1. **Introduction:-**

Progressive perceptual advancement in studies on economy has reached a stage where it demands monographic change in accounting and valuation systems of business entities. In the industrial age, tangible assets such as capital, plant and machinery were the main factors of productivity and value creation. But as knowledge economy unfolds itself, the predominant source of value generation is the knowledge worker who is professionally qualified and technically proficient (Bose & Thomas, 2007). Since the main value drivers are the tacit and explicit manifestations of human mind, the significance of intangible assets such as human capital, customer relations, brand name, corporate reputation, intellectual property, organizational processes, innovation and patents has increased in organizations.

It is often observed that market value of stocks of many companies is higher than the replacement cost of their tangible assets (Dumay, 2009; Guthrie, 2001; Sveiby, 1997b). A plausible explanation for this is existence of a different class of assets which is not reflected in the accounting information of firms. These resources are called Intellectual Capital (Brennan & Connell, 2000). In the germane literature, terms such as intellectual capital, intangible assets, and invisible resources have been interchangeably used by scholars. For almost two decades now, Intellectual Capital (IC) has been occupying a prominent position in economic wealth creation of firms. Hence, it is pertinent for organizations to recognize, measure and manage their Intellectual Capital for competitive advantage (Bhartesh & Bandyopadhyay, 2005). Moreover, organizations need to plan and budget for IC and its components which further necessitate its assessment. While Intellectual Capital embodies the future
growth potential of a firm, the success of that firm will require continuous renewal and efficient use of this asset (Wiig, 1997).

Study on Intellectual Capital is in the initial stages of development and hence, theorists and practitioners are still working on a widely accepted definition, classification and measurement method (Choong, 2008; Kaufmann & Schneider, 2004; Marr & Moustaghfir, 2005). An important factor is the element of intangibility, which makes it difficult to capture the facets of Intellectual Capital in entirety. Its valuation has to be done through indirect means, non-reporting of which leads to undervaluation of firms and sovereign states (Coakes & Bradburn, 2005).

Despite difficulties in identification and measurement, scholars have proposed various models for the valuation of IC. Generally, concept-based models have been proposed [For instance, FiMIAM by Rodov and Leliaert (2002) and 4-Leaf Model by Leliaert et al. (2003)]. Nevertheless, practitioners have also developed models based on their experiences in a particular organizational setting. One prominent example is the Skandia Navigator by Edvinsson and Malone (1997). Usually, questionnaire survey and accounting data-based methods have been applied to quantify Intellectual Capital.

Scholars have proposed a wide range of methods that measure IC at aggregate (firm) and micro (component) levels. These methods can be broadly classified into: (i) Indirect Methods which includes Market Capitalization Methods (MCM) and Return on Asset Methods (ROA) and; (ii) Direct Methods which includes Direct Intellectual Capital (DIC) Methods and Scorecard Methods. Amongst these, the direct methods are complex to employ because they require exhaustive identification and measurement of IC: its components and sub-components, by the management
practitioners. In comparison, the aggregate methods like MCM and ROA are easier to implement, but they have been criticized for being too simplistic in their approach.

This study measures Intellectual Capital efficiency at aggregate and component levels with the help of a modified version of Value Added Intellectual Coefficient (VAIC™) model and links it with the performance of Indian firms. Generally classified under the ROA method, VAIC™ model was postulated by Ante Pulic in 1993 (Pulic, 2004). It uses secondary data to calculate the efficiency of IC and its two components – Human Capital and Structural Capital. Here Intellectual Capital efficiency is the aggregate of the efficiencies of Human and Structural capitals. In addition, the model measures the efficiency of physical and financial capital of a firm by taking Capital Employed (CE) as a proxy variable. But this model has a basic limitation. Contemporary classification of Intellectual Capital describes three components of IC-Human Capital (HC), Structural Capital (SC) and Relational Capital (RC) (Hsu and Fang, 2009; Martín-de-Castro et al., 2011; Martínez-Torres, 2006; Seetharaman et al., 2004; Subramaniam and Youndt, 2005). VAIC™ captures the first two elements only, i.e., HC and SC. Hence, in accordance with the present-day literature, it needs to be extended further to accommodate Relational Capital as well. Another criticism of this model comes from Ståhle et al. (2011) who have argued that the aspects such as perfect superimposition and interdependency between the components of IC are problematic and debatable. This dissertation addresses these issues by adding Relational Capital in the VAIC™ model and by modifying the way the Intellectual Capital components are computed so as to remove the theoretical disagreements arising out of dependent relationship between IC components. Hence, an extended and modified VAIC™ (E-VAIC) model has been presented in this study.
The basic motivation for this dissertation work comes from the fact that Intellectual Capital is an evolving field of knowledge and hence, there is ample scope for research in this area. This has generated interest in academicians and practitioners, both. Therefore, numerous research writings, discussions, professional consultancies, workshops and course works have been dedicated to the theme of Intellectual Capital.

