The Impact of Intellectual Capital on Corporate Value of General Aviation Listed Companies Based on VAIC Model

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Abstract
With the strong support of the government, the general aviation industry has realized the rapid expansion of enterprise scale, but the overall operation is not good. In the era of knowledge economy, intellectual capital has become the core competitive element in intelligent high-tech enterprises. As a general aviation enterprise in technology-intensive industry, it can explore new ways to create corporate value. Accordingly, the article empirically investigates the relationship between intellectual capital and the profitability, operational capacity and solvency of listed companies in general aviation listed companies, based on the VAIC model and selected panel data from 2016 to 2020. The results found that capital employed is positively related to all three capabilities; human capital is positively related to the first two capabilities and negatively related to solvency; and there was no relation between structural capital and all three capabilities. Finally, it is concluded that the development of Chinese general aviation listed companies mainly depends on capital employed, the emphasis on human capital is insufficient and gives some corresponding suggestions at last.

Keywords *intellectual capital, corporate value, general aviation listed companies, VAIC model*

1. Introduction

With the liberalization of low-altitude field in China, the general aviation field will become a new growth point of national economic development. Since the State Council issued the Guiding Opinions on Promoting the Development of the General Aviation Industry in 2016 (abbreviated as Opinions), the state has issued a series of policy documents to accelerate the development of the general aviation industry, and general aviation has been raised to a special position at the strategic level. The rapid and vigorous development of the general aviation industry has driven the development of related enterprises. At present, there are several phenomena in general aviation enterprises: the number of enterprises is large, but the overall strength is weak; the revenue has improved but profits have not; the potential market is large but the growth is still slow. The profitability of the listed company is not good, and there are problems of low pre-tax profit margins and volatile fluctuation. In addition, more than 49% of the pre-tax profits come from subsidies of the Civil Aviation Administration. Therefore, general aviation enterprises need to focus on their own operation, explore value-added ways, improve the competitiveness of enterprises, and build a modern intelligent general aviation ecosystem.

More and more high-tech enterprises emerge in the era of knowledge economy. Different from the traditional enterprises, capital employed is not the core element of competition in the choice of value creation between enterprises, getting value from intellectual capital has become one of the important dependence methods of high-tech enterprises, intellectual capital has become an intangible strategic resources of enterprise competition. As the core of intellectual capital, human capital is playing an increasingly critical role in the enterprise competition. The "19th National Congress Report" proposes to cultivate economic growth points in the field of human capital services and form new economic growth momentum. Therefore, studying the correlation of

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intellectual capital and corporate value and carrying out appropriate development and management of enterprise intellectual capital can promote the creation of corporate value, stimulate economic growth, and accelerate the economic recovery in the field of aviation after the COVID-19.

General aviation industry is a technology-intensive industry, is an important symbol of national science and technology development level, more sensitive to intellectual capital. And the Opinions clearly pointed out that our general aviation industry should pay more attention to high-quality development in the new era, which means that the traditional expansion of Chinese general aviation industry has been fully released in quantity and scale, and in the future, the development of the traditional model of "heavy quantity" will gradually increase in difficulty. The development of general aviation industry needs to focus more on industrial structure, product quality, service personalized improvement and breakthrough. At the same time, the development field of the general aviation industry will also gradually be raised to the all-round flight service industry development mode, which undoubtedly This undoubtedly puts forward higher requirements for the general aviation enterprises. At present, general aviation enterprises do not pay enough attention to intellectual capital, and there are the problems of insufficient number of employees, low quality of personnel and unreasonable personnel structure, which cannot fully support the rapid development of general aviation. However, as an intelligent high-tech industry, the general aviation enterprises have high requirements for the quality and education of the staff, and involve the cooperation with the government, the CAAC, the sports department, the army, etc. It is of great practical significance to study the relationship between intellectual capital and the corporate value of general aviation enterprises, which can enhance the competitive advantage of enterprises, transform the core competitiveness from "quantity" to "quality" gradually, and continue to promote the intelligent high-quality development of general aviation.

