Intellectual capital and corporate financial performance in India's central public sector enterprises

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Abstract: The purpose of this paper is to empirically examine the effect of intellectual capital on the financial performance of the central public sector enterprises (CPSEs) operating in India and also to analyse the contribution made by each component of intellectual capital in the financial performance of the organisation. Secondary data were collected from the constituent companies of the S&P Bombay Stock Exchange (BSE) CPSE index from 2009 to 2018. VAIC™ methodology developed by Professor Pulic has been employed for measuring the intellectual capital efficiency of the CPSEs. The results revealed that intellectual capital shows a weak relationship with profitability (ROA) and market valuation (MB), but it acts as a strong predictor of productivity (ATO). Also, the result shows that human capital is the most significant element among all the three components of intellectual capital, in enhancing the financial performance of the CPSEs.

Keywords: value added intellectual coefficient; VAIC; intellectual capital; financial performance; central public sector enterprise; CPSE; India; profitability; productivity; market valuation; human capital; structural capital; physical capital.

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1 Introduction

With the advent of the technological era and the implementation of the new economic policy, i.e., the liberalisation, privatisation and globalisation, companies are now facing intense competition with their rivals. To endure, dilate and prosper, the business needs such type of strategic assets which cannot be imitated by their competitors. As physical and financial assets can be very easily purchased and arranged by the contender, so here comes the concept of the intellectual capital (IC). In the present economy, knowledge and information, experience and expertise, research and development, relation and attitude towards the stakeholders, etc. plays a dominant role in achieving the competitive advantage by the firm. These non-physical resources such as knowledge, experience, technology and relations together constitute the intellectual capital (Ghosh and Mondal, 2009; Mohammed and Irbo, 2018).

In realism, the wealth of the modern economy now changes from tangible capital to intangible capital. Not only that, there are many companies in the world which are making a vast profit by relying only on the intangible assets (Mondal and Ghosh, 2012). However, the firm faces the real challenge for quantifying their intangible assets, i.e., their IC. Measuring the IC is essential for the firm as both tangible and intangible resources are imperative for enhancing the financial performance of the firm. Many researchers (Bontis, 2001; Edvinsson and Malone, 1997; Mondal and Ghosh, 2012) are of the opinion that traditional financial statements failed to replicate the actual value of the companies as it only concentrates on the financial aspects of the organisation. Measuring and quantifying the benefits of IC such as innovation, increased efficiency of the employees and management, advanced research and development, healthy customer-supplier relationship, etc. is a difficult and challenging task. So the traditional accounting statement may deceive the stakeholders regarding their investment decision, especially in the circumstances when the companies had a gigantic portion of their investment in intangible resources (Firer and Williams, 2003).

In this backdrop, researchers and academicians across the globe had developed many tools and techniques for measuring the IC and checked the linkage of the intellectual capital with the organisation's financial performance. Since there is no consensus on IC measurement methods identified from the existing literature; the researcher and academician identifies more than 40 methods till date. Among all the tools and techniques developed, Pulic (1998) suggested a technique named value added intellectual coefficient™ (VAIC™). Existing literature in different sectors and industries across the world shows the acceptability and reliability of VAIC™ methodology.

Sincere efforts have been made by the researchers across the different countries of the world and in different industry setup to examine the importance of IC in enhancing the performance of the firm. For instance, Saeed et al. (2016) checked this relationship on top 100 Pakistani companies; Riahi-belkaoui (2003) on US multinational firms; Lin et al. (2017) on Taiwanese construction industry; Vidyarthi (2018) on Indian banks; Cisneros and Hernandez-perlines (2018) on the Mexico manufacturing sector; Ginesti et al. (2018) on Italian firms; Adesina (2019) on African banking industry and so on. Earlier, IC was considered vital only for the knowledge-intensive industry, but now it is being considered important for the other industry also like the manufacturing industry (Kamath, 2017). Therefore, this relationship needs to be validated in different country and in different sector because the condition and situation varies from country-to-country and from industry-to-industry. For, e.g., developing economy have abundance of cheap labour but

their financial resources are scarce whereas developed economies have abundance of financial resources but there is a shortage of cheap labour. Also, Smriti and Das (2018) are of the opinion that in the developing countries like India, the IC reporting and disclosure are in the stage of infancy. Therefore, this research is a deliberate attempt to investigate the relationship, if any, in between the intellectual capital efficiency of the central public sector enterprises (CPSEs) of India and their financial performance.

CPSEs are those companies whose 51% or more of its holding are in the hands of Central Government of India (S&P Dow Jones Indices, 2018). In FY 2016–2017, there were total 331 CPSEs in India, out of which 257 CPSEs were in operation and remaining 74 CPSEs were under-construction and employed approximately 11.31 lakh people. As on 31st March 2017, the total investment in all 331 CPSEs amounted to `12.50 lakh crore, and India earns more than 14% of total foreign exchange through these CPSEs, amounting to `87,616 crores (Press Information Bureau, 2018). The contribution made by these CPSEs in India's GDP in the FY 2016–2017 is around 4.63% (FE Bureau, 2018). It constitutes 9.10% of the total market capitalisation of the firms listed in Bombay Stock Exchange (BSE) (Department of Investment and Public Asset Management, 2019). These CPSEs played a critical role in the industrial development by contributing to the different sectors which includes electrical engineering equipment, tea plantation, precision tools, heavy industries, consultancy, civil construction, etc. (Enterprises, 2017). Therefore, data from these CPSEs were taken to scrutinise the relationship between the intellectual capital efficiency of the CPSEs and their financial performance.

