CHAPTER 2

REVIEW OF LITERATURE

IC could be understood as any creation of human intellect or mind. Inventions, Ideas, Know-how, design approaches, computer programs could also be included under the purview of intellectual capital. Current literature on intellectual capital, theory framework and measurement find its origin from accounting and financial perspectives, focusing on the firm level analysis (Botnis et.al., 1999, 2000, 2002). Researches across the globe have tried to delineate the concept of IC and its constituents. The battle for acceptance of IC as an important concept for assessing modern organizations has been largely won. Influential researchers like Karl Sveiby, Leif Edvinsson have all made enriching contributions to treat this “weightless wealth” as one of the most valuable wealth of an organization.

2.1 DEFINITION OF INTELLECTUAL CAPITAL

There are various definitions for intellectual capital. Researchers have tried to define and explore different facets of intellectual capital. But the general indication is that IC is a non-monetary asset without Physical existence but possesses value that can generate future earnings. Given below are important definitions by various researchers.

Itami (1987) has defined intellectual capital as intangible assets which include particular technology, customer information, brand name, reputation, corporate culture, that are valuable to a firms competitive power.
Barney (1991) opines that intellectual capital is something which is intangible and is a major strategic asset capable of generating sustainable competitive advantage and superior financial performance.

Stewart (1997) defined IC as “packaged useful information”. He has also stated that intellectual capital could be viewed as knowledge, information, intellectual property, experience that can be put to use to create wealth. Boudreau and Ramstad (1997) believe that IC is closely related to human resource management.

Botnis 1998, Botnis et.al, 1999 views that IC possesses intellectual attributes that can contribute to the value of the firm. It is a collection of intangible resources and their flows which contributes to the value generating process of the company.

Davenport and Prusak (1997) relates IC with technology, technological changes and those associated with information technology changes. Brooking (1997, p.13) identifies IC as “market assets”, “human centered assets”, “intellectual property assets” and “infrastructure assets”, which when combined with organizations’ other productive resources will eventually lead to value creation.

Roos and Roos (1997) are of the view that it is the “sum of knowledge of its members” and practical translation of this knowledge into brands, trademarks and processes. According to Sullivan (2000) intellectual capital could be defined as knowledge that can be converted into profit. Lev (2001, p.5) considers that an intangible asset is a claim to future business... and it does not have a physical substance.

Rastogi (2003) opines that IC is the collaborative effort of a firm’s human capital, social capital and knowledge management. Daum (2002) states that IC is an intangible characterized by a set of attributes which can
bring economic benefit quickly and it shows network effects. Many of the above definitions tell us about the critical inherent qualities of intellectual capital. To summarise

- intellectual capital lacks physical form;

- **It cannot exist on its own, but derives value from network effect,**

- It is a claim on future assets.

According to IAS 38, IC (IA) has been defined to include expenditures on advertising and marketing, research and developmental activities, human resource expenditures, copy rights, franchises, future interest, licenses, operating rights, patent, record masters, secret processes, trademarks and trade names, organizational structure and values that come from brand names.

### 2.2 INTELLECTUAL CAPITAL AND ITS COMPONENTS

By late 90’s there were numerous groups of researchers which included accounting professionals, management practitioners and academicians who tried to categorize IC. There has been a proliferation of essays, journal articles, conferences which talked seriously about the various components and classification of IC. All these classifications have helped to crystallize concept of IC. There has been a slight variation in framework proposed by various authorities but in the end we find there is great deal of convergence. According to IAS 38, IC (IA) came forward with a classification for ICs and concluded that intangibles could be classified into three categories. Perhaps this would be the first categorization from a non-accounting perspective. Accordingly intangible asset could be classified into three sub-categories as follows:
- Employee or individual competence
- Internal structure.
- External structure.

Another important definition for IC and its classification is offered by OECD (1999) which described Intellectual capital as the economic value of two categories of intangible assets. They are:

- Organizational (structural) capital –SC.
- Human capital(HC)

Human capital includes resources within organization and resources like customers partners, suppliers which are external to organization. The SC refers to proprietary software systems, distribution networks and supply chains. Edvinsson and Malone (1997) view intellectual capital as being composed of two components.

