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The Impact of Intellectual Capital on the Performance of U.S. Property-Casualty Insurance Companies

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Abstract

The purpose of this study is to examine the relationship between intellectual capital and organizational performance. Intellectual capital is measured using Pulic's VAIC™ model consisting of combined measures from human capital, structural capital, and capital employed, and firm performance is measured as return on assets. Data are drawn from 11 publicly traded U.S. property-casualty insurance companies trading on the NYSE. The findings of the analyses do not support a significant relationship between intellectual capital and performance. However, there was evidence to support a strong highly significant association between structural capital as one of the three individual components of VAIC™ and organizational performance. The regression results confirmed each of the models was a strong predictor of explaining the change in the performance of the organizations. This research will aid the property-casualty industry in using metrics to evaluate the optimal use of human capital in conjunction with economic resources to innovate and create greater value for the organization and its stakeholders.

Introduction

Financial and physical assets are economic factors traditionally used by organizations to demonstrate their success, but the emerging economy places value on the role of information and knowledge as a sustainable resource to acquire and maintain competitive advantages [1,2]. For many years, organizational leaders considered the level of economic capital as a key indicator to demonstrate organizational performance to shareholders. Measures of financial capital and physical capital have been the primary indicators of performance, but a significant trend of surplus in market value above book value would cause intellectual capital to emerge as another indicator [3].

The Organization for Economic Co-operation and Development (OECD) defines intellectual capital as the economic value of structural capital and human capital, distinguishing it as a subset of intangible assets [4]. Thomas Stewart interprets intellectual capital as knowledge used to transform information into a more valuable asset in order to yield an economic return using the talents of staff, the value of proprietary knowledge and processes, and the value of relationships with customers and suppliers [4]. According to an article by Brennan and Connell, intellectual capital is defined as assets relating to employee knowledge and expertise, customer confidence in the company, and the efficiency of company business processes [3]. They further explain the classification of intellectual capital is typically differentiated as an external focus on customer relations, internal, and human capital [3]. This article will review intellectual capital utilizing human capital and structural capital. Human capital is the combination of genetic inheritance, education, experience, and attitude about life and business, while structural capital in the form of organizational routines is the critical link allowing intellectual capital to be measured at an organizational level [5,6].

The emphasis on intellectual capital is partially due to organizational leaders realizing the importance of innovation in a competitive global environment and the emergence of a network society driven by information [2]. According to Drucker, knowledge is the most meaningful resource and it is not parallel in significance with labor, capital, and land [7]. Intellectual capital is the most significant organizational asset in the knowledge-based economy [8] and organizational success will be based on the strategic management of knowledge rather than the strategic allocation of physical and financial resources [6].

The means to measure the value of intellectual capital has been the focus of recent research because of limitations associated with the capability of financial statements to explain the difference between an organization's market value and book value, thus not reporting the full value of an organization [2,9]. Some of the primary reasons organizations want to measure intellectual capital include the desire to help formulate strategy, evaluate strategy execution, assist in the firm's diversification and expansion decisions, use as a basis for management compensation, and communicate with external shareholders [9]. Organizations extend external communication beyond the shareholders in order to raise capital and to enhance the reputation of the organization [9]. Organizational reputation can be enhanced by creating and producing higher value products and services facilitated by employing knowledgeable and innovative people [10,11]. By definition, service organizations and intellectual capital are synonymous with reputation playing a crucial role in the current competitive landscape of service industries, especially in the highly regulated and competitive property-casualty industry.

The property-casualty insurance industry offers products in the form of a promise to pay in the event of a covered claim, but service is the primary component of all transactions. The intangible products provided by insurance companies consist of risk pooling and risk bearing, financial services composed of coverage programs, policy

recommendations, loss prevention, and intermediation [12]. In the competitive environment of the personal lines insurance industry, competitive advantages are crucial for the organization to be sustainable and maintain continued growth. The use of innovation to create value allows organizations in the property-casualty insurance industry to differentiate themselves from one another, and employing innovative employees is the launching point to reaching this objective. The recognition and acceptance of value created by intellectual capital has led to the need for an acceptable measurement model [13].

