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Research Article

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The impacts of intellectual capital of China's public pharmaceutical company on company's performance

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ABSTRACT

This article introduces the study of public pharmaceutical companies between 2010 to 2012 to conclude the relationship between intellectual capital and firm performance, through Value Added to Invested Capital (VAIC) method of evaluating intellectual capital and factor analysis of firm's overall performance score. The study finds out that both financial capital and human capital are positively correlated with firm performance while structure capital has no impacts on China's medicine manufacturing. Human capital of Western medicine manufacturing has a more positive correlation with firm performance than that of Chinese medicine manufacturing, but structure capital has no correlation with performance.

Key words: Pharmaceutical Industry, Intellectual Capital, firm's performance, VAIC

INTRODUCTION

With the rapid growth of global economy, traditional production factors such as land, capital, raw materials and labor no longer take leading place. Intellectual capital has already replaced traditional production factors to become strategically important resource. Knowledge-intensive corporations especially more depend on intellectual capital to create firm value.

Pharmaceutical industry is a typical knowledge-intensive industry since it includes introduction, innovation, and storage of knowledge. New drug development needs huge amount of research costs and long period of developing time. Once new drug succeeds to develop, it can bring a big fortune for the company. The feature of knowledge-intensive also relies on sales because sales representative are all highly educated experts. Therefore, this paper chooses pharmaceutical industry as research object and then demonstrate the relationship between intellectual capital and firm's performance to help pharmaceutical enterprises better manage their intellectual capital and realize maximum profits.

It is hard to concretely and perfectly describe intellectual capital and the research scope is wide.The identification study of intellectual capital shows that scholars have different methods of classifying the components of intellectual capital. Some common classification methods are as following:

American Scholar Stewart[1] believes that intellectual capital should include human capital, structure capital, and customer capital (aka H-S-C structure of intellectual capital). This structure points out the value of intellectual capital relies on three components- human capital, structure capital, and customer capital. Edvinsson and Malone[1] proposes that intellectual capital is the sum of human capital and structure capital. British scholar Annle Brooking simply defines intellectual capital as a term representing all intangible assets needed for company's operation. Enterprise equals to the sum of tangible assets and intellectual capital[2]. Value Added to Invested Capital method, proposed by Ante Public[2], states that 1) both human resource and knowledge can influence corporation's performance and 2) either salary payable or salary expense have significant effects on value enhancement.

Based on the researches of foreign scholars, our domestic scholars apply intellectual capital to other areas of management science. Wan Xi[4]finds that physical capital, human capital, and structure capital are all correlated with corporation's performance. Li Haihong and Wang Bo[5]claims that intellectual capital of each industry have quite different influences on firm's performance. In conclusion, through the study of intellectual capital in addition with needs of managerial accounting, many scholars provide a rich set of decision making tools for future decision making of enterprise.

EXPERIMENTAL SECTION

1、The research hypothesis

Any business operation is based on manpower, material resources and financial resources. Financial capital plays an extremely important role in enterprise development. Without it, no strategic planning and implementation willbe accomplished. Therefore, this article assumes that:

H1: Financial capital positively affects firm performance.

Human capital refers to knowledge, skills and experience of employees and managers, as well as the value they bring to the enterprise. Staff's knowledge and experience are valuable enterprise's strategic resources that cannot be replaced and imitated. Especially in the pharmaceutical industry, the research and development of new medicines are the competitive advantage for enterprises and the key of enterprise performance. In addition with the support of advanced equipment, human capital is also an essential element in this research. Therefore, this article assumes that:

H2: Human capital positively affects firm performance. Corporate organizational structure, governance model, incentive and control mechanism, information support system and safety production management are all very important to corporation development. These factors are collectively called structure capital. Structure capital can make the enterprise not only operate more effectively and more safely, but also guarantee financial capital and human capital more efficiently invested. Therefore, this article assumes that:

H3: Structure capital positively affects firm's performance.

2、Calculation process of intellectual capital index

The definition of intellectual capital will also adopt VAIC method in this study. The standard formula is VAIC = CEE + HCE + SCE.A detailed description is discussed as follows:

(1) Enterprise value-added (VA)

Defined formula: VA = OUT - IN

VA stands for enterprise value-added; OUT stands for enterprise's output, including all the revenues of products and services in the market; IN means enterprises' input, including all expenses deducting salary payments.

Computational formula: VA = PTP + PC + I

PTP represents pre-tax profits; PC is payment costs, extracted from the cash flow statement; I represents the interest expense, expressed by "financial expense" in income statement.