2. Theoretical Basis and Literature Review

The division of intellectual capital has multiple theories such as pluralism, ternary theory and binary theory, and currently more recognized is ternary theory and binary theory. Ternary main representative is Thomas Stewart. He holds that intellectual capital is composed of human capital, structural capital, and customer capital, namely "H-S-C" [1]. Binary theory includes customer capital into structural capital, so that intellectual capital is divided into human capital and structural capital. Binary theory believes that customer capital is the external structure of the enterprise and the interaction product of human capital and structural capital, which can essentially be classified into the structural capital [2]. Either way, scholars at home and abroad believe that the core of intellectual capital is human capital [3]. In any enterprise, human capital can generate income for the enterprise based on maintaining its day-to-day operations. Enterprise structure capital is based on the human capital of enterprises, which provides a kind of capital with good working conditions for human capital. Structural capital can be divided into two parts: inside and outside and figure 1 lists the classification of intellectual capital binary theory in detail.

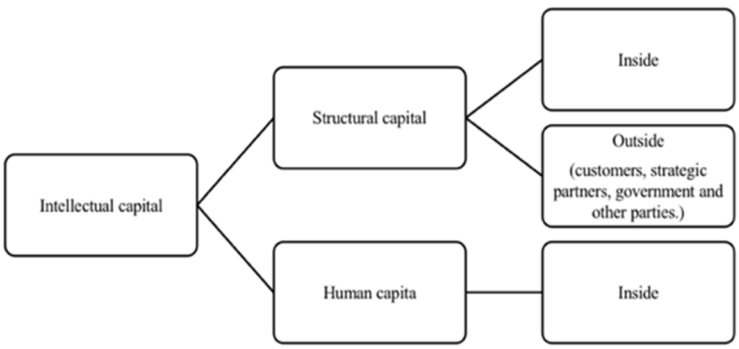

Figure 1. Intellectual capital "binary say"

In resource basic theory, capital employed, as an enterprise basic resource, is a necessary condition for enterprise survival and development, and has a great impact on enterprise performance [4]. Enterprise capital is composed of intellectual capital and capital employed, which together affect the performance of enterprises. However, capital employed is difficult to become the core competitiveness of enterprises because of its uniqueness.

The Intellectual Value-Added Coefficient Model (VAIC) proposed by Ante Pulic (2000) mainly studies the value-added potential of intellectual and financial capital [5]. The characteristic of this method is to measure intellectual capital indirectly by measuring the value-added rate of intellectual capital. The VAIC model can objectively evaluate the corporate value appreciation efficiency. Steven Firer believes that the VAIC model is the best way to measure the value efficiency of corporate

value appreciation [6]. Although capital employed is different from the concept of intellectual capital, it is necessary to use capital employed as a reference for the study of the effect of human capital on enterprise performance in the application of VAIC model. To play a role, human capital must rely on the combination of capital employed and intellectual capital in order to produce greater effectiveness [7].

3. Research and Design

3.1. Study of sample selection and data collection

The sample selected in this paper is a total of 14 listed companies, including 2 listed companies in the board market, 2 in the medium-sized market and 10 in the new third board market.

The data are all from Cninf Net and the SME Share Transfer System.

3.2. Variable designs

The variables taken in this article are shown in Table 1. The evaluation index of corporate value is based on DuPont Analysis Method and The Operational Rules of Enterprise Performance Evaluation (Revised).

TABLE 1. The selection of variables

Variable category	Economic implications	Variable name	Variable symbol	Variable description
dependent variable	Profitability	Return on Equity	ROE	Net Profit / Net Assets
	Operational	Total Assets Turnover	TAT	Net Main Business Income / Total Assets
	Solvency	Debt to Assets Ratio	DTAR	Total Liabilities / Total Assets
independent variable	Structural capital	Human Capital Efficiency	HCE	Corporate Value Added / Human Capital =VA/HC
	Structural capital	Structural Capital Efficiency	SCE	Corporate Value Added / Structural Capital =VA/SC
	Capital Employed	Capital Employed Efficiency	CEE	Corporate Value Added / Capital Employed =VA/CE
Control variable	Scale	Natural Logarithm of Total Assets	SIZE	Natural Logarithm of The Total Assets at the end of the year
	Growth	Net profit growth rate	GROWTH	Net Profit Growth of this year / Total Net Profit of last year

3.3. Model building

Based on the VAIC model, the relationship between the value of VAIC is studied by panel regression analysis. The panel regression model usually involves three models, namely mixed POOL model, fixed effect FE model and random effect RE model. Generally, the panel data is applicable to three model. The test steps are as follows.