Literature Review

The literature shows there are a number of studies examining a variety of factors which influence organizational performance, such as corporate governance [14], corporate diversification [15,16], social responsibility [17], human resource management [18], and corporate culture [19]. Early research examines economic and organizational variables influencing performance [20]. Hansen and Wenerfelt identified market share, growth, and diversification as indicators to examine impacts on organizational performance [20].

Gale and Branch conclude market share is the primary structural determinant of organizational performance resulting from the benefits of scale economics [21]. Orlitzky's study examines multiple relationships, but finds organizational size has no significant paths to financial performance [22]. Research studies examining the impact of diversification on firm performance find more diversified organizations perform poorer than less diversified organizations relative to their competitors, and diversification does not provide organizations with valuable intangible assets [15,16]. The findings from the various studies suggest organizations with greater market share and are narrowly diversified have the capacity to leverage economies of scale and use a focused strategy to gain a competitive advantage.

Additional studies show economic factors are not the only influencers of organizational performance. Baliga, Moye, and Rao examine the impact of CEO duality on firm performance and find insignificant evidence of an impact on short-term and long-term performance when the firm's duality status changes [23]. Leadership is a major component of an effective organization, and while CEO duality does not directly impact performance, leadership's handling of corporate governance can dictate the effectiveness of optimizing the influence of people, processes, and culture. In the study on the relationship between corporate governance and organizational performance, researchers find organizations with greater agency problems do not perform as well as those with fewer problems [14]. Ensuring all levels of leadership are aligned with the corporate objectives and all are acting in the best interest of a singular mission. As an example, Anderson and Reeb investigate the relation between founding-family ownership and firm performance to determine if minority shareholders are adversely affected by family ownership as an organizational structure and find better performance when family members serve as CEO [24]. Additionally, research by Klein finds there is a positive relationship between return on investments when an insider director is on the finance committee of the board of directors [25]. These research findings support the influence of organizational structure on performance.

Additional research focuses on how organizations manage internal and external factors which potentially influence performance. The literature shows there are studies covering a broad range of areas such as human resource management [18,26], environmental management [27], and corporate social responsibility [28]. Research by Bharadwaj examines IT capability and firm performance and finds firms with high IT capability tend to outperform other firms [29]. There is extensive literature covering a myriad of economic or organizational factors which impact the performance of an organization. However, there is a gap in identifying the factors which explain performance. The variance in market value and book value made researchers aware there were factors other than economic and organizational areas potentially influencing performance, so studies to examine intellectual capital began. The literature reflects numerous studies examining the impact of intellectual capital on the performance of companies spanning various industries worldwide.

Recent studies examine intellectual capital's influence on firm performance in a wide range of industries overwhelmingly focused on the financial sector of companies outside the United States. The study by Iswati and Anshori [30] examine insurance companies on the Jakarta Stock Exchange and find intellectual capital influences performance. Muhammad and Ismail [31] investigate companies in the banking, insurance, and brokerage industries and also find intellectual capital has a positive relationship with organizational performance. Lu et al. [32] tested the impact of intellectual capital on the performance of life insurance companies in China and find positive operating efficiency with high intellectual capital. There are different components of intellectual capital, and the literature shows it includes human and structural capital with the means to create a sustainable competitive advantage [33]. Cabrita and Bontis [34] examine the individual components of intellectual capital of the Portuguese banking industry and find human capital is the most important construct. Clarke, Seng, and Whiting [35] investigated the publicly listed companies in Australia and find all components have a positive relationship with performance, but structural capital impacted the subsequent year's performance.

Although difficult to measure, intellectual capital is one of the many factors which explains business success and is a source of competitive advantage [36]. Initial studies to analyze insurance industry performance used frontier efficiency and productivity methods [12]. Measuring intellectual capital continues to emerge, but more recently Pulic's [37] proposal of a measure of the efficiency of value added by organizational intellectual capacity (VAIC™) is emerging as one of the most widely used in research to date [10].

Though studies have been conducted on factors influencing the performance of U.S. firms, the majority have focused on areas other than intellectual capital [18,26,38]. This research will examine the influence of intellectual capital on firm performance of U.S. property-casualty insurers publicly-traded on the New York Stock Exchange (NYSE). Including this section, the remainder of the article is organized into 4 sections. Section 2 is the literature review. Section 3 is the research methodology consisting of data and sample selection. Section 4 provides details of the results and discussion, and concludes with section 5.