(2)Financial Capital Appreciation Coefficient(CEE)CEE = VA/CE

CE is the sum of all financial capital; in other words, the sum of tangible assets. CE equals to the total capital minus intangible capital.

(3)Human Capital Appreciation Coefficient (HCE)

Human capital (HC) is salary expense, drawn from the cash flow statement. Pulic believes that human capital should be able to reflect its contribution to value-added. Thus, human capital efficiency can be expressed by the relationship between human capital and added value: HCE = VA/HC.(4)Structure Capital Appreciation Coefficient(SCE) Pulic model calculating formula: SC=VA-HC. Pulic believes that human capital and structure capital have reciprocal relationship when VA is fixed, so he uses another method to measure the efficiency of the capital structure, avoiding the inverse relationship between HCE and SCE. The calculation formula is SCE = VA/SC

3.The calculation method of enterprise performance

Enterprise performance is a comprehensive evaluation index, including debt paying ability index, profitability index

and operation ability. This study uses factor analysis to reduce dimensions of enterprise performance indicators. It is able to represent the basic situation of enterprise performance objectively and scientifically, as well as avoid multicollinearity effects between variables. Specific index selection is as follows:

Solvency indicators: asset-liability ratio, current ratio, quick ratio, the rights and equity multiplier.

Profitability indicators: earnings per share, return on assets, return on equity.

Operating indicators: accounts receivable turnover, inventory turnover, fixed assets turnover.

4、Intellectual capital and corporate performance correlation analysis

Model: $PERF=\beta_0+\beta_1CEE+\beta_2HCE+\beta_3SCE+\beta_4SCALE$

Table 1 Regression analysis variable

Type	Abrev.	Variable	Formula mode
Dependent variable	PERF	Firm's performance	Get from factor analysis
Independent variable	CEE	Financial capital	VA/CE
	HCE	Human capital	VA/HC
	SCE	Structure capital	VA/(VA-HC)
Control variable	SCALE	Scale	LN(total assets)

RESULTS AND DISCUSSION

1、Factor analysis results

(1) KMO and Bartlett's test

KMO is used to test the partial correlation between variables. If KMO<0.5, the statistics is not suitable for factor analysis. In this study, KOM is 0.549, greater than 0.5, so we select 10 impact factors of enterprise performance to conduct factor analysis. The significance of Bartlett test is less than 0.01, so there is significant correlations between variables.

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.549
Bartlett's Test of Sphericity	Approx. Chi-Square	3031.661
	df	45.000
	Sig.	0.000

(2) Extract the main factor

The larger absolute value of the load, the better it can represent the variable. According to this view, the first common factor can better represent three variables-Return on Equity, Return on Assets and Earning Per Share, interpreted as profit ability factor. The second common factor can better stand for three variables- Current Ratio, Quick Ratio and Fixed Assets Turnover, explained as the short-term debt paying ability factor. The third common factor can better represent Equity Multiplier and the Asset-liability Ratio, interpreted as the long-term solvency factor. The fourth common factor mostly represents Inventory Turnover and Accounts Receivable Turnover, interpreted as operating ability factor.

Table 3 Rotated Component Matrix(a)

	Component			
	1	2	3	4
Return on Equity	**0.947**	-0.052	0.079	0.032
Return on Assets	**0.937**	-0.034	-0.137	0.04
Earning Per Share	**0.714**	0.202	-0.257	-0.116
Current Ratio	-0.057	**0.939**	-0.253	-0.021
Quick Ratio	-0.067	**0.933**	-0.257	-0.011
Fixed Assets Turnover	0.39	**0.674**	0.182	0.19
Equity Multiplier	-0.141	-0.096	**0.949**	-0.056
Asset-liability Ratio	-0.073	-0.218	**0.949**	-0.057
Inventory Turnover	-0.168	0.006	0.025	**0.742**
Accounts Receivable Turnover	0.142	0.049	-0.102	**0.658**

（3）The factor score and firm preference score

Factor score matrix as shown in Chart 4, four main factor score expression is:

$FACT_1=0.035X_1+0.004X_2-0.061X_3-0.066X_4+0.272X_5+0.375X_6+0.393X_7+0.045X_8+0.153X_9-0.074X_{10}$

$FACT_2=0.051X_1+0.112X_2+0.419X_3+0.415X_4+0.045X_5-0.063X_6-0.037X_7-0.025X_8+0.34X_9-0.022X_{10}$

$FACT_{3=}0.482X_1+0.497X_2+0.008X_3+0.005X_4-0.068X_5-0.022X_6+0.095X_7-0.024X_8+0.237X_9+0.022X_{10}$

$FACT_4=-0.023X_1-0.026X_2-0.068X3-0.058X_4-0.133X_5+0.029X_6+0.027X_7+0.63X_8+0.154X_9+0.719X_{10}$

Table 4 Component Score Coefficient Matrix

	Component			
	1	2	3	4
Asset-liability Ratio	0.035	0.051	0.482	-0.023
Equity Multiplier	0.004	0.112	0.497	-0.026
Current Ratio	-0.061	0.419	0.008	-0.068
Quick Ratio	-0.066	0.415	0.005	-0.058
Earning Per Share	0.272	0.045	-0.068	-0.133
Return on Assets	0.375	-0.063	-0.022	0.029
Return on Equity	0.393	-0.037	0.095	0.027
Accounts Receivable Turnover	0.045	-0.025	-0.024	0.63
Fixed Assets Turnover	0.153	0.34	0.237	0.154
Inventory Turnover	-0.074	-0.022	0.022	0.719

In order to scientifically classify and further evaluate the performance of China's public pharmaceutical companies, this study adopts regression method to calculate the factor score of four main factors and weights the main factors by their contributions to the total amount of information, the formula is:

$PERF=0.2571FACT_1+0.2311FACT_2+0.2068FACT_3+0.1043FACT_4$

3、The multiple linear regression results

(1) Descriptive statistics

The descriptive statistics of the whole samples reflects that China's pharmaceutical industry has the highest human capital investment, with a mean of 2.9637; however, according to the big discrepancy between standard deviation, we find out that human capital investment varies a lot among different enterprises. Financial capital is least invested, with a mean of 0.165, and the smaller variance indicates that financial capital of China's pharmaceutical industry investment tends to be at average level. Meanwhile, the performance level of China's pharmaceutical industry is not high, with an average of only 0.0002. It does not achieve profits as high as other high-tech industries' do.

Table5 Descriptive statistics including all samples

	N	Minimum	Maximum	Mean	Std. Deviation
CEE	258	0.0083	0.4514	0.1650	0.0757
HCE	258	0.3342	29.2636	2.9637	2.2508
SCE	258	-1.9433	8.2232	1.9026	0.8687
VAIC	258	-1.2634	30.4767	5.0313	2.1874
PERF	258	-0.7900	2.3600	0.0002	0.4126

Table 6 Descriptive statistics divided by Chinese medicine and Western medicine

Western Medicine	N	Minimum	Maximum	Mean	Std. Deviation
CEE	144	0.0083	0.4265	0.1565	0.0753
HCE	144	0.3342	29.2636	3.0350	2.6793
SCE	144	-1.9433	8.2232	1.9391	1.0590
VAIC	144	-1.2634	30.4767	5.1306	2.5538
PERF	144	-0.7900	2.3600	0.0024	0.4352
Chinese Medicine	N	Minimum	Maximum	Mean	Std. Deviation
CEE	114	0.0521	0.4514	0.1758	0.0752
HCE	114	1.0042	10.2046	2.8734	1.5566
SCE	114	1.0899	3.6398	1.8567	0.5415
VAIC	114	2.2828	12.5750	4.9059	1.6126
PERF	114	-0.7600	2.0600	-0.0025	0.3840

Comparing Chinese and Western pharmaceutical manufacturing's, this article reveals that financial capital of Chinese medicine manufacturing is higher than that of Western medicine manufacturing, but human capital and structure capital are lower than that of Western medicine manufacturing. The result indicating that Chinese medicine

manufacturing is more willing to put into the traditional factor such as financial capital than Western medicine manufacturing is, while Chinese medicine manufacturing does not emphasize on the modern factors of intellectual capital (HCE, SCE) comparing to Western medicine manufacturing. In terms of business performance, the score Western medicine manufacturing industry is 0.0024 and the performance level is positive. However, the score of Chinese medicine manufacturing is only -0.0025, significantly lower than Western medicine manufacturing score. （Table6）

（2）The correlation analysis

As shown in chart 7, through the total sample analysis, business performance is related with financial capital and human capital at the 1% significant level, but structure capital is not related to firm performance. Meanwhile, we find that there is significant correlation between human capital and financial capital, while there is no correlation between financial capital and structure capital.

Table 7 Correlations

		PERF	CEE	SCALE	HCE	SCE
Pearson Correlation	PERF	1				
	CEE	.479***	1			
	SCALE	.358***	0.15***	1		
	HCE	.350***	0.095**	0.277***	1	
	SCE	-.125**	-0.042	-0.158***	-0.387***	1

*Annotation：***,**stand for the significance at 1% and 5% level*

（3）Multiple linear regression analysis

First, in order to avoid multicollinearity between variables which leads to the unreasonable variable parameter estimation, this study adopts SPSS20.0 to examine variance inflation factor (VIF) of explaining variables and control variables. As shown in chart 8, all the VIFs are less than 2, demonstrating the effectiveness of the regression model which has no multicollinearity.