First, F test is used for selection comparison between FE model and POOL model. P-value less than 0.05 means that the FE model is better. Second, BP test is used for the selection and comparison between RE model and POOL model. P-value less than 0.05 means that the RE model is better. Third, Hausman test is used for FE model and RE model selection comparison. P-value less than 0.05 means that the FE model is better, and vice versa, the RE model is used.

For theoretical research, three regression models are constructed:

Model 1:

$$ROE=\beta_1+\alpha_{11}HCE+\alpha_{12}SCE+\alpha_{13}CEE+\alpha_{14}SIZE+\alpha_{15}GROWTH+\varepsilon_1 \quad (1)$$

Model 2:

$$TAT=\beta_2+\alpha_{21}HCE+\alpha_{22}SCE+\alpha_{23}CEE+\alpha_{24}SIZE+\alpha_{25}GROWTH+\varepsilon_2 \quad (2)$$

Model 3:

$$DTAR=\beta_3+\alpha_{31}HCE+\alpha_{32}SCE+\alpha_{33}CEE+\alpha_{34}SIZE+\alpha_{35}GROWTH+\varepsilon_3 \quad (3)$$

Among them: β_1, β_2, β_3 are intercept; α_{11}, α_{12}, …, α_{35} are regression coefficient of the variables in each model; ε_1, ε_2, ε_3 are random variables. Mode 1, 2 and 3 analyze the impact of human capital, structural capital and capital employed from the three perspectives of profitability, operational capacity and solvency, using ROE, TAT and DTAR as the dependent variables respectively.

4. Empirical Analysis

Firstly, the relationship between intellectual capital and the corporate value is preliminarily judged by descriptive statistics. Then, F test, BP test and Hausman test are carried to determine the types of their respective panel regression models. Finally, the regression analysis is conducted based on the respective test results. EViews is used for descriptive statistical analysis, and SPSS is used for F test, BP test, Hausmann test and panel regression analysis.

4.1. Sample descriptive statisticss

The descriptive statistic of the sample shows that the data of each variable fluctuates greatly. Compared with the mean, the use of median can more easily describe the overall level, so this study uses median and standard deviation for descriptive statistical analysis. Overall, during the period 2016-2020, the largest median was HCE, followed by SCE, and finally CEE. This shows that structural capital plays the most important role in increasing the value of general aviation listed companies, followed by human capital, while capital employed has been at the low end.

The annual change of the median of the independent variable is made into a broken line chart, and the results are shown in Figure 2. In terms of individual terms, although structural capital plays the biggest role, its own contribution to the value of enterprises is decreasing year by year, while human capital is exactly the opposite. At the same time, it can be roughly predicted through Figure 2 that the contribution of human capital to the value of general aviation listed companies will exceed the structural capital in a few years.

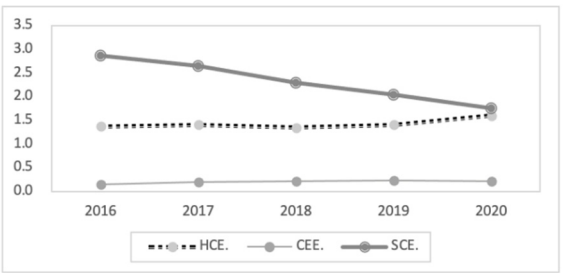

Figure 2. Description of the median intellectual capital of general aviation listed companies

4.2. Correlation analysis

According to Table 2, after three tests, the model 1, 2, 3 are used for panel regression analysis of RE model, FE model and FE model respectively.