- **Human capital**: includes knowledge skill and experience of employees.
- **Structural capital**: includes the embodiment, empowerment and supportive infrastructure of human capital.

Structural capital is divided into Organizational capital and customer capital which is further divided into Process capital and Innovation capital

- **Customer Capital**: It is the strength and loyalty of customer relations either within or outside the organization.
- **Organizational Capital**: Includes the organizational philosophy and systems for leveraging the organizational capabilities

- **Innovation Capital**: Comprises of intellectual property which are protected commercial rights such as copyrights, trademarks and intangible assets.

- **Process Capital**: Contains the techniques, procedures, programmes that help in enhancing the quality of service.

The well known Skandia Navigator is a measurement model derived by Edvinsson and Malone from the above given classification

![Skandia Navigator Diagram](image)

**Figure 2.1 Edvinsson Malone’s Skandia Navigator**

The Skandia Value Scheme (Source: Edvinsson, Malone (1997, P.52)
Many researchers have accepted Seivby’s classification of IC after proposing some minor changes to it. Petty and Guthrie (2000) used only two of the three categories of IC of Sveiby. Mouritsen et.al (2002) and Pablo’s (2003) also used the same categorization as used by Sveiby. Pablo’s termed “Customer capital” as “relational capital”.

Haanes and Lowendahl (1997) classify a company’s resources into tangible and intangible resources. Intangible resources are regarded as IC of a company. The intangible resources are divided into competence and relational resources. Lowendahl (1997) further divides competence and relational categories into two sub categories named individual and collective depending on whether the resource is employee or organizationally focused.

![Haanes and Lowendahl Model](image)

**Figure2.2: Haanes and Lowendahl Model**

Source: Haanes and Lowedahl (1997)
Five subgroups of intellectual assets have been identified by Gu and Lev (2001, p.14) for easy identification and simplification. They include

- Research and development
- Advertising
- Capital expenditures.
- Information systems
- Technology acquisition

This classification would be helpful in measuring intangibles and would be helpful for investors and market. MERITUM (2002) – THE MEASURING OF INTANGIBLES TO UNDERSTAND AND IMPROVE INNOVATION MANAGEMENT for the measurement of intangibles within a firm in their MERITUM Project 6 used Sveiby’s model and classification which categorizes IC into human resources, structural resources and relational resources. FASB NN (2001) categorizes Intellectual capital as intellectual assets for financial reporting. They include

- Technology
- Customer
- Market
- Workforce
- Contract
- Organization and
- Statutory based assets.
On review of literature Maar et.al (2003) is of the opinion that IC can be categorized into three main categories.

- Strategy
- Influencing Behavior
- External validation

Maar and Chatzkel (2004) opine that research work on intangible assets often classify IC into

- Human capital which includes the skills and talent and knowledge of employees
- Information Capital which includes information systems, databases and computer system
- Organization Capital which includes Culture, leadership, employee alignment and team work.

Andriessen and Stem (2004) are of the opinion that IC could be broken down into three categories like human resources, organizational resources and relational resources. IC includes all intangible resources that are available to an organization, that give a relative advantage and which in combination are able to produce future benefits.

In the words of Youndt et.al IC consists of (1) Human capital (2) Organizational capital (3) Social Capital. They further explain that IC is the sum of all knowledge that an organization is able to leverage in the process of conducting business to gain competitive advantage. The IC-dVAL approach by Bounfour (2003) integrates four dimensions of competitiveness. It refers to:
- Resources as inputs which include tangible resources, investment in R&D, acquisition of technology etc.

- Processes include dynamic strategies which find their roots in intangible factors.

- Intellectual capital as a combination of intangible resources which can lead to specific results such as collective knowledge, patents, reputation, trademarks, network etc.

- Output level where the performance of an organization is measured through the analysis of their product and services.