2 Review of literature

2.1 Intellectual capital, its component and measurement

Till now, there is no oneness regarding the definition of intellectual capital. Different researchers and academicians had given their definition. Some researchers define IC as the intangible assets which are not listed on the traditional balance sheet of the organisation although it has the positive effect on the business performance (Mondal and Ghosh, 2012; Ozkan et al., 2017). However, Andriessen (2004) and Stewart (1997) define IC as 'a packaged useful knowledge'. Leif Edvinsson, the world first director of intellectual capital at Skandia Assurance & Financial Service (AFS) defines IC as 'knowledge that can be converted into value' (Edvinsson and Sullivan, 1996). On the other hand, Skandia AFS defines IC as "possession of knowledge, stakeholder relationship, an applied experience of the employees, professional skills and business technology which together employed to attain the competitive advantage by the firm."

Experts of intellectual capital classified it into three components: human capital (HC), structural capital (SC) and relational (customer) capital (RC) (Edvinsson, 1997; Saint-Onge, 1996; Stewart, 1997).

Human capital (HC) is one of the vital elements of IC and helps in escalating the performance of the organisation (Cabrita and Bontis, 2008; Edvinsson and Malone, 1997; Seleim et al., 2004). It is the knowledge that resides within the employees which embraces their knowledge and skill, talent and behaviour, experience and expertise, problem-solving ability, creativity and competence, etc. (Ramandeep and Narwal, 2016; Ricceri, 2008).

Structural capital (SC) is the non-physical components created by the employees but owned by the organisation and stays within the organisation when employees leave the firm. SC acts as the support for the HC and includes organisation systems and charts, concepts and models, patents and databases, etc. (Ghosh and Mondal, 2009).

Relational capital (RC) is defined as the rapport of the firm with the suppliers and customers (Sveiby, 1997). It includes the combination of the relationship of the firm with the various stakeholders which include customers, competitors, community, suppliers, government, etc. and the goodwill of the business on the basis of products and services offered to the stakeholders (Curado et al., 2014; Singh et al., 2016).

So far as now, IC acts as a critical success factor in almost all types of organisation. This study employs the VAIC™ methodology or the Austrian approach developed by Pulic (1998, 2000) in the Austrian Intellectual Capital Research Centre (AICRC). The VAIC™ methodology has the following advantages over the other measures (Chen Goh, 2005; Chen et al., 2005; Firer and Williams, 2003; Ghosh and Mondal, 2009; Tseng and Goo, 2005):

- it provides handy information to all the stakeholders with the help of which they can assess and compare the performance of the different companies
- it is easy to calculate as it uses the data which can be easily found in the audited financial reports of the company
- it considers human capital (HC) as one of the vital sources of intellectual capital which is in line with all the prominent definitions of IC found in the existing literature.

2.2 Intellectual capital literature review

There are a large number of studies conducted across the globe to check the effect of IC on the financial performance of the organisation by applying the VAIC™ methodology. For example, Afroz et al. (2018) observed that in textile sector of Bangladesh, human capital is insignificant for profitability, productivity and market valuation whereas physical capital acts as a robust predictor for profitability, productivity and market valuation. Another study was conducted by Smriti and Das (2018) on the Indian firms listed in COSPI, and they discovered that firm's productivity was significantly affected by the human capital whereas sales growth and market value can be improved by employing the structural capital and physical capital. Khalique et al., (2018) checked the same association of IC with financial performance in the knowledge-intensive SMEs of Malaysia. The results revealed that all the six elements of IC are significant for the performance of the organisation. A similar study was conducted on the 121 pharmaceutical firms listed on the BSE of India by Smriti and Das (2017) and found that only profitability is significantly affected by the IC while for productivity and market valuation, IC remains insignificant. Besides, the results also showed that physical and structural capital act as an essential element for enhancing market valuation and productivity of the pharmaceutical firms in India.

Another study was conducted by Kweh et al. (2019) in Malaysia for exploring the relationship between IC and firm performance and also to check the moderating role of government ownership on the above relationship. They found that the firms under government ownership and non-government ownership are significantly different in

terms of firm performance. Singh et al. (2016) conducted a study on Indian banks and found that banks profitability could be increased by improving the efficiency of IC. A similar study on 38 Indian banks was conducted by Vidyarthi (2018) for the 12 years and revealed that the relationship between the IC and three efficiency scores are significant and positive while only HCE in all the three components of IC is significant and positive. However, the impact of IC and HCE on the three efficiency scores is very minimal. Another research on the banking industry of the six Gulf Cooperation Council (GCC) counties by Al-Musali and Ku Ismail (2016) revealed that there exists a very strong liaison between the VAIC and their financial performance. They also discovered that in regards to the IC performance, Qatar ranks first while Bahrain is on the last rank. Khalique and de Pablos (2015) checked this relationship in electrical and electronic SMEs in Malaysia and found that the success of the firm depends strongly on the intellectual capital of the organisation.

Chen et al. (2005) researched the Taiwan listed companies and discovered that intellectual capital had a substantial positive influence on market valuation, profitability and revenue growth. Firer and Stainbank (2003) examined the data of 65 companies listed on Johannesburg Stock Exchange (JSE) and found that the intellectual capital well explains the productivity and profitability, but it failed in explaining the market valuation. A study conducted on the companies constituting the Hang Seng Index (HSI) of the Hong Kong Stock Exchange by Chan (2009a, 2009b) aimed at exploring the association between the IC and four financial performance measures of the organisation. The researcher found that only a moderate relationship exists in between the IC and profitability while among the components of IC, physical capital is the significant player in enhancing the financial performance of the company.

