74	3.50		
		SST	629.78	85			
	OIGR	SSA	9.35	11	0.85	7.93	0.00
		SSW	8.16	76	0.11		
		SST	17.51	87			
Operating efficiency	ROTA	SSA	8.92	11	0.81	4.50	0.00
		SSW	13.70	76	0.18		
		SST	22.62	87			
	WCT	SSA	286107.05	11	26009.73	1849.07	0.00
		SSW	1069.04	76	14.07		
		SST	287176.10	87			
	ITO	SSA	35531.59	11	3230.14	1.43	0.18
		SSW	167430.97	74	2262.58		
		SST	202962.55	85			
Market value	Tobin'Q	SSA	53.72	11	4.88	1.60	0.12
		SSW	232.51	76	3.06		
		SST	286.23	87			

The profit ability, development capacity, operating efficiency and market value are shown in Table 3.

The Table 3 shows that the business model has significant impact on the profit ability. The significances of ROA, ROE, OPA, and BEPS are 0.00, 0.00, 0.01 and 0.00 respectively. The significances are all less than 0.05, so there are significant differences.

The Table 3 also shows that the business model has significant impact on development ability. The significances of OPGR, OIGR are 0.00 and 0.00. The significances are all less than 0.05, so there are significant differences.

The Table 3 shows that the business model has a certain influence on the operation efficiency, but significance of operation efficiency is weaker than the profit ability and development ability. The significance of the ITO of is 0.18, which is far greater than 0.05. This shows that the business model does not have a significant effect on ITO. But the significances of RTA and WCT are 0.00 and 0.00, so business model has weak influence on the operation efficiency.

But the Table 3 shows that business model has weakest effect on market value. The significance of the Tobin's Q is 0.12, which is far greater than 0.05, so there is no statistically significance.

5. Comprehensive Evaluation

We comprehensively evaluate the 12 business model types by the principal component analysis (PCA) method. We use the 10 measures as the comprehensive evaluation index. Because these 10 measures have different units, before the PCA, we fist normalize the measures. Specific methods are as follows:

$$\overline{x}_{ij} = \frac{x_{ij} - x_j^{\min}}{x_j^{\max} - x_j^{\min}} \tag{9}$$

where x_{ij} is the firm j's financial performance measure in the business model i, x_j^{max} and x_j^{mix} are the maximum and the minimum of the measure j in the 12 business model types respectively.

Next, we select several principal components from the 10 measures in statistical software SPSS 19.0. Then according to eigenvalues, we give these principal components weights, and sum these weighted principal components. Finally we calculate the comprehensive evaluation of all business model types [16]. The results are shown in Table 4.

Table 4. The Result of Comprehensive Evaluation

Business Model Types	Evaluation	Rank
Downstream, regional leading and conservative type	0.3999	12
Midstream, regional leading and conservative type	0.5721	10
Midstream, domestic leading and conservative type	0.5333	11
Midstream, international leading and conservative type	0.5967	7
Upstream, regional leading and conservative type	0.6336	6
Upstream, domestic leading and conservative type	0.7302	4
Downstream, regional leading and aggressive type	0.5927	8
Midstream, regional leading and aggressive type	0.5758	9
Midstream, domestic leading and aggressive type	0.6511	5
Midstream, international leading and aggressive type	0.7715	2
Upstream, domestic leading and aggressive type	0.7847	1
Upstream, international leading and aggressive type	0.7668	3

From Table 4, we can see that different business model types have different comprehensive evaluations, and the gap between evaluations is huge. The reason may be related the elements of business model.

According to the dimension of industrial chain, the comprehensive evaluations of the upstream firms are higher than midstream and downstream. The technical barriers of the

upstream of IT industry are very high; outsiders cannot enter easily, so there is higher marginal profit. While the technical barriers of the midstream and downstream of IT industry are relatively low; outsiders is easy to invade and imitate, so the competition is fierce and profit margin is relatively low.

According to the dimension of market scope, the comprehensive evaluations of international and domes-tic leading types are higher than the regional leading type. The firms of the international and domestic leading types have better quality and more customers groups. These types of firms have higher requirements for the managing and marketing ability. The firms of the regional leading type have less customers groups and this type of firms often lack the managing and marketing ability.

According to the dimension of R&D intensity, the comprehensive evaluations of aggressive type are higher than conservative type. The R&D investment of aggressive type is always larger. The ability of technological innovation of aggressive type is stronger, so this type of firm is more competitive.

Although the elements (dimensions) of business model have a certain effect on the financial performance, a separate element is not enough to have a material impact on the financial performance. The combination of elements and their interactions can lead to the performance differences between firms. This reflects the business model has systematic characteristic.

From the Table 4, the comprehensive evaluations of some business model types are small (such as midstream, international leading and aggressive type, up-stream, domestic leading and aggressive type), but the comprehensive evaluations of some business model types are large (such as downstream, regional leading and conservative type, upstream, international leading and aggressive type). We believe that, indeed some business models perform better than others.

6. Conclusion

In this paper, we put forward a quantifiable and multi-dimensional typology for business models based on IT industry. We study the effect of business model on financial performance by variance analysis method. The results have shown that business model is important influence factor of financial performance. Business model mainly influences the firm's profit and development ability, but has weak influence on the operation efficiency and no significant effect on market value. The effect of business model has relation with its components. From comprehensive evaluation, we find that some business models have better financial performance than others. From the analysis of the elements of business model, namely the industrial chain, market scope and R&D intensity; we may find the listing firms with investing value.

We explain the source of financial performance from the perspective of business model, which can be a guide for business model innovation and investment in the securities market.

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