Researches stated above have been helpful in understanding the categorization of IC. Studies reveal that there has been convergence in classification of IC. Most of the studies classify intellectual capital into human capital, organizational and relational capital. Rather than definitions, categorization has always been helpful in understanding the essence of IC. Most of the intellectual capital measurement models take its roots from these classifications.

### 2.3 STATE OF THE ART IN INTELLECTUAL CAPITAL RESEARCH

Intellectual capital and its components have been explained with a fair amount of detailing in the literature. It is interesting to note that IC has been studied by practitioners and academicians from both Qualitative and Quantitative perspectives. Qualitative measures take the knowledge management route and focus on the firm /organization specific approach. They rely on in-depth observations of a phenomenon and usually have an Inside Out Approach which makes generalization difficult. On the contrary quantitative measures have numerical orientation with a broad outlook which
aim to extend and apply IC research to a large data sample, across different industries over a long observation period. These kinds of studies will be helpful in case of well defined research problems and clearly stated hypotheses. Lot of information is available on different methods of valuation of IC (Bontis, 2001; Bontis et al., 1999; Luthy, 1998; Petty and Guthrie, 2000; Sveiby, 2002 and Andriessen, 2004a). Anyhow there are very few studies which have successfully implemented these methods in practice. Maar et.al (2003) states that it is important for researchers to put the newly formed theoretical assumptions through rigorous empirical test so as to prove that measuring of IC is worthwhile and could bring in organizational gains. Empirical evidences through such studies can help in validation of theoretical drivers of IC measurement.
<table>
<thead>
<tr>
<th>Research article</th>
<th>Author(s)</th>
<th>Study type</th>
<th>IC Dimension</th>
<th>Performance measures</th>
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<tr>
<td>Why do firms measure their intellectual capital?</td>
<td>Bernard Marr, Dina Grav and Andy Neely (2003)</td>
<td>Systematic/conceptual review</td>
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<td>Researchers in the field of IC should test the theories rather than adding more theory. Or else it might end up in a case where there is no credibility for the researchers in IC, as they don’t move beyond a stage of assuming that IC is worthwhile</td>
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<tr>
<td>Which IC is more important? A life – Cycle Perspective</td>
<td>Ching-Ju Liang and Ying-Li Lin(2008)</td>
<td>Quantitative &amp; Quantitative</td>
<td>Customer capital Process capital Human Capital Innovation Capital</td>
<td>Dividend payout rate sales growth rate, marketing expenditure rate capital expenditure rate, Firm age</td>
<td>Ohlson Residual model(1995) Qualitative measures used for IC variables valuation</td>
<td>3627 companies in different life cycle stages(Tiwan )</td>
<td>There is strong evidence that the explanatory power provided by IC is incremental to financial performance for companies in each life cycle stage.</td>
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<td>Valuing the future Intellectual capital supplements at Skandia.</td>
<td>Stephen Chen (2003)</td>
<td>Application of game theory (quantitative)</td>
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<td></td>
<td>Theoretical / Conceptual paper</td>
<td></td>
<td>“hidden” value that may be uncovered by applying game theory is the deterrence value of investments in intellectual capital</td>
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<td>Study on Intellectual Capital and Enterprise’s Performance (Chinese Market)</td>
<td>ZHANG Ji-jian, ZHU Nai-ping, KONG Yu-sheng (2006)</td>
<td>Quantitative (regression model)</td>
<td>VAIC, VACA, VAHU, STVA</td>
<td>ROA</td>
<td>VAIC&lt;sup&gt;TM&lt;/sup&gt; &amp; traditional measures in A/e.</td>
<td>32 samples for yr 2004 from automobile industry.</td>