Another study on US multinational firm by Riahi-belkaoui (2003) had revealed a strong positive rapport between the IC and the financial performance of the multinational companies. Mondal and Ghosh (2012) conducted a study on 65 Indian Banks and found that profitability (ROA and ROE) and productivity (ATO) is positively associated with the IC. The results also revealed that human capital (HC) contributes significantly to the profitability (ROA) while structural capital (SC) and relational capital (RC) are vital only for the productivity (ATO). A study on 141 Japanese banks conducted by Mavridis (2004) aims at checking the relationship of intellectual capital and physical capital with a value-based performance of the banks. The researcher found that there exist a significant positive correlation only in between the physical capital and value added. Ghosh and Mondal (2009) in their study had reported that IC is only significantly affecting the profitability while productivity and market valuation remains insignificant with the intellectual capital. In contrast with these studies, Firer and Williams (2003) found that firm performance remains unaffected by the corporate intellectual ability.

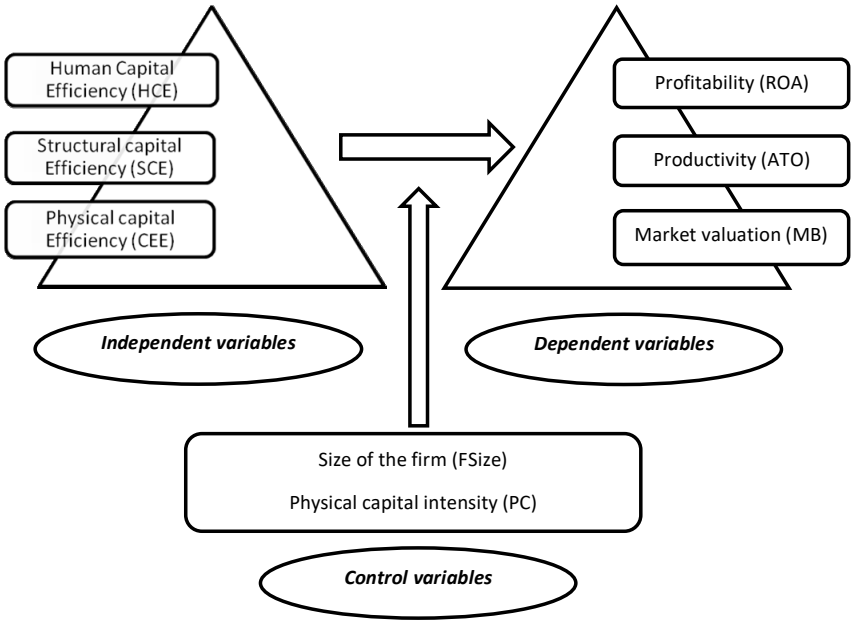
3 Research methodology

3.1 Objectives of the study

After an extensive literature review, it is very much clear that the researchers across the globe have investigated in the different sectors regarding the association between the intellectual capital and the financial performance of the business organisation. Based on

the review of the literature, the authors developed a conceptual model illustrated in Figure 1.

Figure 1 Conceptual model



Source: Compiled by the authors

Therefore, in the light of the existing literature, the principal objective of the study is to make contribution to the existing literature on the intellectual capital and financial performance of the firm by providing evidences from the India's CPSEs just because of the reason that these firms remain unexplored for the IC research. Although, the other primary research objectives of the study are as under:

- to evaluate the VAIC and its component and rank the firm as the best performer and poor performer depending on VAIC
- to assess the degree of association between the intellectual capital efficiency and corporate financial performance of the selected CPSEs
- to analyse the contribution of each component of VAIC on the financial performance of the selected CPSEs.

3.2 Hypotheses of the study

By critically reviewing the literature on IC and financial performance using the VAIC™ methodology, the first set of hypotheses is projected to inspect the relationship between the IC and three financial performance measures. Here positive association is expected in between the IC and three measures of financial performance as observed by many studies across the globe (Al-Musali and Ku Ismail, 2016; Mondal and Ghosh, 2012; Ku Ismail and Al-Musali, 2011; Zéghal and Maaloul, 2010). The hypotheses are as under:

H1a Companies with a higher intellectual capital efficiency (VAIC™) have higher profitability.

H1b Companies with a higher intellectual capital efficiency (VAIC™) have higher productivity.

H1c Companies with a higher intellectual capital efficiency (VAIC™) have higher market value.

Human capital (HC) is perceived as the utmost vital component of intellectual capital (Pulic, 2004). Experience and talented personnel make the difference between profit and loss and efficiency and inefficiency (Al-Musali and Ku Ismail, 2016). Therefore, based on the results of the previous studies (Kamath, 2008; Choudhury, 2010; Mondal and Ghosh, 2012; Ozkan et al., 2017; Sharabati et al., 2010), the researcher has hypothesised that human capital is positively associated with the three financial performance measures. The hypotheses are as under:

H2a Companies with higher HCE have higher profitability.

H2b Companies with higher HCE have higher productivity.

H2c Companies with higher HCE have a higher market valuation.

Structural capital (SC) includes the entire supportive infrastructure that is indispensable for the smooth and efficient functioning of the human capital. Therefore, structural capital is termed as a facilitator in augmenting the learning and creativity of the human capital (Bontis et al., 2000). On the above basis, following hypotheses are framed:

H3a Companies with higher SCE have higher profitability.

H3b Companies with higher SCE have higher productivity.

H3c Companies with higher SCE have a higher market valuation.

Meanwhile, values cannot be created without a minimal amount of physical and tangible asset (Pulic, 1998). Many previous studies had verified this statement (Firer and Williams, 2003; Mehralian et al., 2012; Ozkan et al., 2017; Puntillo, 2009; Dzenopoljac et al., 2017). Based on this, the following research hypotheses are formulated:

H4a Companies with higher CCE have higher profitability.

H4b Companies with higher CCE have higher productivity.

H4c Companies with higher CCE have a higher market valuation.

