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Intellectual Capital Efficiency and Financial performance of BSE 500 Companies: A Dynamic Regression Model

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Abstract: The current study investigates the impact of intellectual capital efficiency on financial performance of BSE 500 Companies. Intellectual capital Efficiency is measured with the help of Modified Value Added Intellectual Coefficient (MVAIC) method and the financial performance of the selected companies as measured with the help of return on assets (ROA) and return on equity (ROE). In the study the dynamic effect of the dependent variable is also examined. The dynamic effect indicates the impact of lagged variable of the dependent variable on itself. This is also known as presence of auto correlation in the dependent variable i.e. ROA and ROE. Thus, in order to incorporate the dynamic effect of the financial performance the dynamic panel data models were applied. The dynamic models are divided into two categories namely difference GMM and system GMM. The study found that the lagged variable of ROA have significant impact on the dependent variable ROA. The system GMM model is used to analyse the impact of intellectual capital efficiency on the financial performance of the selected companies. The intellectual capital efficiency is found to have significant impact on the ROA and ROE of the selected companies.

Key Words: Modified Value Added Intellectual Coefficient (MVAIC), Return of Assets (ROA), Return on Equity (ROE)

1. INTRODUCTION:

Value creation in the information-based economy is primarily dictated by the efficient use of intangible resources, often known as intellectual capital. Stuart (1996) asserts that the creation of intellectual capital is acknowledged as the primary source of wealth creation globally. The foundation of the company's competitive advantage is its collection of tangible and intangible assets (Grant, 1996). Many facets of human life have grown and developed over the past few decades, with tremendous advances in science, research, technology, and general economic development being driven by human intellectual capacity. Knowledge is becoming more and more important to the economy in the new information era (Dzenopoljac et al., 2017) **.T**his is crucial for a company to acquire and

hold onto in order to have a competitive edge (Ghosh & Wu, 2007; Curado et al., 2011). Intellectual capital (IC) is widely recognized as the most valuable resource for company performance and the cornerstone of competitiveness, according to Cabrita et al. (2017).

The importance of knowledge for global competitiveness has received considerable attention from both academics and practitioners. All of them think that the key to preserving a competitive edge and long-term business success is intellectual capital, also known as intangible assets. According to some scholars (Roos & Roos, 1997; Stewart, 1997), intellectual capital is the culmination of all the skills and knowledge that contribute to a business's long-term competitive advantage. As Mondal and Ghosh (2012) point out, the wealth of the modern economy is actually based more on intangible assets than on physical assets anymore. Creative abilities and innovation have been the cornerstone of success and development with the corresponding skills and experience; this has ultimately resulted in adding value to the company's products and improved its competitive position (Curado et al., 2011; Catalfo & Wolf, 2016). Rich intellectual resources and methods for identifying and documenting them have given countries and organizations a further competitive advantage (Singh & Sidhu, 2016).

2. REVIEW OF LITERATURE

Following two groundbreaking studies that measured the relationship between intellectual capital (IC) and company performance, the field of intellectual capital acquired significant traction. Based on an exploratory study employing a questionnaire survey, Bontis (1998) defined intellectual capital (IC) as the total of human capital (HC), structural capital (SC), and customer capital and established a causal relationship between IC characteristics and business success. However, quantitative measurement using secondary data (accounting variables) was not possible until Pulic's (1998) path-breaking work on IC. Pulic (1998) conceptualized IC as a sum of human capital, structural capital and physical capital. It is undeniable that a firm's intellectual capital has grown to be one of its most valuable assets, and a growth in intellectual capital investments raises the value of the company (Berzkalne and Zelgalve, 2013).Scholars and practitioners are now delving deeply into the connection between IC and company performance as indicated by profitability, productivity, earnings, and market performance (Xu, & Li 2019). This section is a critical analysis of previous studies looking into how intellectual capital affects a firm's success. Komenic & Pokrajcic (2012) used the VAIC methodology to quantify intellectual capital in a study they conducted on 37 multinational firms in Serbia between 2006 and 2008.

Corporate performance was measured by return on equity, return on assets, and productivity. Regression analyses were used to examine the relationship between the efficient use of MNCs' intellectual capital on firm performance. All three business performance measures showed a favorable correlation with human capital, according to the first empirical study conducted in Serbia using the VAIC approach. Only return on equity demonstrated a statistically meaningful and positive link with structural capital efficiency, according to the data.

