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The Nexus Between Intellectual Capital and Financial Performance: An Econometric Analysis from Pakistan

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Abstract

Intellectual Capital, a valuable intangible organizational asset, is primarily linked to a company's financial performance and is divided into three categories: human, structural, and relational capital. This paper investigates the impact of intellectual capital on the financial performance of selected Pakistani companies in the Information and Communication sector, as this sector is heavily reliant on intellectual capital. The data for 11 firms was gathered from the State Bank's Financial Statements Analysis of Companies Listed on the Pakistan Stock Exchange from 2015 to 2020. Pulić's (2004) Value Added Intellectual Coefficient (VAICTM) has been used to assess a company's IC efficiency. VAIC™ and its components, the efficiency of intellectual capital, and the efficiency of capital employed are calculated. Financial performance is measured through return on assets, return on capital employed, and asset turnover ratio. Multiple regression, fixed-effect, and random-effect Panel Data estimation are used in the empirical study. The findings suggest that intellectual capital efficiency has a large impact on major profitability metrics, but little effect on company productivity. It can be inferred from the results that the companies must invest in advanced technology, the latest machinery, and well-equipped offices to improve financial performance and productivity and gain a competitive advantage.

Keywords: Intellectual Capital, Financial Performance, Panel Data, Value Added Intellectual Coefficient (VAIC™)

JEL Classification Code: O34, L25, C33

1. Introduction

In the knowledge-based economy, intellectual capital (IC) is a critical asset for a company's value creation (Gul et al., 2021). Intangible assets, such as intellectual capital, allow businesses to obtain a competitive advantage over their competitors and plan for future benefits (Chowdhury et al., 2018). The value-creation through IC investment is possible through innovation, employees' knowledge and training, and relationships (Wang et al., 2014). The intangible assets have become the most competitive and valuable assets in the knowledge-based economy and industry (Hsu, 2001). Most companies in the information and communication sector, such as Apple, TATA, and Microsoft, have competed so well worldwide based on their employees' intellectual capital, knowledge, and skill. The intellectual property is mostly not imitable, so these companies have been leading the industry for many years. Thus, intellectual capital has become the new basis of competition and survival for companies to maintain competitive advantage and add economic value (Gul et al., 2021).

A balanced scorecard, IC Report Method and Value Added Intellectual Coefficient model (VAIC™) are some of the approaches used to measure and evaluate IC. The most widely used method by academic experts and researchers is the VAIC™ (Pulić, 1998), as Pulić's VAIC™ measures the value addition of the company through the efficiency of the firm's IC (Ståhle et al., 2011). There has always been a challenge in measuring and reporting intangible assets

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due to the difficulty in measuring human efficiency, capital efficiency, and R&D effectiveness (Svieby, 1997). The focus has always been on measuring and reporting the tangible assets of the firms. Pulić (1998) coined the term VAIC™ to describe the method for assessing a company's intellectual capital. Pulić's VAIC™ measure has gained a lot of attraction as it can assess intellectual capital from three perspectives: human capital (HC), physical and financial capital (CEE), and structural capital (SCE) (Pulić, 1998, 2004) Various studies have used this measure and confirmed it as a reliable tool to measure IC of the firms (Xu & Liu, 2020; Bayraktaroglu et al., 2019; Chowdhury et al., 2018;); we will also use Pulić's VAIC™ to measure the impact of IC on the financial performance in Pakistani context. Intellectual capital affects the financial performance and productivity of any firm. However, its impact should be intense in the case of the knowledge-intensive sector such as the information and communication sector. However, to identify the optimal level of IC, there is a dire need to identify which dimensions of intellectual capital affect a company's performance. Unless empirical literature provides evidence of which dimensions of IC add to a company's financial performance, it is erroneous to invest in IC blindly.

On the contrary, Pakistan follows a "one fits all" policy to improve human capital (UNIDO, 2010), failing to attain the required objectives. Since the level of IC differs among sectors, size, and location, there is a need to conduct a study that is specific to a sector. Since the financial performance of the information and communication sector is expected to be heavily influenced by the IC investment, therefore this sector is chosen for this study.

2. Literature Review and Hypothesis Development

The researchers and academic experts define Intellectual Capital according to their understanding and context, but the underlying assumption of intellectual capital remains the same. "Intellectual capital is made up of knowledge, applied experience, organizational technology, customer relationships, and professional skills" (Edvinsson & Malone, 1997).

Svieby (1997), who is considered the pioneer in the IC movement in Sweden, emphasizes that knowledge-based intangible assets are more critical than the tangible or financial assets of the firms. The hidden assets, such as employee training and experience and internal and external structure, are more important to the companies in gaining a competitive advantage than the tangible assets (Edvinsson & Malone, 1997).