<td>Compared to matter capital, the impact of human capital on business performance is more significant, and the impact of the structure capital is less significant.</td>
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<td>Application of VAIC method to measure corporate performance-A quantile regression</td>
<td>Hwei-Jen Shiu (2006)</td>
<td>Quantitative (Conditional Quantile regression)</td>
<td>Capital employed efficiency Human Capital efficiency Structural capital efficiency</td>
<td>ROA, ATO, MB Control Variables – Firmsize leverage, ROE</td>
<td>VAIC&lt;sup&gt;TM&lt;/sup&gt; &amp; traditional measures in A/e.</td>
<td>80 Taiwan listed technology Companies.</td>
<td>Technology industry in Taiwan is in transforming intangible assets such as intellectual capital into high value added or services</td>
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<td>Intellectual capital and traditional measures of corporate performance</td>
<td>Steven Firer, S. Mitchell Williams (2003)</td>
<td>Quantitative (Regression Model)</td>
<td>ROA, ATO and MB Control Variables – Firmsize leverage, ROE</td>
<td>VAIC™ &amp; traditional measures in A/c</td>
<td>75 co’s in bank, ele, IT&amp; services For 2001</td>
<td>Overall, the empirical findings suggest that physical capital remains the most significant underlying resource of corporate performance in South Africa despite efforts to increase the nation’s intellectual capital base.</td>
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<td>Thinking critically about Intellectual capital accounting</td>
<td>Robin Roselender and Robin Fineham (2001)</td>
<td>Theoretical commentary on intellectual capital reporting</td>
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<td>Suggests the adoption of critical accounting perspective, which can explore the possibility of intellectual capital providing its own accounts.</td>
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<td>Measuring and intervening: how do we theorise</td>
<td>Jan Mouritsen</td>
<td>Descriptive argument for measurement of intellectual</td>
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<td>measurement of intellectual capital is interesting because it is an input that starts action.</td>
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<td>intellectual capital management?</td>
<td>(2004)</td>
<td>capital</td>
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<td>rather than a conclusion that stops action</td>
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<td>Evidence from the IT industry Taiwan</td>
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<td>Profiting from intellectual capital: learning from</td>
<td>Suzanne Harrison and Patrick H.S</td>
<td>Paper which throws insight into the best IC M Practices</td>
<td>IC Value creation &amp; Extraction</td>
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<td>factors affecting the measurement of intellectual capital, and the ways in which companies tailor their ICM activities to match the needs of their different business strategies.</td>
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<td>leading companies</td>
<td>Sullivan Sr.</td>
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<td>Fair value of intellectual property: An option based valuation of nearly 8000 intellectual property assets</td>
<td>NIR KOSBOVSKY (2002)</td>
<td>Quantitative/Valuing IP with TRRU Metrics (option pricing model)</td>
<td></td>
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<td>7707 patents appr. (245000 patents filed, 15000 patents were sampled of which 7707 has been used for study.</td>
<td>The data suggests that professionally calculated indications of IP values based on option pricing models such as TRRU which yield fair values objectively</td>
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<td>Intellectual capital and Financial returns</td>
<td>Hong Pew Tan, David Plowman and Phil Hancock (2007)</td>
<td>Quantitative</td>
<td>VACAVAHU,STV A.,(VAIC™ Methodology)</td>
<td>ROE, ASR, EPS</td>
<td>PLS-PM</td>
<td>150 companies 4 industries 3 years</td>
<td>results support the notion that companies that actively nurture and increase their IC are likely to experience superior performance. The paper would also suggest that the Pulic model provides companies with a simple approach to measuring their IC.</td>