The importance of this topic is reflected in the increased attention of the professional services industry and the many new knowledge-based firms launched over the past decade [6]. Because companies are creating value in new ways, they need new business models accurately reflecting 21st century business realities [39].

Research Methodology

The data to identify all U.S. property-casualty insurance companies in the sample selection is collected from the Mergent database. There are 53 insurance companies publicly traded on the New York Stock Exchange (NYSE). After excluding all inactive companies and active commercial companies, 11 active personal lines insurance companies remain in the sample. The organizations cover five market-capitalization segments ranging from micro to mega (Table 1). Financial data covering the 11-year period from 2003 to 2013 for each company are extracted from financial reports available on the Mergent database. The financial data for each company listed in Table 2 are used to calculate the formulas supporting Pulic's VAIC™ method measuring the value creation efficiency using accounting based figures [37].

Market Capitalization of U.S. Property Casualty Insurance Companies on the NYSE

Market Capitalization	Company	Ticker
Micro	First Acceptance Corp.	FAC
Small	Horace Mann Educators Corp.	HMN
	Universal Insurance Holdings Inc.	UVE
Mid	Hanover Insurance Group Inc.	HIG
	Mercury General Corp.	MCY
Large	Allstate Corp.	ALL
	Chubb Corp.	CB
	Hartford Financial Services Group Inc.	THG
	Progressive Corp. (OH)	PGR
	Travelers Companies Inc. (The)	TRV
Mega	Berkshire Hathaway Inc.	BRK B

Table 1: Personal lines property-casualty insurers categorized based on market capitalization. (Micro <$250M, Small $250M - $2B, Mid $2B - $10B, Large over $10B, and Mega over $100B).

VAIC™ Results for U.S. Property-Casualty Insurance Companies on the NYSE

Insurance Company	VAIC	HCE	SCE	CEE
Universal Insurance Holdings Inc.	4.779	4.038	0.560	0.181
Chubb Corp.	2.519	1.914	0.470	0.134
Progressive Corp. (OH)	2.216	1.577	0.356	0.283
Horace Mann Educators Corp.	2.211	1.714	0.401	0.096
Hartford Financial Services Group Inc.	2.211	1.771	0.407	0.033
Travelers Companies Inc.	2.169	1.681	0.388	0.099
Berkshire Hathaway Inc.	2.124	1.587	0.367	0.170
Mercury General Corp.	1.938	1.412	0.276	0.249
Allstate Corp.	1.789	1.413	0.290	0.086
First Acceptance Corp.	1.619	1.252	0.125	0.243
Hanover Insurance Group Inc.	1.433	1.197	0.149	0.087
Average	2.273			

Table 2: Results of VAIC calculations for years 2003 through 2013 of U.S. Property-Casualty Insurance companies publicly traded on the NYSE. (VAIC is calculated using the VAIC™ methodology consisting of financial data. VAIC = HCE + SCE + CEE).

The purpose of the article is to examine the impact of intellectual capital on organizational performance of U.S. property-casualty personal lines insurance companies publicly trading on the NYSE. The results of the study are expected to answers the following questions:

Does intellectual capital impact performance of an organization?

Do the individual components of intellectual capital impact performance of the organization?

Based on the research questions, the VAIC method measures will be used to test the following hypotheses:

H1: There is a significant relationship between intellectual capital and firm performance.

H2: There is a significant relationship between the human capital component of intellectual capital and firm performance.

H3: There is a significant relationship between the structural capital component of intellectual capital and firm performance.

H4: There is a significant relationship between the capital employed component of intellectual capital and firm performance.

Regression analysis is the statistical test the researcher uses to determine the strength of the relationship between return on assets as the dependent variable and human capital efficiency, structural capital efficiency, and capital employed efficiency as the independent variables. Firm size, firm leverage, and return on equity are control variables.