The results of the multiple linear regression analysis of Western medicine manufacturing are: The T value between financial capital appreciation coefficient (CEE) and enterprise performance is 4.113, significant at 1% confidence level. Hypothesis 1 is proved to be true. The T value between human capital value coefficient (HCE) and corporation performance is 6.759, also significantly correlated at the 1% confidence level. Hypothesis 2 is proven. Structure capital appreciation Coefficient didn't pass the test of significance, so it has no correlation with corporation performance. Hypothesis 3 is rejected. Moreover, the control variable “Scale” has a significant positive correlation with enterprise performance. It shows that scale benefits are created with large firm scale.

The results of the the multiple linear regression analysis of Chinese medicine manufacturing are: The T value between financial capital appreciation coefficient (CEE) and enterprise performance is 8.107, significant at 1% confidence level. Hypothesis 1 is established. The T values of human capital value coefficient (HCE) is 2.308, significant at 5% confidence level. Hypothesis 2 is also proved. Besides, control variable “Scale” is related with performance, in accordance with Western medicine pharmaceutical industry.

Table 8 Result of Multiple Linear Regression

Western Medicine	Unstandardized Coefficients		t	Sig.	VIF
	B	Std. Error			
(Constant)	-2.619	.692	-3.785	.000	
CEE	1.589	.386	4.113	.000***	1.044
HCE	.077	.011	6.759	.000***	1.153
SCE	.036	.029	1.254	.212	1.139
SIZE	.096	.032	2.995	.003***	1.080
Chinese Medicine	Unstandardized Coefficients		t	Sig.	VIF
	B	Std. Error			
(Constant)	-3.706	.673	-5.505	.000	
CEE	2.958	.332	8.915	.000***	1.034
HCE	-.030	.013	-2.361	.020**	1.930
SCE	-.176	.061	-2.875	.005***	1.604
SCALE	.168	.033	5.136	.000***	1.299

*Annotation：***,**stand for the significance at 1% and 5% level*

CONCLUSION

As shown in Chart 7, there are strong positive correlations between the Intellectual capital elements. Human capital is positive correlated with financial capital, as well as with structure capital. It means investments of human capital promote investments of financial and structure capital. The introduction of technical personnel will inevitably motivate new medicine research and the development of sales progress. All of these need financial capital support. The recruitment of management talents are going to change management pattern and to upgrade information system and production safety system. These improvements are also based on the growth of structure capital. However, financial capital and structure capital have no significant correlation, which shows more money input may not lead to more structure capital increase.

In this research, the descriptive statistics of whole samples reveals that the pharmaceutical industry pays most attention on human capital comparing with financial capital and structure capital. In addition, China's pharmaceutical industry is divided into Western medicine manufacturing and Chinese medicine manufacturing for the further study in order to discuss the relationship between intellectual capital and firm performance in two perspectives. Findings are as follows. First, the performance level of Chinese medicine manufacturing is negative, significantly lower than Western medicine manufacturing. The result suggests that with Western medicine entering into Chinese market, the population of consumers of Chinese medicine becomes smaller. Therefore, the market prospects for Chinese medicine is worse than that of Western medicine and then its bleak future leads to its poor performance. Secondly, financial capital and human capital of Western medicine manufacturing both have significant positive correlations with firm performance, but structure capital and corporate performance have no correlation. Thus, financial capital and human capital have played an important role in Western medicine manufacturing, while structure capital has not been paid enough attention. Financial capital of Chinese medicine manufacturing and firm performance are proved to be positive correlated. This result is consistent with that of the Western medicine manufacturing, revealing that pharmaceutical industry has focused more on financial capital as the basic element of enterprise development. Although human capital of Chinese medicine manufacturing also has relevance with corporate performance, but the significance level is lower than that of Western medicine manufacturing. It is because Chinese medicine manufacturing products mainly rely on traditional pharmaceutical formulations passed down through generations. On the contrary, in Western medicine manufacturing, the high-tech talents constantly develop new medicines to improve competitiveness, so the positive correlation between human capital of Chinese medicine manufacturing and enterprise performance is not as high as that of Western medicine manufacturing. In addition, capital structure also has not correlated with corporation performance in Chinese medicine manufacturing, suggesting that China's pharmaceutical industry has not yet approached the most suitable and the most efficient business operating mode.

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