3.3 Research methods

This section describes the various variables used in the study and their proxy measures for performing the analysis systematically. These are discussed in the following sections.

3.3.1 Independent variables

The VAIC™ (Pulic, 1998) methodology is applied for computing the efficiency of the intangible assets of these CPSEs and forms the basis for the independent variables. The VAIC™ is measured by using three components, as it is made on the supposition that

value can only be created with an addendum of intellectual capital along with the financial and physical capital. Higher the VAIC coefficient more will be the value created with the same amount of resources of the organisation (Pulic, 1998, 2000). These three components are human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE).

The first step in calculating the VAIC™ is to calculate the organisation's value added (VA). VA refers to the total value added to the firm by employing all its available physical, financial and intangible capital (Nawaz, 2019). The following algebraic equation shows the computation of the VA:

$$VA_i = I_i + DP_i + D_i + T_i + R_i$$

where VA_i is the value added to the firm *i*; I_i is the interest expenses of the firm *i*; DP_i is the depreciation and amortisation expenses on fixed assets of the firm *i*; D_i is the dividend paid by the firm *i*; T_i is the corporate tax of the firm *i* while R_i is the cumulative retained profits of the firm *i*.

After computing the VA, the next step is to calculate the components of VAIC™, i.e., HCE, SCE and CEE. HCE is the efficiency of human capital employed that creates the value. Following the leading researchers of IC, 'total salaries and wages' are used as an indicator of human capital (Edvinsson, 1997; Pulic, 1998; Sveiby, 1997). Hence, HCE is the generated amount of VA per monetary unit infused on the employees of the organisation. Algebraically,

$$HCE_i = VA_i / HC_i$$

where

HCE_i human capital efficiency coefficient of firm *i*

VA_i value added to the firm *i*

HC_i total salary and wage cost of the firm *i*.

Now the time comes for the calculation of the structural capital efficiency (SCE). It starts with the computation of structural capital (SC) of the firm. According to the review, structural capital is the results of the past performance of the human capital, e.g., patents, license, relationship with the suppliers and customers, etc. (Al-Musali and Ku Ismail, 2016). According to the inventor of the VAIC™, Pulic (1998, 2000) states that SC is the result of subtracting HC from value added (VA) of the firm. Algebraically,

$$SC_i = VA_i - HC_i$$

where

SC_i structural capital of the company *i*

VA_i value added to the company *i*

HC_i total salary and wage cost of the firm *i*.

The above equation shows that the larger the portion of HC in the value creation, the smaller the share of SC, i.e., the relationship between the human and structural capital in creating the value for the organisation is inversely proportional to each other. Therefore,

SCE is the efficiency of the structural capital employed in generating the value for the firm. It can be expressed in the following formula:

$$SCE_i = SC_i / VA_i$$

where

SCE_i structural capital efficiency coefficient of firm *i*

SC_i structural capital of the company *i*

VA_i value added to the company *i*.

The last step in the computation of VAIC™ involves the calculation of capital employed efficiency (CEE). CEE is the efficiency of physical and financial capital in value creation for the business organisation. It can be obtained by using the following formula:

$$CEE_i = VA_i / CE_i$$

where

CEE_i capital employed efficiency coefficient of the firm *i*

VA_i value added to the company *i*

CE_i capital employed in the firm *i*.

Finally, VAIC™ can be acquired by adding HCE, SCE and CEE. Algebraically:

$$VAIC_i^{TM} = HCE_i + SCE_i + CEE_i$$

3.3.2 Dependent variables

Turning towards discussing the dependent variable, financial performance of the business organisation in this study is evaluated by the accounting ratios of profitability (ROA), productivity (ATO) and market valuation (market-to-book value – MB ratio). The reasons for taking these variables are that these ratios are widely being used in the majority of the previous studies (Kamath, 2008; Chan, 2009a, 2009b; Firer and Williams, 2003; Ghosh and Mondal, 2009; Mehralian et al., 2012; Ramandeep and Narwal, 2016; Smriti and Das, 2017).

ROA shows the efficacy of utilising the resources of the organisation in generating profits. It also shows the excess of revenue over the cost and reflects the profitability of the firm. It is the ratio of *net income (PAT) and the total assets* of the firm. *ATO* describes the efficiency of converting the input into the output and used for showing the productivity of the organisation. It is the ratio of *total revenue and total assets* of the respective firm. Last dependent variable is the *MB* value ratio, which shows the excess of market value over the book value of the firm, i.e., the market value of the organisation that the stockholders are amenable to pay. It is obtained by dividing the *market capitalisation with the book value of total assets* of the organisation.

3.3.3 Control variables

Consistent with the prior studies, size of the firm and physical capital intensity were included in the study for controlling their influence on the dependent variable. The size of

the firm (FSize) is computed by the natural log of total market capitalisation of the individual firm for controlling the effect of size on value creation (Chan, 2009a, 2009b; Chen et al., 2005; Firer and Stainbank, 2003; Firer and Williams, 2003). Whereas, physical capital intensity (PC) is calculated by dividing the fixed assets of the company by its total assets for controlling the consequence of fixed assets on the performance of the firm (Firer and Stainbank, 2003; Firer and Williams, 2003; Ghosh and Mondal, 2009).