TABLE 2. Model test results

Model	Test type	Test value	Test conclusion
Model 1: ROE	BP test	χ^2 (1) =5.072, p=0.024.	The RE model
Model 2: TAT	H test	χ^2 (5) =104.620, p=0.000.	The FE model
Model 3: DTAR	F test	χ^2 (5) =19.436, p=0.002.	The FE model

TABLE 3. Result of intellectual capital and corporate value panel model return[A]

Variables	Model 1	Model 2	Model 3
C.	-0.171*	-0.126	-5.003**
	(-2.144)	(-0.113)	(-5.279)
HCE.	0.014**	0.012	-0.031**
	2.963	(0.935)	(-2.915)
CEE.	0.324**	0.091	0.007**
	(9.499)	(0.909)	(0.669)
SCE.	0.001	0.001	-0.001
	(1.227)	(0.485)	(-0.429)
Adj.R^2	0.929	0.046	0.928

a. note: Upper grade *, * * indicates * p <0.05, * * p <0.01,5%, 1% is significant, with t-value in parentheses.

The significant results are intuitively shown in Table 4, where "+" indicates significant positive correlation, "-" indicates significant negative correlation, and "0" indicates no significant correlation.

TABLE 4. Significant impact results

	ROE.	TAT.	DTAR.
HCE.	+	+	-
SCE.	0	0	0
CEE.	+	+	+

5. Conclusions and Suggestions

The results confirm the positive impact of intellectual capital on the overall value of general aviation listed companies. The following conclusions are derived from the VAIC model and panel regression analysis.

(1) The influence of capital employed on corporate value plays a significant promoting role in profitability, operational capability and solvency. For general aviation enterprises, capital employed is the basis and guarantee of corporate value creation, and its investments are shorter to liquidated. General aviation enterprises are mostly young enterprises, which means that there is

fierce competition between enterprises. Enterprises have high requirements for short-term profitability, but the overall profitability is not good. Blindly increasing investment and employment is not a good way to improve enterprise value.

(2) Although there are two sides of the impact of human capital on corporate value, the positive impact occupies a larger proportion. Its negative role is mainly reflected on solvency. Human capital investment is a long-term process with a certain lag. General aviation enterprises belong to the growth enterprise, which investment affected long-term solvency may not present. So, the impact of human capital on solvency can be diluted, but enterprises should see the long-term development of human capital.

(3) In general, the positive impact of capital employed on corporate value is better than human capital, which is consistent with the insufficient attention paid to the investment, development and utilization of human capital. According to the core role of human capital in intellectual capital, it is very necessary to improve the efficiency of human capital itself, play its maximum utility, and strengthen the role of human capital in promoting the value of enterprises.

According to the analysis results and the reality, the following suggestions are made:

(1) The coordinated development of intellectual capital and capital employed. It can be seen from the conclusion that the role of capital employed on general aviation enterprises has been fully released, but the operational situation is still not ideal. Therefore, in the process of investment and development of general aviation enterprise capital, the accumulation and investment of intellectual capital should be placed in the key position. On the other hand, enterprises must grasp the market environment, combined with the relevant policies issued by the government, constantly adjust the proportion of intellectual capital and capital employed investment, and create more corporate value.

(2) Exert sufficiency effect of human capital and pay attention to talent development. The development of human capital requires the reserve of human resources. Therefore, long-term plans and arrangements must be made in accordance with the company's own circumstances, and it is necessary to make a scientific and reasonable allocation of the human capital of the general aviation enterprises.

Since intellectual capital is mainly composed of intangible assets and is not usually reflected in the financial statements, all the accounting of human capital is replaced by "cash paid by the enterprise for the employees". At the same time, there are many methods to estimate intellectual capital however this paper only adopts the VAIC model, so other methods are needed to be explored. Finally, this paper has studied that the human capital positively affects the value of the general aviation enterprises in the intellectual capital, and the next step is to research how to improve the efficiency of human capital

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