Xu and Liu (2020) extended the existing understanding of the relationship between firm performance and intellectual capital of manufacturing firms in Korea. The study found that the extended model performed better than the original VAIC model. Human capital and physical capital were found to be the most significant types of intellectual capital, whereas structural capital had no impact on the financial performance of the firms. Shiu (2006a) looked at 80 Taiwanese publicly traded companies to see if there was a link between financial performance and intellectual capital expenditure. The study found a favorable relationship between VAICTM and profitability but a negative relationship between VAICTM and productivity. Shiu (2006b) employed the VAICTM method to determine the influence of intellectual capital on business performance, however this time he used a quantile regression methodology rather than the VAICTM method. He discovered that the VAICTM components have a substantial impact on ROA. The majority of studies suggest that intellectual capital has a considerable impact on a company's financial performance, while the results vary depending on the country and industry (Tan et al., 2007; Kamath, 2008).

Recent studies are exploring the disclosure of IC to see if increased performance associated with IC forces the IC disclosure in emerging economies. Audit quality and size of the audit team affect the extent of IC disclosure (Solikhah et al., 2020; Astuti et al., 2020), whereas gender diversity does not have an impact on IC disclosure in Indonesia (Herli et al., 2021; Khan & Khalique, 2014). The results are inconclusive and need more investigation, just as the link between IC and firm performance is not consistent across different regions.

There are limited studies conducted in Pakistan, particularly in the non-financial sector. Small and Medium Enterprises (SMEs) were employed by Khalique et al. (2015) to investigate the relationship between the IC and the financial performance of these businesses. They discovered that structural and technological capital has a positive impact on a company's success, whereas human capital has no impact on a company's financial performance. The findings are surprising, given that human capital is one of VAICTM's most important components. The insignificant relationship shows that the human capital is either inefficient or highly paid in the case of SMEs; therefore, the higher cost of Human Capital could not boost the financial performance of SMEs. Khan et al. (2012) discovered a positive association between intellectual capital and the financial performance of Pakistani banks in another study. Ousama and Fatima (2015) discovered a link between intellectual capital and the financial performance of Pakistani Islamic banks. The research on financial performance and intellectual capital is intense but has shown mixed results. Moreover, the research in this area in the Pakistani context is scarce, and there is no research conducted on the intellectual capital performance of the information and communication sector. Thus, there is a pressing need for research into the influence of intellectual capital on financial success in various industries so that policymakers can use these results to make policies for better corporate performance and IC investment. As a result, the

following hypotheses have been proposed to evaluate the impact of IC on company financial performance:

H1: *VAIC™ components have a significant positive impact on the profitability of the companies in the Communication and Information sector*

This hypothesis can be subdivided into the following two hypotheses:

H1(a): *VAIC™ components have a significant positive impact on the ROA of the companies in the Communication and Information Sector.*

H1(b): *VAIC™ components have a significant positive impact on the ROE of the companies in the Communication and Information sector*

H2: *VAIC™ components have a significant positive impact on the productivity (ATR) of the companies in the Communication and Information sector*

3. Materials and Methods

The purpose of this study is to look into the effect of intellectual capital on the financial performance of companies in the communication and technology sector. For this purpose, we need to define and identify how financial performance and IC will be measured. *Financial performance* is the dependent variable measured through the following financial performance ratios whereas Intellectual Capital is the dependent variable measured through Pulić's (1998) VAIC™ model.

Return on Assets (ROA) = Net Income / total Assets
Return on Equity (ROE) = Net Income / Stockholder' equity
Assets Turnover Ratio (ATR) = Net Sales / Average total Assets

The financial performance of the companies is measured through the profitability ratios, which are ROA and ROE, whereas ATR is the productivity ratio (Dzenopoljac et al., 2016). VAIC™ is the main methodology employed in this study, which is the sum of three components defined as follows:

CEE = capital employed efficiency captures the value-added efficiency by capital employed
HCE = Human Capital Employed captures the value-added efficiency of Human capital
SCE = Structural Capital Employed captures the value-added efficiency by structural capital

VAIC™ is the sum of all the efficiencies as shown in the equation below;

$$VAIC™ = CEE + HCE + SCE,$$

Where,
CEE = VA/CE
HCE = VA/HC
SCE = (VA – HC)/VA
ICE = HCE + SCE
VA (Value added) = operating profit + employee cost + depreciation + amortization
CE (Capital Employed) = company net assets
HC (Human Capital) = Total salaries and wages paid by the company
SC (Structural capital) = value added less salaries

To capture the significant impact of IC on the financial performance of the companies, there is a dire need to control the size of the companies. Two control variables are introduced in the regression models, which are as follows:

Firm size = measured through a log of total assets log(TA)
Physical Capital intensity (CI)6 = fixed assets to total assets ratios (Firer & Stainbank, 2003)
Total Equity = log (TE)

4. Results

4.1. Data and Sample Selection

The sample selection criteria are presented in this chapter, followed by descriptive statistics for the variables utilized in the study. From 2015–2020, data from 11 firms in the information and communication sector was collected and listed on the Pakistan Stock Exchange. The data was collected from State Bank's Financial Statements Analysis of Companies which is regarded as a reliable source collecting firm-level data. To run the statistical analysis, STATA 15 was used. To identify the impact of intellectual capital on financial performance, various regression models, including fixed-effect, dynamic and multiple are employed.