3.4 Regression models

The regression analysis contains the six regression models. Models 1, 2 and 3 examine the association between the three measures of financial performance (i.e., ROA, ATO and MB) and an aggregate measure of intellectual capital (i.e., VAIC™) after controlling for the size of the firm and physical capital intensity. These three models are used to examine Hypotheses H1a, H1b and H1c respectively.

$$\text{Model 1}: \text{ROA} = \alpha + \beta_1 \text{VAIC™} + \beta_2 \text{FSize} + \beta_3 \text{PC} + \varepsilon$$

$$\text{Model 2}: \text{ATO} = \alpha + \beta_1 \text{VAIC™} + \beta_2 \text{FSize} + \beta_3 \text{PC} + \varepsilon$$

$$\text{Model 3}: \text{MB} = \alpha + \beta_1 \text{VAIC™} + \beta_2 \text{FSize} + \beta_3 \text{PC} + \varepsilon$$

While in the last three models, i.e., models 4, 5 and 6, the three constituents of VAIC™, i.e., HCE, SCE and CEE are used as a predictor of corporate financial performance. Here also, the control variables, i.e., firm size and physical capital intensity are also included for controlling their effect.

Model 4 is used for examining the Hypotheses H2a, H3a and H4a:

$$\text{Model 4}: \text{ROA} = \alpha + \beta_1 \text{HCE} + \beta_2 \text{SCE} + \beta_3 \text{CEE} + \beta_4 \text{FSize} + \beta_5 \text{PC} + \varepsilon$$

Model 5 is used for examining the Hypotheses H2b, H3b and H4b:

$$\text{Model 5}: \text{ATO} = \alpha + \beta_1 \text{HCE} + \beta_2 \text{SCE} + \beta_3 \text{CEE} + \beta_4 \text{FSize} + \beta_5 \text{PC} + \varepsilon$$

Model 6 is used for examining the Hypotheses H2c, H3c and H4c:

$$\text{Model 6}: \text{MB} = \alpha + \beta_1 \text{HCE} + \beta_2 \text{SCE} + \beta_3 \text{CEE} + \beta_4 \text{FSize} + \beta_5 \text{PC} + \varepsilon$$

3.5 Data source and sample size

Prowess database has been used for extracting the data which is maintained by the Centre for Monitoring Indian Economy (CMIE) for the ten years, i.e., from 2008–09 to 2017–18. The sample of the study encompasses 43 companies of S&P BSE CPSE index out of the total 49 companies in the index. The data of the rest six companies were dropped out as continuous data was not available. These 43 companies together comprise around 97% of net sales and 95% of market capitalisation for all the CPSE constituting the S&P BSE CPSE index in the year 2018. Their importance for the Indian economy motivates the researcher for taking the data of these companies for the present study.

4 Findings of the study

4.1 Descriptive statistics

The descriptive statistics of the dependent, independent and control variables are presented in Table 1. Profitability (ROA) and productivity (ATO) had means of 4.50% and 13.91% respectively, and market valuation (MB) had a mean of 1.372 times. Comparing the values of independent variables indicate that human resource (HCE) is more significant in creating the value added for the CPSEs as compared to structural (SCE) and physical capital (CEE). These values can be used for the comparison purpose across different sectors within the countries and even outside the country.

Table 1 Descriptive statistics of all the variables in the study

Variables	*Mean*	*SD*	*Minimum*	*Maximum*
ROA	0.045	0.156	–1.109	1.027
ATO	1.391	3.690	–0.00005	28.597
MB	1.372	2.321	0.033	28.996
HCE	60.655	180.208	–18.981	1,725.487
SCE	0.856	0.703	–9.640	3.603
CEE	0.920	2.043	–14.349	21.316
VAIC™	62.432	180.233	–20.550	1,727.551
FSize	3.805	0.952	0.955	5.435
PC	0.246	0.185	0.0002	0.793

Note: Sample size (n) = 430.

Source: Compiled by the authors

Figure 2 provides an understanding of the trends in India's CPSEs through the averages of the industry over the ten years from 2009 to 2018. It is very clear from the figure that profitability (ROA) and market valuation (MB) ratios fluctuated throughout the study period whereas productivity (ATO) shows a decreasing trend continuously from 2012 onwards.

Figure 3 shows the trend of VAIC and its component in India's CPSEs. The VAIC changes mainly with the change in the human capital efficiency (HCE). HCE shows an increasing trend from 2012 onwards till the year 2017, then again decreases in 2018. SCE and CEE fluctuated throughout the study period, but it burgeons drastically in the year 2015 and 2016 respectively.

4.2 VAIC ranking

From VAIC and market capitalisation for the year 2018, the firms are ranked as best performer and the poor performer. These are given in Table 2.

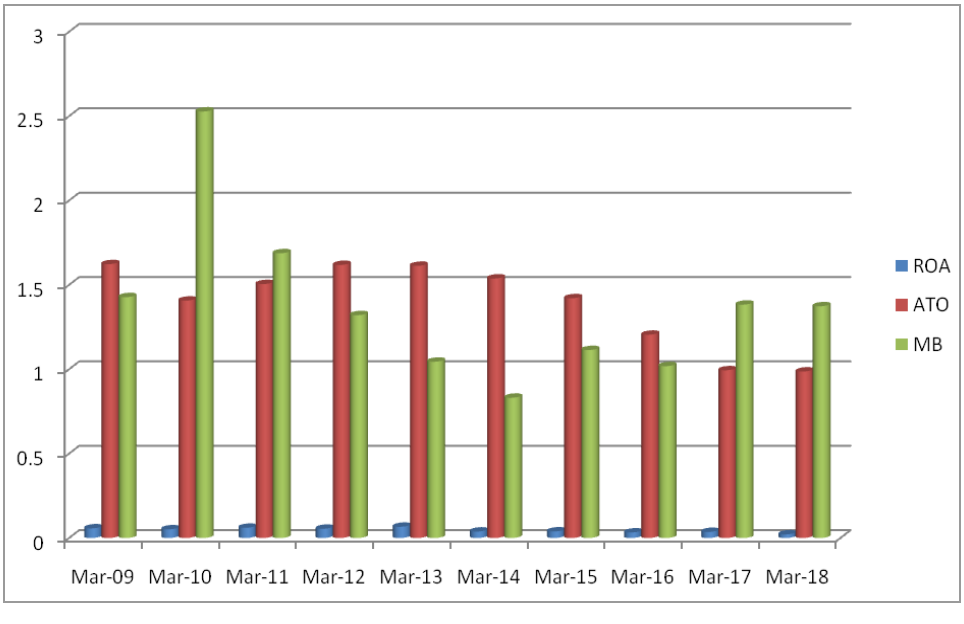
Top 5 performers on the basis of VAIC include three Navratna companies and two Miniratna companies. On the other hand, top 5 performers by market capitalisation include four Maharatna companies and one Navratna company. The results are very bewildering and unexpected that these Maharatna companies which have an average annual net profit of over `5,000 crores are not on the top of VAIC ranking except one.