The equation used to test the first hypothesis is expressed as:

$$ROA = \alpha + \beta1(VAIC^{™}) + \beta2(FSIZE) + \beta2(FLEV) + \beta6(ROE) + \varepsilon$$

The equation used to test the three remaining hypothesis is expressed as:

$$ROA = \alpha + \beta1(HCE) + \beta2(SCE) + \beta3(CEE) + \beta4(FSIZE) + \beta5(FLEV) + \beta6(ROE) + \varepsilon$$

Where ROA is Return on equity (ROA); net investment income is included in net profit because insurance companies gain a large part of their income through prior investments, and the addition allows the evaluation of organizational performance to reflect the degree of efficiency in employing assets [40].

Intellectual capital is measured using Pulic's VAIC™ model and is equivalent to the combinations of human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE)

$$VAIC^{™} = HCE + SCE + CEE$$

The components of VAIC™ are calculated as follows:

Human capital efficiency (HCE) is an indicator of value added efficiency of human capital expressed as equation:

HCE = VA ÷ HC

Where VA is value added calculated as:

VA = O + HC + D + A

Where O is operating income; HC is payroll as a proxy for human capital, calculated at 25% of revenues which is consistent with the recommendation from the Society of Human Resource Management; D is depreciation; and A is amortization.

Structural capital efficiency (SCE) is equal to structural capital divided by human capital expressed as equation:

SCE = SC ÷ HC

Where SC is value added minus human capital expressed as:

SC = VA - HC

Capital employed efficiency (CEE) is equal to value added divided by capital employed expressed as equation:

CEE = VA ÷ CE

Where CE is a proxy for the organization's tangible resources and consists of physical capital and financial assets making up total assets minus intangible assets.

Firm size (FSIZE) represented as the natural logarithm of each organization's total assets, organizational financial leverage (FLEV), and return on equity (ROE) are control variables incorporated into the regression model to control for their effect on the performance of the organization [41].

Results and Discussion

The analysis of the value added intellectual coefficient (VAIC™) and each of its components calculated for the 11 organizations during years 2003 to 2013 found Universal Insurance Holdings, Inc. (UVE) has the highest average efficiency ranking in human capital and structural capital, but Progressive exceeded Universal in capital employed with a 36% higher average efficiency score and 88% higher than the lowest ranking organization. This indicates Progressive is not only efficient at using resources to create value, but they have the resource capability to do so. However, overall UVE has the highest average VAIC™ efficiency ranking, 47% higher than the next closest organization and 70% higher than the lowest average efficiency ranking (Table 2). UVE holds the top eight slots for highest VAIC™ efficiency score of all 121 observations and the last three years are trending upward, indicating UVE is the most effective company at creating new value per invested dollar.

The organizations were analyzed based on market capitalization and there were no trends identified based on market cap of the organizations. Chubb was one of only six companies making up the large and mega cap with a score above the 2.273 VAIC™ efficiency score, indicating market size does not tend to provide an advantage in overall intellectual efficiency.

	ROA	VAIC	FSIZE	FLEV
VAIC	0.065			
FSIZE	0.148	-0.249**		
FLEV	-0.018	-0.167*	-0.236**	

| **ROE** | 0.737** | 0.399** | -0.019 | -0.145 |

Table 3: Pearson correlation matrix. * Statistical significance at the 5% level. ** Statistical significance at the 1% level.

Correlation and multiple regression analyses were conducted to examine the relationship between VAIC™ and return on assets while controlling for firm size, leverage, and return on equity (Table 3). The results show there is a negligible positive relationship, but the relationship is not significant. However, there is a strong positive and highly significant relationship between VAIC™ and ROE, indicating organizations with higher intellectual capital efficiency tend to produce greater ROE. It is also an indication liabilities are not leveraged to contribute to performance. VAIC™ has a weak negative correlation with firm size and highly significant, indicating smaller firms have the potential for greater intellectual capital efficiency.

The multiple regression model produced $R^2 = .624$, $F_{(4, 116)} = 48.09$, $p < .000$. The VAIC™ scores had highly significant negative regression weights, indicating organizations with greater performance as measured by ROA are expected to have lower VAIC™ scores, after controlling for other variables in the model. Firm size and ROE have positive and significant regression weights, but firm leverage did not contribute to the model (Table 4).