Hamdan(2018) conducted a study on 198 firms from the kingdom of Saudi Arabia and the Kingdom of Bahrain for the period of 2014-2016 to investigate the relationship between intellectual capital and firm accounting and market-based performance. The results of the random effect regression indicated that intellectual capital and return

on assets were positively correlated, but there was no discernible correlation between them and the firms' market-based performance (Tobin's Q). According to the study, traditional performance measurement based on accounting data can still be used to look at the relationship between a company's success and its intellectual capital. The effectiveness of intellectual capital and organizational performance in Bangladesh's pharmaceutical industry were studied by Chowdhury et al. in 2019. Websites and the publicly available database containing the annual reports of 23 businesses listed on the Dhaka stock exchange from 2013 to 2017 have been mined for secondary data. The degree of intellectual capital efficiency is measured in terms of capital employed efficiency, human capital efficiency, and structural capital efficiency using the Pulic VAIC approach (2000, 2004). The Sata dataset has undergone multiple regression analysis to investigate the correlation between financial factors like return on equity and the constituents of the VAIC. Market-to-book value ratio, asset turnover, and return on assets. According to the study, during the study period, human resource efficiency appears to have contributed more value-added to the pharmaceutical sector than tangible and structural assets did. The return on equity was not predicted by the value-added intellectual coefficient, which had a substantial impact on the assets turnover ratio and return on assets but not on structural capital or capital employed.

In order to investigate the relationship between the performance of high-tech and non-high-tech enterprises and intellectual capital, Xu and Li (2019) studied 116 high-tech and 380 non-high-tech SMEs of China's manufacturing sector listed on the Shenzhen stock exchanges between 2012 and 2016. The study took into account the multifaceted character of intellectual capital by incorporating relational capital (RC) into the MVAIC model. The study has employed three Indicators, i.e., earnings, profitability, and efficiency in measuring the performance of the sample firms. Research hypotheses were tested through multiple regression models. The study revealed a significant difference in MVAIC between high-tech and non-high- tech SMEs. The empirical results found that intellectual capital has a positive impact on the performance of SMEs in China regardless of firm type. The effect of intellectual capital on earnings and efficiency is more significant in non- high-tech SMEs in China. CEE, HCE and SCE largely influenced the Earnings of Chinese SMEs. A model explaining how a company can convert a green strategy into an improved green process innovation performance was created by Jirakraisiri et al. in 2021. Information has been gathered from 514 managers in the sample. The hypothesis was tested using regression analysis. The study discovered that the three components of green intellectual capital—human, organizational, and relational capital—are positively impacted by businesses' green strategic intent. These three factors therefore have a favorable impact on the performance of green process innovation (GPIP). According to the study's findings, a company's organizational and relational capital is not as significant as its green human capital.

3. RESEARCH OBJECTIVES AND METHODOLOGY

3.1 Objective of the study: The main objective of this paper is to investigate the impact of intellectual capital efficiency on the financial performance of BSE 500 companies.

3.2 Sample Size: The sample of BSE 500 companies have been considered for the study however, companies whose key variables for measuring intellectual capital (MVAIC) and financial

performance from 2009-10 to 2018-19 were missing and excluded from the study. The companies with negative value-added were also excluded from the study. Thus, the final sample consists of 351 companies out of these 255 are from manufacturing sector and 96 are from service sector.

3.3 Data sources: Data are collected for a period of 10 years from 2009-10 to 2018-19 from prowess database, which is developed maintained and updated by the Centre for Monitoring Indian Economy (CMIE).

3.4 Measurement of Variables: The variables used in this study can be classified into three categories: dependent variables, independent and control variables.

3.4.1 Dependent variable: Return on Assets (ROA) and Return on Equity (ROE) is taken as dependent variables for regression equations.

3.4.2 Independent variable: This study uses the Modified Value Added Intellectual Coefficient (MVAIC) and its four components—Capital employed efficiency (CEE), Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Relational Capital Efficiency (RCE)—as independent variables to assess the effectiveness of intellectual capital, as recommended by Nimtrakoon (2015) and Xu and Li (2019). A higher MVAIC rating denotes superior management of a firm's capacity for value creation. The calculation of MVAIC can be elaborated as follow:

Value Added (VA)=W+I+T+NI (Riahi-Belkaoui, 2003)

W= Total employee expenditures, I=Interest T=corporate tax, NI=Profit after tax

Capital Employed Efficiency (CEE)=VA/CE

Human Capital Efficiency (HCE)=VA/HC

Structural Capital Efficiency(SCE)=SC/VA

Relational Capital Efficiency (RCE)=RC/VA

MVAIC=CEE+HCE+SCE+RCE

Value Added (VA) by a company within a specific financial year is needed to calculate the intellectual capital efficiency. CEE is the capital employed efficiency of the firm; Capital Employed (CE) is the total of all tangible assets. Human Capital efficiency (HCE) determines the efficiency of human capital on the value creation of the firm; HC is human capital measured by total employee expenditures. Structural Capital Efficiency (SCE) measures the efficiency of structural capital and the structural capital (SC) measured by VA-HC Relational Capital Efficiency (RCE) calculates the effectiveness of relational capital on value creation, and relational capital (RC) is measured by marketing, selling, and advertising expenses.

3.4.3 Control variables: In this study, Size, Age, Leverage and Industry Type is taken as control variable in the regression equation.