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<td>Measuring intellectual capital: a new model and empirical study</td>
<td>Jin Chen Zhaohui Zhu Hong Yuan Xie (2002)</td>
<td>Qualitative Index</td>
<td>7 point Scale index measures HU, SC, INNC, CUC, all put to IC.</td>
<td>-</td>
<td>Correlation analysis, Path Analysis</td>
<td>31 valid questionnaires from high tech companies</td>
<td>IC measurement Index enables the enterprise to measure their distance from competitors, demand from customers and ent’prises with best management practices.</td>
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<td>Intellectual capital Measurement effectiveness</td>
<td>Gopika Kannan, Wilfried G. Aulbur (2004)</td>
<td>Theoretical paper</td>
<td></td>
<td></td>
<td></td>
<td>100 literature review paper</td>
<td>Needs analysis is done the measurement process which reviews and maps organizational information need, creation, use, flow, and storage; identifies gaps, duplication, costs; and value; and uncovers the barriers to effective knowledge flow</td>
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<td>An empirical investigation of the relationship between</td>
<td>MingChin Chen, Shu-Ju Cheng, Yuhchang</td>
<td>Quantitative analysis</td>
<td>VAIC, VACA, VA HU, STVA, RD, AD</td>
<td>ROE, ROA, GR &amp; NP</td>
<td>Regression Analysis</td>
<td>4254(for 11 years)</td>
<td>study provides empirical evidence that investors place higher value on firms with better</td>
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<td>intellectual capital and firms’ market value and financial performance</td>
<td>Hwang (2005)</td>
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<td>intellectual capital efficiency, and that firms with better intellectual capital efficiency yield greater profitability and revenue growth in both the current and the following years</td>
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<tr>
<td>Extended VAIC model: measuring intellectual capital components</td>
<td>Jamal A. Nazari and Irene M. Herremans (2007)</td>
<td>Quantitative</td>
<td>Human, Customer, Renewal and Process Capital</td>
<td></td>
<td>No sample study</td>
<td></td>
<td>There is model development and hypothesis setting. No application of theory is done</td>
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<td>Intellectual capital and corporate in Indian Pharmaceuticals industry</td>
<td>G. Bharathi Kamath</td>
<td>Quantitative</td>
<td>VAIC, VAHU, STVA</td>
<td>ROA, ATO, MB (control variables – ROE, MCAP, Leverage)</td>
<td>Linear Multiple regression</td>
<td>Top 25 companies</td>
<td>No significant positive relationship between the firm’s performance with any IC variable. In India, market is under developed and yet to reflect the performance of the firms.</td>
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<td>Intellectual capital performance of quoted banks on the Istanbul stock exchange market</td>
<td>Abdullah Yalama Metin Coskun (2007)</td>
<td>Quantitative</td>
<td>VAIC™ VACA, VAHU, STVA &amp; VAIC</td>
<td>ROA, ROE, LDR</td>
<td>DEA</td>
<td>17 banks (1995 to 2004)</td>
<td>Study measured IC by using the VAICTM approach and the DEA to find out portion of the IC that is transformed into profitability. Study shows obtained efficiency values are not stable annually. But has proven that IC contributes more than physical capital</td>
</tr>
<tr>
<td>Intellectual capital and firm</td>
<td>Ahmed Riahi-Belkaoui</td>
<td>Quantitative</td>
<td>Net value addition</td>
<td>NVA over total assets</td>
<td>Regression</td>
<td>81 multinational companies in</td>
<td>Results appear to support the hypothesis that IC is associated with future</td>
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<td>performance of US Multinational Firms (Study on resource based and stake holders view)</td>
<td>(2003)</td>
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<td>the forbes list for 4 years (1992-96)</td>
<td>firm performance as measured by a NVA in support of both the resource-based and stakeholder views.</td>
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<td>The intellectual capital performance of the Japanese banking sector</td>