The reason for this appears to be that they are not leveraging their intellectual ability properly and their primary focus is only on the physical capital. The results also showed that these Navratna and Miniratna companies in comparison to Maharatna companies leverage their intellectual ability efficiently.

Table 2 Top and poor performer by VAIC and market capitalisation

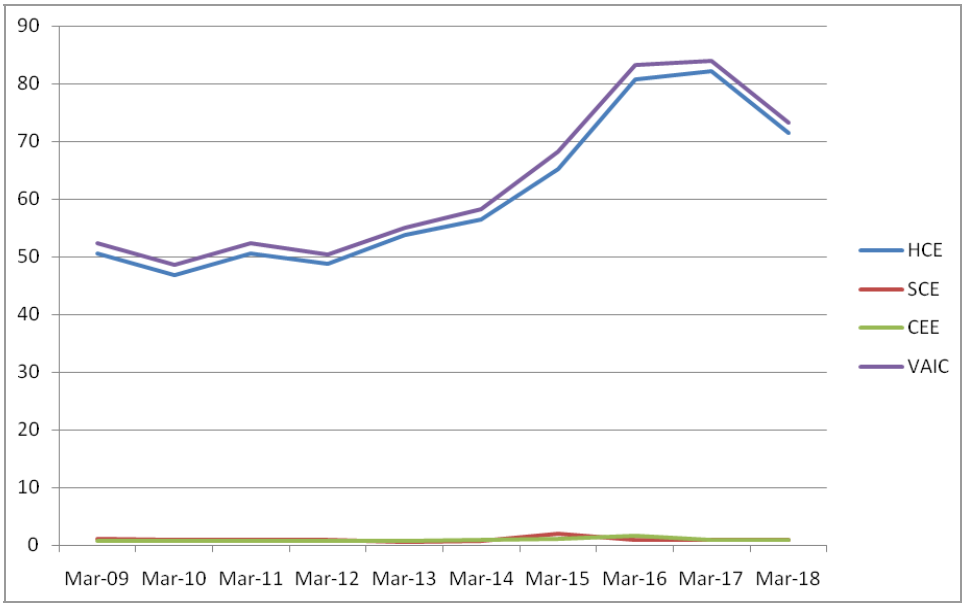
On the basis of VAIC of 2018		*On the basis of market capitalisation of 2018*	
Top 5 performer		Top 5 performer	
1	Balmer Lawrie Investment Ltd.	1	Oil & Natural Gas Corporation Ltd.
2	Power Finance Corporation Ltd.	2	Coal India Ltd.
3	Rural Electrification Corporation Ltd.	3	Indian Oil Corporation Ltd.
4	Mangalore Refinery & Petrochemicals Ltd.	4	NTPC Ltd.
5	Rashtriya Chemicals & Fertilizers Ltd.	5	Power Grid Corporation of India Ltd.
Poor 5 performer		Poor 5 performer	
1	Bharat Immunologicals & Biologicals Corporation Ltd.	1	State Trading Corporation of India Ltd.
2	Mahanagar Telephone Nigam Ltd.	2	Scooters India Ltd.
3	Hindustan Fluoro Carbons Ltd.	3	Hindustan Organic Chemicals Ltd.
4	Indian Telephone Industries Ltd.	4	Bharat Immunologicals & Biologicals Corporation Ltd.
5	Hindustan Organic Chemicals Ltd.	5	Hindustan Fluoro Carbons Ltd.

Figure 2 Average financial ratios of CPSE from 2009 to 2018 (see online version for colours)



Source: Compiled by the author

Figure 3 Average of HCE, SCE, CEE and VAIC for the year 2009 to 2018 (see online version for colours)



Source: Compiled by the author

4.3 Regression results and analysis

In presenting the regression results, the standardised regression coefficient (β) along with the *t*-value and *p*-value are shown. Values of β can be used to investigate the predictive power of the independent variables. Besides, variance inflation factor (VIF) has also been reported in the table of the regression results, which shows the existence of the problem of multicollinearity if VIF is above 10 (Dormann et al., 2013).

The regression results for models 1, 2 and 3 are shown in Tables 3, 4 and 5 respectively. Models 1, 2 and 3 are used to assess the Hypotheses H1a, H1b and H1c respectively which aimed at exploring the relationship between VAIC™ and ROA, ATO and MB. The results in Tables 3, 4 and 5 revealed that in all the first three models, there is a momentous positive association between the efficiency of IC and financial performance of the business organisation. It shows the acceptance of the Hypotheses H1a, H1b and H1c but these models do not show good adjusted R^2 except for productivity (40%). In contrast, studies conducted by Kamath (2008) on Indian pharmaceutical industry have very high adjusted R^2 in profitability (91%), productivity (90%) and market valuation (53%). The results revealed that, for escalating the financial performance of India's CPSEs, some other assets other than the intellectual capital have to be employed.