Model	Coefficients	t-statistics	p-value	Co linearity Statistics	
				Tolerance	VIF
(Constant)	-0.036	-1.103	0.272		
VAIC	-0.007	-3.376	0.001	0.752	1.330
FSIZE	0.006	2.143	0.034	0.855	1.170
FLEV	0.012	1.624	0.107	0.887	1.128
ROE	0.223	13.475	0.000	0.830	1.204
Adjusted R2	0.624				

Table 4: Regression Model 1. ROA = α + β1(VAIC™) + β2(FSIZE) + β2(FLEV) + β6(ROE) + ε.

Correlation and multiple regression analyses were conducted to examine the relationship between the three individual components of VAIC™ and return on assets while controlling for firm size, leverage, and return on equity (Table 5). The results show there is a positive correlation with each of the components, but to varying degrees of strength. There is an insignificant relationship with HCE, moderate with SCE, and weak with CEE. ROA shares a highly significant relationship with SCE and CEE, indicating organizations with higher structural capital efficiency and capital employed efficiency tend to optimize resources to create value.

	ROA	HCE	SCE	CEE	FSIZE	FLEV
HCE	0.007					
SCE	0.297**	0.696**				
CEE	0.248**	0.169*	0.136			
FSIZE	0.148	-0.262**	0.084	-0.431**		
FLEV	-0.018	-0.198*	-0.185*	0.487**	-0.236**	

ROE	0.737**	0.373**	0.390**	0.215**	-0.019	-0.145

Table 5: Pearson Correlation Matrix. * Statistical significance at the 5% level. ** Statistical significance at the 1% level.

The multiple regression model produced R^2 = .71, $F_{(6, 114)}$ = 46.43, $p < .000$. HCE scores had highly significant negative regression weights, indicating organizations with greater performance as measured by ROA are expected to have lower human capital efficiency scores, after controlling for other variables in the model. SCE and CEE scores had significant positive regression weights, indicating organizations with greater performance based on ROA are expected to have higher structural capital and capital employed efficiency scores, after controlling for other variables in the model (Table 6). ROE has highly significant positive regression weights, but firm size and firm leverage did not contribute to the model. The adjusted R^2 indicates the overall model is a strong predictor in explaining the change in the performance of the organizations.

Model	Coefficients	t-statistics	p-value	Co Statistics	linearity
				Tolerance	VIF
(Constant)	-0.005	-0.158	0.875		
HCE	-0.018	-6.422	0.000	0.384	2.605
SCE	0.073	4.223	0.000	0.411	2.433
CEE	0.071	2.338	0.021	0.559	1.790
FSIZE	0.003	0.988	0.325	0.624	1.603
FLEV	-0.001	-0.165	0.869	0.649	1.540
ROE	0.204	13.363	0.000	0.771	1.297
Adjusted R2	0.694				

Table 6: Regression Model 2. ROA = α + $\beta1$(HCE) + $\beta2$(SCE) + $\beta3$(CEE) + $\beta4$(FSIZE) + $\beta5$(FLEV) + $\beta6$(ROE) + ε.

Conclusion

Measuring the full value of organizations should be a priority for organizational leaders, investors, and other stakeholder, especially in the service oriented industry of insurance. The traditional measures include only financial factors which do not provide consideration for the value added by intellectual capital and how organizations benefit from the optimization of human and structural resources by employing them efficiently. This research study examined the relationship between intellectual capital as measured by the VAIC™ methodology and organizational performance as measured by return on assets, and findings did not support a significant relationship between the two. An assessment of market capitalization was conducted and found no indication of influence in the VAIC™ calculations. However, there was evidence to support an association between individual components of VAIC™ and organizational performance. Structural capital was found to have the strongest and most significant association amongst the remaining two components, and was the key factor in predicting the change in organizational performance. The research illustrated how components of intellectual capital can be used to create value and influence performance with the efficient use of resources. This research will aid the property-casualty industry in using metrics to evaluate the optimal use of human capital in conjunction with economic resources to innovate and create greater value for the organization and its stakeholders. The examination of the impact of liabilities on intellectual capital and performance of property-casualty insurance companies are areas for future research.

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