<td>Dimitrios G. Mavridis (2004)</td>
<td>Quantitative VAIC™</td>
<td>HC, CA</td>
<td>EBT/Equity, Profit/Equity</td>
<td>Regression</td>
<td>141 banks (2000-2001)</td>
<td>The predictive analysis made states that there is a normal, strong, significant and positive correlation between VA and physical capital (CA) VA, CA &amp; HU adds different value to BPI</td>
</tr>
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<td>Indian software and pharmaceutical sector IC and financial performance</td>
<td>Santanu Ghosh and Amitava Mondal (2009)</td>
<td>Quantitative VAIC™</td>
<td>VACA, VAHU, ST VA</td>
<td>ROA, ATO, MB, Leverage and Physical capital intensity</td>
<td>Regression</td>
<td>80 firms (Pharma and Software) 2002-2006</td>
<td>Empirical findings, based on multiple regression clearly indicate that intellectual capital is the positive predictor of profitability &amp; not so in the case of productivity</td>
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<td>The impact of intellectual capital on firms’ market value and financial performance</td>
<td>Dimitrios Maditinos, Dimitrios Chatzoudes Charalampos Tsairidis Georgios Theriou (2011)</td>
<td>Quantitative VAICT™</td>
<td>VACA, VAHU and STVA</td>
<td>ROE, ROA and GR</td>
<td>Regression Analysis</td>
<td>96 companies (three years) 4 sectors</td>
<td>Empirical investigation failed to support that investor’s place higher value on firms with greater IC. Anyhow VAHU has shown sig. relationship with ROE.</td>
</tr>
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<td>Investigating the value and efficiency of intellectual capital</td>
<td>Paula Kujansivu and Antti Lo¨nnqvist (2007)</td>
<td>Quantitative CIV and VAICT™</td>
<td>IC and total efficiency</td>
<td>-</td>
<td>Correlation analysis</td>
<td>11 major Finnish Industries, 10 years, approx 20,000 cases</td>
<td>Mixed results for IC and total efficiency. But the reliability of results are strong because of the larger sample base</td>
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<tr>
<td>Implementing the KPMG Value Explorer Critical success factors for applying IC measurement tools</td>
<td>Daniel Andriesson (2005)</td>
<td>Qualitative</td>
<td>Core Competencies, financial valuation</td>
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<td>Valuation of intellectual capital can help to solve several types (internal, external) company problems, but thorough knowledge about the usage of various methods and situations should be studied.</td>
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<tr>
<td>TREEOR Model: An Approach to the Valuation of Intellectual Capital</td>
<td>Maria Sarafia and José M. Sarabia (2005)</td>
<td>Quantitative</td>
<td>IC. Growth quantity of knowledge and Speed of the knowledge supply</td>
<td>-</td>
<td>Runge Kutta’s method of Mathematical program</td>
<td>one numerical case discussed</td>
<td>Identify elements of firm growth, and knowledge and IC</td>
</tr>
</tbody>
</table>
Above given studies reveal that IC studies are multifaceted in nature. There are studies in intellectual capital pertaining to Knowledge Management, Strategy and Accounting information. The list is far too long to be quoted here. There are certain issues which are neglected in IC research which are revealed from the above table viz. there are very few quantitative studies which have employed large sample sizes and are longitudinal in nature. There is an urgent need for the researchers to study the impact of intellectual capital on performance in different industrial and national settings. The goal for the researchers should be to show that the relationship between IC and performance can be generalized to other industries and countries (Bontis, 2001). In this respect Botnis (2001) has rightly pointed out that intangible asset researchers have to “move from perceptual measures in isolated cases to large-scale studies with objective measures”. Finally, none of the studies identified above have longitudinal multiple industry oriented studies from India. Thus the proposed research intends to have an Indian focus through a longitudinal study on major IC oriented industries.