The regression analysis results of models 4, 5 and 6 are shown in Tables 6, 7 and 8 respectively. Model 4 is used to assess the Hypotheses H2a, H3a and H4a; model 5 is used to test the Hypotheses H2b, H3b and H4b while model 6 is used to examine the Hypotheses H2c, H3c and H4c. These models aimed at investigating the relationship

between the constituents of VAIC™ (i.e., HCE, SCE and CEE) and the financial performance of the organisation (i.e., ROA, ATO and MB).

Table 3 Multiple regression results of model 1

Variables	*Standardised coefficient (β)*	*t-value*	*p*	*VIF*
VAIC™	0.222	5.064	0.000*	1.028
FSize	0.337	7.764	0.000*	1.006
PC	–0.149	–3.383	0.001*	1.035
Adjusted R-square = 0.198				

Notes: H1a: Companies with a higher VAIC™ have higher profitability.
$ROA = \alpha + \beta_1 VAIC™ + \beta^2 FSize + \beta_3 PC + \varepsilon$.
*Significant at 5% level.

Source: Compiled by the authors

Table 4 Multiple regression results of model 2

Variables	*Standardised coefficient (β)*	*t-value*	*p*	*VIF*
VAIC™	0.599	15.793	0.000*	1.028
FSize	–0.219	–5.846	0.000*	1.006
PC	0.004	0.117	0.907	1.035
Adjusted R-square = 0.401				

Notes: H1b: Companies with a higher VAIC™ have higher productivity.
$ATO = \alpha + \beta_1 VAIC™ + \beta_2 FSize + \beta_3 PC + \varepsilon$.
*Significant at 5% level.

Source: Compiled by the authors

Table 5 Multiple regression results of model 3

Variables	*Standardised coefficient (β)*	*t-value*	*p*	*VIF*
VAIC™	0.129	2.806	0.005*	1.028
FSize	0.166	3.647	0.000*	1.006
PC	–0.248	–5.379	0.000*	1.035
Adjusted R-square = 0.117				

Notes: H1c: Companies with a higher VAIC™ have higher market valuation.
$MB = \alpha + \beta_1 VAIC™ + \beta_2 FSize + \beta_3 PC + \varepsilon$.
*Significant at 5% level.

Source: Compiled by the authors

The components of VAIC altogether explain 39.8% of the variation in the productivity (ATO) in which HCE performs a pivotal role by explaining 59.7% of the productivity outcome. For elucidating the variation of other two dependent variables profitability (ROA) and market valuation (MB), the VAIC components did not weigh much as only 22.8% and 11.4% variations are explained by them collectively. Although HCE is significant and positively affecting the profitability (ROA), productivity (ATO) and market valuation (MB) results in the acceptance of the Hypotheses H2a, H2b and H2c respectively. The results also revealed that SCE is the insignificant predictor of ATO and MB and significant interpreter of ROA but in the negative direction. Therefore, the regression results failed to accept the Hypotheses H3a, H3b and H3c.

Table 6 Multiple regression results of model 4

Variables	*Standardised coefficient (β)*	*t-value*	*p*	*VIF*
HCE	0.235	5.437	0.000*	1.035
SCE	–0.146	–3.377	0.001*	1.036
CEE	–0.102	–2.393	0.017*	1.008
FSize	0.357	8.288	0.000*	1.030
PC	–0.127	–2.933	0.004*	1.048
Adjusted R-square = 0.228				

Notes: H2a: Companies with a higher HCE have higher profitability.
H3a: Companies with higher SCE have higher profitability.
H4a: Companies with higher CCE have higher profitability.
$ROA = \alpha + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 FSize + \beta_5 PC + \varepsilon$.
*Significant at 5% level.

Source: Compiled by the authors

Table 7 Multiple regression results of model 5

Variables	*Standardised coefficient (β)*	*t-value*	*p*	*VIF*
HCE	0.597	15.672	0.000*	1.035
SCE	0.019	0.498	0.619	1.036
CEE	0.013	0.338	0.736	1.008
FSize	–0.222	–5.828	0.000*	1.030
PC	0.002	0.065	0.949	1.048
Adjusted R-square = 0.398				

Notes: H2b: Companies with higher HCE have higher productivity.
H3b: Companies with higher SCE have higher productivity.
H4b: Companies with higher CCE have higher productivity.
$ATO = \alpha + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 FSize + \beta_5 PC + \varepsilon$.
*Significant at 5% level.

Source: Compiled by the authors

Table 8 Multiple regression results of model 6

Variables	*Standardised coefficient (β)*	*t-value*	*p*	*VIF*
HCE	0.131	2.841	0.005*	1.035
SCE	–0.029	–0.631	0.528	1.036
CEE	0.014	0.299	0.765	1.008
FSize	0.171	3.700	0.000*	1.030
PC	–0.246	–5.293	0.000*	1.048
Adjusted R-square = 0.114				

Notes: H2c: Companies with higher HCE have a higher market valuation.
H3c: Companies with higher SCE have higher market valuation.
H4c: Companies with higher CCE have higher market valuation.
$MB = \alpha + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 FSize + \beta_5 PC + \varepsilon$.
*Significant at 5% level.

Source: Compiled by the authors

Also, CEE is the significant predictor only of ROA, but in the negative direction and for ATO and MB it is insignificant. The empirical results failed to support the Hypotheses H4a, H4b and H4c. Two control variables are also included in the study. First, the size of the firm (FSize), measured by the log of market capitalisation, is found to be significant and positively related with the profitability (ROA) and market valuation (MB) while it is significantly but negatively associated with the productivity (ATO). Second, the physical capital intensity (PC) is significant only for the ROA and MB but in the negative direction. In conclusion, the constituents of VAIC had merely little role to play in foretelling the financial performance of the CPSE's.