4.2. Descriptive Statistics

Table 1 shows the descriptive statistics for the dependent variable, independent variable, and control variable. Sample companies' financial performance is measured using ROA, ROE, and ATR, while their intellectual capital is measured using ICE and CEE. The control variables are LA and CI. The mean value of ICE is 4.409199, which shows that every 1 rupee invested in the intellectual capital creates a value of rupee 4.409199 in return. It seems that the information and communication sector companies are quite efficient in creating

Table 1: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
ROA	66	0.028	0.21	–0.48	0.67
ROE	66	0.23	1.38	–2.00	10.37
ATR	66	0.65	0.48	0.09	2.25
SCE	66	0.64	1.25	–1.58	6.78
ICE	66	4.40	8.74	–1.91	67.38
CEE	66	0.01	2.19	–14.70	0.31
Log (TA)	66	16.21	1.75	13.56	19.49
CI	66	0.63	0.20	0.23	0.88
Log (TE)	66	15.30	1.54	12.17	18.59

Table 2: Correlation Analysis

	ROA	ROA	ATR	SCE	ICE	CEE	Log(TA)	CI	Log(TE)
ROA	1								
ROE	0.91	1							
ATR	0.52	0.28	1						
SCE	–0.02	0.03	–0.39	1					
ICE	0.21	0.22	–0.09	0.15	1				
CEE	0.86	0.75	0.72	–0.12	0.08	1			
Log (TA)	–0.07	–0.00	–0.27	0.04	0.14	–0.27	1		
CI	–0.41	–0.29	–0.52	0.26	0.14	–0.57	0.51	1	
Log (TE)	0.021	0.12	–0.33	0.07	0.20	–0.20	0.96	0.49	1

value on the intellectual capital investment. The mean value of CEE is .0104635, which shows a positive value creation for every rupee invested in the capital employed. This result is quite surprising, which shows that the capital invested in the information and communication sector is either idle or obsolete, which is not sold out and reinvested somewhere to generate higher value. The financial performance of the companies is not quite robust; the mean value of ROA, ROE, and ATR is 2.86%, 23.95%, and 65.87%, respectively. However, due to higher variation in the data, the range is relatively high, and the maximum ROA and ROE are .6702 and 10.371, respectively. The size of the companies is measured through a log of assets, which has a mean value of 16.21.

The results of the Pearson correlation matrix are presented in Table 2. There is no multicollinearity among the independent variables, but there is a positive connection between CEE & ICE and financial performance metrics.

4.3. Panel Data Analysis

Since we have both time series and cross-sectional data, panel data and multiple regression analysis is employed to examine the impact of the intellectual capital on the financial performance of the companies. Three multiple regression models are built since we use three financial performance metrics, namely ROA, ROE, and ATR. The fixed effect, random effect, and multiple regression models were examined for each multiple regression model. The Hausman test was used to identify which regression analysis technique is best suited under each model. The generalized multiple regression model with '*n*' observation is as follows, where *Y* is the independent and *x* is the dependent variable:

$$Y_i = \beta_0 + \beta_1 x_2 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_n x_n + e_n$$

The results of the first regression model with ROA as the financial performance are presented in Table 3. The Hausman test finds that the random effect model is preferred over the fixed effect for panel data with an explanatory power of 40%. Under the random effect model, both ICE and CEE have a significant positive impact on ROA. CI has a significant negative impact, whereas LA has an insignificant positive impact on ROA. According to the findings, a 1% increase in ICE and CEE raises the ROA by 0.006 and 0.042,

Table 3: Impact of VAIC™ on ROA

Dependent Variable: ROA	OLS	Fixed Effect	Random Effect
Constant	0.0628741 (0.1934661)	0.0922009 (1.026538)	0.0488143 (0.3747805)
ICE	0.006079** (0.0023224)	0.002058 (0.0017672)	0.0025968* (0.0017341)
CEE	0.0415923*** (0.0095501)	0.0211084** (0.0086747)	0.0229984*** (0.0076727)
CI	–0.533507*** (0.119879)	–0.7843407* (0.2814634)	–0.632814*** (0.1931905)
Log (TA)	0.016491	0.0253541 (0.0653843)	0.0220549 (0.0256313)
R-squared	0.315259	0.3373	0.4013
Adjusted *R*-squared (within)	0.270358	0.3005	0.3490