The purpose of this research is to first study whether the theory of IC works in the Indian context. Another specific objective is to measure the IC efficiency and how far VAIC™ is useful in explaining IC and to check whether there is an evidence for confirmation of theory. This study could be considered as a preliminary diagnostic study which intends to understand the relationship between IC and Corporate performance. Comparison of IC over the years and predicting IC for years in the future is beyond the scope of the study and hence time series analysis has not been considered here. But it also makes an interesting area for future research.
2.3 MEASUREMENT OF INTELLECTUAL CAPITAL

“When you can measure what you are speaking about and express it in numbers you know something about it; but when you cannot measure, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind. It may be the beginning of knowledge, but you have scarcely in your thoughts, advanced to the stage of science”

Lord Kelvin

It has been stated that if one cannot measure, one cannot manage (Liebowitz and Ch’ing 2000). There has been a plethora of proposed methods and theories to measure intangible assets or intellectual capital. The biggest hindrance in measurement of intellectual capital is the fact that intangibles are difficult to quantify and are very expensive. The results of measurement are uncertain as it has been arduous to measure a social phenomenon close to scientific accuracy. The case of valuation of intellectual capital is unique because it does not arise out of any normal transaction. Hence it is challenging to value and report IC under the traditional methods. There is no accepted methodology for valuation of intellectual assets and this has led to numerous efforts by researchers. Most of the valuation methods of intellectual capital falls under four basic categories which are an extension of classification put forth by Luthy (1998) and Williams (2000). They are as follows

- Direct Intellectual capital Methods (DIC)
- Market Capitalization Methods (MCM)
- Return on asset methods (ROA)
- Scorecard Methods (SC)
**Direct Intellectual capital Methods (DIC):** This method estimates the monetary value of intangibles by identifying various components. Once they are identified evaluation is done individually or as an aggregated coefficient.

**Market Capitalization Methods (MCM):** In this method the value of intellectual capital or intangible asset is found out by the difference between company’s market capitalization and shareholder’s equity.

**Return on Asset Method (ROA):** First step in this method is to calculate the company ROA. This is done by calculating the average pre-tax earnings of a company for a time period which is then divided by the average tangible assets of the company. The company average ROA thus found is compared with the industry average. The difference is multiplied by the company's average tangible assets to obtain the average annual earnings from the Intangibles. By dividing the above-average earnings by the company's average cost of capital or an interest rate, we can derive an estimate of the value of its intangible assets or intellectual capital.

**Score Card Methods (SC):** Various components of intellectual capital or intangible assets are identified and indicators of indices are generated in the form of graphs or are reported in the form of score cards. In this method no monetary value estimation is done. The final result may be a composite index.

Those methods which monetize the value of intangibles like market capitalization method and Return on asset method would be useful in case of mergers and acquisitions and stock market valuations. It would also be helpful in comparisons among companies and industries. Above all it can be easily communicated to the public at large. But these methods would be of very less use for non-profit organizations or those companies which are not quoted in
stock exchanges. Methods like ROA are highly susceptible to interest rate fluctuations and discounting rate assumptions.

Methods like DIC and SC create a more comprehensive picture about company’s health. Usage of these methods would be better than any financial matrices as it can be applied at any level in the organization. Valuation of intangible assets depends on the purpose, situation and audience. In case the idea is to monitor performance with a control function the best suited methods would be performance indicators like KPIs. If the intention is to value a business for acquisition, merger or selling then valuation methods like brand valuation, money per client or per click would be more useful. In case of reporting the best methods would be IC supplements, EVA and Triple bottom-line. The best method to value an investment decision is the good old traditional discounted cash flow method. Direct IC methods and Score Card methods would be best suited for calculating the hidden value. It is important to understand that there is no one method which can fulfill all purposes. Methods should be selected depending on the situation, purpose and audience.

The table given below represents the major measurement methods for Intellectual capital. There are two major divisions for the measurement classification. One set of measure gives the value in monetary terms, while another set of measures do not give valuation in monetary terms.