4. RESULTS AND DISCUSSION:

Dynamic Panel regression model

In the study the dependent variables are the financial performance of the selected companies as measured with the help of ROA and ROE. In the study the dynamic effect of the dependent variable is also examined. The dynamic effect indicates the impact of lagged variable of the dependent variable on itself. This is also known as presence of auto correlation in the dependent variable i.e. ROA and ROE. Thus, in order to incorporate the dynamic effect of the financial performance the dynamic panel data models were applied. The dynamic models are divided into two categories namely difference GMM and system GMM. The results of the dynamic panel regression model are discussed below:

4.1 Intellectual capital (MVAIC) and financial performance (ROA)

The system GMM model is used to analyse the impact of intellectual capital efficiency on the financial performance of the selected companies as measured with the help of ROA. The one lagged term of the ROA is also included in the system GMM model. The results of the system GMM model conducted on the STATA software is shown below in Table 1.

Table 1: Dynamic Panel Regression Model (GMM Model)

Independent variable	Regression coefficients	Standard Error	Z Statistics	P value	Wald Statistics (p value)	Arrelano-Bond AR(1) test AR(2) test
ROA. L1	0.3424	.0196	17.48	0.000*	**569.56 (0.000)**	AR1 test -1.9977 (0.045)
MVAIC	0.1038	.0112	9.22	0.000*		
Log (TA)	-1.302	.254	-5.13	0.000*		
Log (Age)	1.215	.529	2.29	0.022**		AR2 test 0.457 (0.647)
DER						
Industry_type	-8.357	2.910	-2.87	0.004*		
Constant	12.978	10.619	1.22	0.222		

*Note: ** Significant at 5 % significance level *Significant at 1% significance level*

The results presents in table1 indicates that the lagged variable of ROA is found to have significant impact on the dependent variable ROA. Further the intellectual capital efficiency (regression coefficients = 0.1038, p value= 0.000) is found to have significant impact on the ROA of the selected companies. The impact of included control

variables is also found to have significant impact on ROA of the selected companies. The AR (1) test is found to be significant, whereas the AR (2) is found to be insignificant. Thus it is concluded in the intellectual capital efficiency significantly influences the financial performance of the selected companies as measured with the help of ROA.

4.2 Intellectual capital (MVAIC) and financial performance (ROE)

The system GMM model is used to analyse the impact of intellectual capital efficiency on the financial performance of the selected companies as measured with the help of ROE. The one lagged term of the ROE is also included in the system GMM model. The results of the system GMM model conducted on the STATA software is shown below in table 2:

Table 2: Dynamic Panel Regression Model (GMM Model)

Independent variable	Regression coefficients	Standard Error	Z Statistics	P value	Wald Statistics (p value)	Arrelano-Bond AR(1) test AR(2) test
ROE. L1	0.2129	.010	21.11	0.000*		
MVAIC	0.2095	.090	2.31	0.021**		AR1 test -2.5745 (0.0100)
Log.TA	-5.173	.639	11.25	0.000*	**1053.17 (0.000)**	
Log.Age	-.795	.641	2.29	0.022**		AR2 test 1.400 (0.1615)
DER	4.669	.415	11.25	0.000*		
Industry_type	-18.297	10.263	-2.87	0.004*		
Constant	28.603	39.308	1.22	0.222		

*Note: ** Significant at 5 % significance level *Significant at 1% significance level*

The results shows in table 2 indicate that the lagged variable of ROE is found to have significant impact on the dependent variable (ROE). Further the intellectual capital efficiency (regression coefficients = 0.2095 p value= 0.021) is found to have significant impact on the ROE of the selected companies. The impact of included control variables is also found to have significant impact on ROE of the selected companies. The AR (1) test is found to be significant, whereas the AR (2) is found to be insignificant. Thus it is concluded in the intellectual capital efficiency significantly influences the financial performance of the selected companies as measured with the help of ROE.

5. CONCLUSION

In today's knowledge economy, the firms those are successfully able to manage their Intellectual Capital and its components will have better profitability and higher value. Therefore, these firms are advised to take a note of the findings and focus on improving their competitive advantage using IC. Firms need to realize better ways in which to use their IC to increase their profitability and create value. It is found that intellectual capital (MVAIC) has a significant positive impact on the ROA and ROE of the selected companies. It reveals that efficient use of the

intellectual capital results in a higher return on assets and return on equity for the shareholders. Indian firms can improve their financial position by proper utilization of intellectual capital. The findings results support the significant role of Intellectual capital in creating value for shareholders and other stakeholders and provide strong support to the arguments that IC is a valuable resource for a company's competitive advantages and will contribute to the company's financial performance. The results indicate that the lagged variable of ROA is found to have significant impact on the dependent variable ROA. The results are similar to the findings of Phusavat (2011) and Sardo and Serrasqueiro (2018). The result shows that the lagged variable of ROE is found to have significant impact on the dependent variable (ROE).

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