5 Conclusions and direction for future research

With the implementation of the new economic policy in 1991, the business scenario in India has changed drastically especially with the adoption of the policy of globalisation which converted the whole world into a single market. It opens many new business opportunities on the one hand but making the competition very stiff on the other. In this competitive environment, attaining the competitive advantage is possible only by employing those strategic assets/resources whose imitation is difficult for their competitors. So, here the intellectual assets such as knowledge and competencies, skills and experience, R&D, information and technology, etc. played very crucial role in attaining the competitive advantage.

Therefore in the light of above statement, this research is one of the few studies in the Indian context that explores the relationship in between the intellectual capital and the three dimensions of the financial performance of India's CPSEs. In the present study, the intellectual capital performance of CPSEs is measured by employing the VAIC™ methodology on the sample of 43 CPSEs listed on the S&P BSE CPSE index. Overall findings depend on the analysis of multiple regression which fails to establish any substantial positive relationship between the IC efficiency and their three financial performance measures, namely profitability (ROA), productivity (ATO) and market valuation (MB). One probable justification for this is that these CPSEs are placing greater stress on other kinds of assets for creating the value and augmenting their financial performance. These results are in line with the findings of many previous studies (Afroz et al., 2018; Chan, 2009a, 2009b; Deep and Narwal, 2014; Firer and Williams, 2003; Pal and Soriya, 2012; Dzenopoljac et al., 2017) which show a minimal role of intellectual capital in the organisation's financial performance. However, the empirical result contradicts few of the earlier studies (Chen et al., 2005; Tan et al., 2007) that show very high dependence of financial performance on the IC of the organisation. Next, we turn towards the finding of HC as it has generated a significant effect on all the three regression models.

The observed result confirms that all the three hypotheses relating to human capital are strongly accepted, i.e., companies with greater HCE have higher profitability, productivity and market valuation. The empirical findings imply that by increasing the investment in the human capital, CPSEs can heighten their profitability, productivity and market valuation. The positive relationship between human capital and market valuation shows that companies having a massive investment on the HC are valued higher by the stakeholders than the companies having a small amount invested on the HC. These findings are in contrast with the outcomes of few studies (Afroz et al., 2018; Chan,

2009a, 2009b; Smriti and Das, 2017) that show the inconsequential nature of human capital on the financial performance measures. There is more scope for the development of human capital in India's CPSEs by providing them with systematic training, reward according to performance, job security, proper motivation, recruitment and selection by merit, etc.

The regression results regarding the structural capital revealed that SCE remains insignificant for productivity and market valuation. The result shows the consistency with the findings of Kamath (2008), Chan (2009a, 2009b) and Mehralian et al. (2012). The possible reason for this dearth of relationship between the structural capital and market valuation shows that investors are insignificant regarding the SC while valuing the CPSEs. According to Chen et al. (2005), the reason for this weak relationship is due to the incompleteness of the SC in the VAIC™ methodology. Since advertising and R&D are treated as an expense and therefore not taken as a chunk of SC makes the structural capital incomplete. However, profitability is significantly negatively affected by the SCE. It indicates that by reducing the expenditure on the structural capital, CPSEs can improve their profitability.

Turning towards the physical capital, all the three hypotheses that had been assumed that higher physical capital would lead to higher financial performance were not supported. The results are in contrast with the findings of Afroz et al., (2018), Chan (2009a, 2009b) and Mohammed and Irbo (2018) in which very high significant association was found between the physical capital and the financial performance measure. CEE is only significantly associated with the profitability of the CPSEs but in the negative direction. It means that as more and more capital is employed in the business, the profitability of the CPSEs decreases. The result shows that even after investing a considerable amount, i.e., `12.50 lakh crore in these CPSEs as on 31st March 2017, this study indicates that physical and financial capital is insignificant for all the three financial performance measures. One possible reason for this may be that the managers and directors are not utilising their available funds properly or these CPSEs may be either undercapitalised or overcapitalised. So, proper reasons should be found out in further research that is not within the scope of this study.

Finally, we look at the findings of the two control variables included in the study. The results revealed that the size of the firm (FSize) is found to be positively related with the profitability (ROA) and market valuation (MB) but negatively associated with the productivity (ATO). It implies that in India, companies having the larger market capitalisation tend to be more profitable and valuable but less productive regarding income created per unit of assets devoted. Second, the physical capital intensity (PC) is significant only for the ROA and MB but in the negative direction. Since the assumption here was that the fixed assets help in improving and enhancing the financial performance of the organisation, but the results failed to support it. It means that by decreasing the investment in the fixed assets, the CPSEs can improve their profitability and market valuation.

The present study contributes in many ways: First, the study contributes to the scarce knowledge of the intellectual capital literature in developing countries like India. Second, it increases the awareness level among the stakeholders, especially to the managers and investors, regarding the importance of human capital in improving the measures of financial performance. Third, this study acts as a wakeup-call for developing the SC in the CPSEs such as improving the systems and databases, enhancing the technical

know-how, etc. This study has implications for the high-level managers and policy-makers, that disclosing of IC measurement, recording and reporting should be made obligatory so that the investors may become conscious and aware regarding the actual position of the company before investing their money.

This study is also not free from limitations which are as follows: the foremost is the inherent limitations of the VAIC™ methodology for the measurement of IC; therefore future research can be conducted with different models of IC measurement. Secondly, the data has been taken only for 43 CPSEs listed in S&P BSE CPSE index. Therefore in future, data from all operating 257 CPSEs can be taken, so that results obtained are more reliable. Third, this study focuses only on one sector, i.e., CPSEs. Future studies can be conducted on different sectors, and inter-sector comparison along with the inter-country comparison can be made.

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