Notes: Robust standard errors are clustered on firms as shown in parentheses. RE panel estimation was used based on the Hausman test. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 4: Impact of VAIC™ on ROE

Dependent Variable: ROE	OLS	Random Effect
ICE	0.0050903 (0.0047807)	0.002518 (0.0039255)
CEE	1.192814*** (0.1491414)	1.009875*** (0.1565768)
CI	0.109528 (0.2989134)	–0.8407141* (0.4623012)
Log (TE)	0.0871829*** (0.0322777)	0.2460977*** (0.0643126)
Constant	–1.812967*** (0.4522212)	–3.606643*** (0.9375501)
R-squared	0.6630	0.5475
Adjusted *R*-Squared (within)	0.6361	0.5329

Notes: Robust standard errors are clustered on firms as shown in parentheses. RE panel estimation was used based on the Hausman test. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 5: Relationship between VAIC™ and ATR

Dependent Variable: ATR	OLS	Random Effect
ICE	–0.0026 (0.0058)	–0.0002 (0.0034)
CEE	–0.0764*** (0.0239)	–0.0078* (0.0155)
CI	–1.2192*** (0.3011)	–0.7830* (0.4471)
Log (TA)	0.01707 (0.0348)	–0.0644 (0.0658)
Constant	1.1541** (0.48606)	2.1977** (0.9878)
R-squared	0.4777	0.4123
Adjusted *R*-Squared (within)	0.4355	0.3823

Notes: Robust standard errors are clustered on firms as shown in parentheses. RE panel estimation was used based on the Hausman test. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

respectively. The findings show that increasing ICE and CEE investment raises the ROA. As a result, the first hypothesis H1 is accepted.

Table 4 shows the findings of the second regression model with ROE as the financial performance. With an explanatory power of 53.3 percent, the Hausman test reveals that the random effect model is chosen above the fixed-effect model for panel data. CEE has a significant positive impact on ROE; a 1% increase in CEE increases ROE by 100%. CI has a positive and significant impact, whereas LE has a significant positive impact on ROA. The results show that an increase in ICE does not significantly impact ROE; however, an increase in CEE investment increases the ROE. Thus, the second hypothesis is rejected, and we conclude that the VAIC has no impact on ROE.

The results of the final regression model with ATR as the dependent variable are presented in Table 5. The Hausman test finds that the random effect model is preferred. Both ICE and CEE have a negative impact on ATR under all models. ICE has an insignificant impact under the random effect model and OLS models, whereas CEE has a negative but significant impact on ATR under both models. The negative and insignificant results make us reject the hypothesis and conclude that increase in intellectual capital investment does not impact ATR.

5. Discussion

The data analysis shows that components of VAIC™ have a significant impact on the profitability of the companies, whereas no impact was found on the productivity of the companies. The influence of CEE on ROE and ROE is significant. It shows that if the company increases its capital employed efficiency, the ROE and ROA will increase. On the other hand, ICE also has a significant positive impact on ROA but an insignificant impact on ROE. It shows that an improvement in Intellectual Capital employed causes the ROA to increase, but the subsequent increase in the ROE is insignificant. Both ICE and CEE have a negative impact on the ATR. The impact of ICE on ATR is insignificant, whereas the impact of CEE on ATR is significant. It can be inferred that the companies with higher capital employed experience better financial performance in terms of profitability (ROA and ROE).

In contrast, an insignificant impact on ATR shows that the productivity of the companies is not quite efficient in utilizing the financial capital employed. It can be inferred from the results that the companies must invest in advanced technology, the latest machinery, and well-equipped offices to improve financial performance and productivity and gain a competitive advantage. Although the intuitive assumptions were that both ICE and CEE impact productivity, the findings showed that both of the VAIC™'s components have an insignificant impact on ATR.

6. Conclusion

This paper aims to identify the impact of intellectual capital on the financial performance of companies in the information and communication sector. Pulić's (1998) VAIC™ model was used to measure all three components of VAIC™. These three components of VAIC™ are human capital, intellectual capital, and structural component. The financial performance measures are split into profitability and productivity; the profitability was measured through ROA and ROE, whereas the productivity was measured through the Assets Turnover ratio. The data was collected from State Bank's financial statement analysis from 2015 to 2020. There are 11 companies listed on the Pakistan Stock Exchange in the communication and Information sector. This sector was chosen as no study has ever been conducted on this sector in Pakistan, whereas this sector is knowledge-intensive. Our results confirm that Intellectual capital has a significant impact on ROA and ROE. Thus, more significant investments in ICE and CEE will yield higher profitability in terms of ROA and ROE as firms' productivity is not affected by ICE and CEE, which shows the productivity of the companies in the information sector is not dependent on the intellectual capital. However, some other factors affect productivity. However, a reasonably large sample across multiple industries should be used to validate these results.

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