Secondary intellectual stimulus for this study comes from the observed discrepancy between prevailing Intellectual Capital typology and the VAIC™ model. As stated earlier, Relational Capital is missing in Pulic’s model. There are other criticisms as well. However, most of the researchers in India and world over have used original VAIC™ model, in sheer denial of the contemporary classification of Intellectual Capital. Their attempt has been to apply VAIC™ in different geographical and industrial settings. In comparison, the present work addresses some of the criticisms of VAIC™ and adds novelty to the model by inclusion of Relational Capital as a new variable. Another novelty of this dissertation is that each component of Intellectual Capital has been represented with a different proxy. For example, HC has been captured through the aggregate of Employee Cost and Directors’ Remuneration. The proxy used for SC is the sum of Administrative and Research & Development Expenses. For estimating RC, the sum of Advertising, Marketing, Selling and Distribution Expenses has been used. There is no proxy for IC because it is an aggregate of Human, Structural and Relational capitals. The use of such surrogates has helped in removing the interdependency between Human Capital and Structural Capital as seen in the VAIC™ model. Here, efficiency of each of these components independently contributes to the overall efficiency of the Intellectual Capital of a firm.
The primary objective of this research work is to measure the efficiency of Intellectual Capital and its components and to study its impact on the performance of firms in India. Here, the term ‘performance’ connotes to the financial performance. Basic assumption is that Intellectual Capital, Physical Capital (represented by Capital Employed) and the components of IC viz. Human Capital, Structural Capital and Relational Capital, are positively related to the performance of firms. Three measures of financial performance have been selected – Return on Assets (ROA), Return on Equity (ROE) and Return on Sales (ROS). They form dependent variables in the regression equations. Since Relational Capital has been introduced as the new variable, greater focus is on the behaviour of this variable. It is expected to exhibit a significant positive relationship with the dependent variables.

The second research objective of this study is to propose and empirically test an extended and modified version of the VAICTM model with the underlying assumption that in comparison to VAICTM, the new model (E-VAIC) shall be a better predictor of the strength of relationship between Intellectual Capital efficiency and performance of firms in India. This hypothesis has been tested by comparing the expounding power of the two models – VAICTM and E-VAIC.

For empirical investigation of the proposed hypotheses, firms belonging to three groups of industries from India – Pharmaceuticals, Information & Technology (IT) and Healthcare, have been selected. These sectors are knowledge driven and lay due emphasis on the quality of human capital, R&D activities, product & process innovation and intellectual proprietorship. Such features make these industries an attractive proposition for research on Intellectual Capital.
The general research hypotheses have been tested separately on these three industries. Pharmaceutical firms have given best results for Intellectual Capital Efficiency and Physical Capital Efficiency, both. Among the three components of Intellectual Capital, Human Capital has consistently shown strong association with firm performance across the industries. In comparison, the regression results for the other two IC components – Structural Capital and Relational Capital, are not as consistent. In tune with contemporary perspective, Relational Capital Efficiency was included in the overall schema of VAIC™ model. For Pharmaceutical firms, this variable has shown positive association with all three performance variables. However, for Software and Healthcare firms, it was found to be positive and statistically significant for ROS only. Thus, although Intellectual Capital literature indicates Relational Capital as a component of IC, the data and the methodology used in this study provide only partial support for inclusion of this variable in the VAIC™ model. In addition to testing the effect of IC efficiency on firm performance, the interaction effect between IC components has also been investigated. Generally, the predictive power of E-VAIC model has increased after interaction terms were added, thereby, indicating the presence of moderation effect in Intellectual Capital components.

While comparing VAIC™ and E-VAIC, the outcome has been ‘mixed’, with data supporting both the models in Indian context. In Pharmaceutical sector, VAIC™ has performed better. In case of Software firms, VAIC™ has shown superior results for ROA only. For Healthcare firms, E-VAIC has shown better results. These findings definitely build up a strong case in favour of the E-VAIC model proposed in this dissertation.
This research work has academic and professional implications. It has added value to the IC literature by enhancing the explanatory power of VAIC™ model. Since most of the previous studies (Abdulsalam et al., 2011; Clarke et al., 2011; Gan and Saleh, 2008; Ghosh and Mondal, 2009; Kamath, 2008; Kujansivu, and Lönnqvist, 2007; Maditinos et al., 2011; Mavridis, 2005; Mehralian et al., 2012; Pal and Soriya, 2012; Tan et al., 2007) have used VAIC™ in its original form, the present work is more contemporary in nature. For academicians and research scholars, this study opens up avenues for development of newer IC measurement models. Since E-VAIC, the new model has greater predictive power, practising managers and external stakeholders can use this model to assess IC efficiency of their firms.

This dissertation has been organised as follows – second section reviews literature on Intellectual Capital: its definition, typology, measurement techniques, accounting, and reporting. Trailing sub-sections deal with IC and performance of firms in Pharmaceutical, IT and Healthcare sectors. Status of Indian research on IC has been discussed next. Section three identifies research gaps and narrows down to research questions. Further, it states the general research hypotheses developed to answer research questions. Section four describes the research methodology. VAIC™ model has been discussed in section five. A commentary on VAIC™ has been attached. Section six describes the proposed model (E-VAIC). In section seven, variables have been described. In next three sections – 8, 9 and 10, the proposed model has been applied on three industries – Pharmaceutical, IT (Software) and Healthcare. Section eleven examines the interaction effect between IC components. Under section twelve, a general conclusion has been presented. The final three sections – 13, 14 and 15, deal with implications, limitations and future research prospects, respectively.