### Table 2.2 Intellectual Capital Measurement Models

<table>
<thead>
<tr>
<th>Monetized valuation Methods</th>
<th>Non–Monetized Valuation Methods</th>
<th>Proponent</th>
<th>Year</th>
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<tbody>
<tr>
<td>The Balance Score Card</td>
<td>Kaplan and Norton</td>
<td>1992</td>
<td></td>
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<tr>
<td>Technology Broker method;</td>
<td>Brooking</td>
<td>1996</td>
<td></td>
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<tr>
<td>Skandia IC Report method;</td>
<td>Edvinsson and Malone -</td>
<td>1997</td>
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<tr>
<td>Monetized valuation Methods</td>
<td>Non– Monetized Valuation Methods</td>
<td>Proponent</td>
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<tr>
<td>IC-Index</td>
<td>Roos et al</td>
<td>1997</td>
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<tr>
<td>Intangible Asset Monitor approach;</td>
<td>Sveiby</td>
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<td>Heuristic Frame.</td>
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<td>Vital Sign Scorecard</td>
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<tr>
<td>Ernst &amp; Young Model</td>
<td>Barsky and Marchant</td>
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<tr>
<td>Value Chain Scoreboard™</td>
<td>Lev B</td>
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<td>IC-dVAL™</td>
<td>Bonfour</td>
<td>2003</td>
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<td>Dynamic monetary model</td>
<td>Milost</td>
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<td>EVVICAETM</td>
<td>McMcCutcheon</td>
<td>2008</td>
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<tr>
<td>Regional Intellectual Capital Index (RICI)</td>
<td>Schiuma, Lerro, Carlucci</td>
<td>2008</td>
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<tr>
<td>ICU Report</td>
<td>Sanchez</td>
<td>2009</td>
<td></td>
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<tr>
<td>Economic Value Addition - EVA</td>
<td>Stern &amp; Stewart</td>
<td>1997</td>
<td></td>
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<tr>
<td>Tobin’s q method.</td>
<td>Tobin James</td>
<td>1950</td>
<td></td>
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<tr>
<td>VAICTM Model</td>
<td>Ante Pulic</td>
<td>1997</td>
<td></td>
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<tr>
<td>Calculated intangible value</td>
<td>Dzinkowski</td>
<td>2000</td>
<td></td>
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<tr>
<td>Knowledge Capital Earnings model</td>
<td>Lev and Feng</td>
<td>2001</td>
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</table>
2.4 VALUE ADDED INTELLECTUAL CAPITAL COEFFICIENT – VAICTM

The basic ideology behind any business is growth and value creation. Management practitioners and researchers agree that the existing measuring systems will not be able to measure intellectual capital flawlessly. Since the upcoming business models are based more on intangibles, its valuation has become inevitable. Taking this into consideration, the importance of IC in value creation, Ante Pulic along with his colleagues at the Austrian IC Research centre developed a new method to measure the IC of companies which they called as “Value Added Intellectual Coefficient” – VAICTM. This method is very significant since it helps us to measure the value creation efficiency of both tangible and intangible assets of an organization. The strength of VAICTM method is its ability to assess the IC within an organization. This method utilizes the value creation capability of two primary sources – physical capital resource and IC resources. It assumes that IC cannot exist in isolation nor can it derive value alone. Only when it combines with physical capital can it generate value.

VAICTM uses values from income statement and balance sheet. Pulic (2000a, b) argued that market value of an organization is created by IC and capital employed of which the former consists of Human capital and Structural Capital. This method is different and can be distinguished from other methods since it indirectly measures IC by measuring Capital Employed Efficiency (VACA), Human capital efficiency (VAHU) and structural capital efficiency (STVA). The sum of these three measures shows the intellectual capital efficiency – VAIC. Higher the VAIC value, better the value creation efficiency of the firm. VAICTM serves as an index for measuring, comparing and does a real – time tracking of improvement in the intellectual capital ability.
Unlike traditional accounting which focuses on controlling cost, Pulic (2000b) focused on value creation and he opined that two resources namely capital employed and intellectual capital creates value addition for an organization. Pulic believes that employees who are prime carriers of knowledge should be treated as a resource or an investment rather than a cost.

There are a number of reasons for choosing VAIC™ over other methods for measuring IC. They are as follows.

- It provides a standardized and consistent basis of measure thereby, better enabling the effective conduct of an international comparative analysis using a large sample size across various industrial sectors. Most of the methods for measurement of IC are customized to fit the specific requirements of the company; hence they lack generalization opportunities and have less comparability.

- All data used in the VAIC™ calculation are based on audited information; therefore, calculations can be considered objective and verifiable.

- VAIC™ is a straightforward technique that enhances cognitive understanding and enables ease of calculation by various internal and external stakeholders. Ease of calculation is a feature that has enhanced the universal acceptance of many traditional measures of
corporate performance (such as ROA, market-to-book value). Alternative IC measures are limited as they only be calculated by internal parties or rely upon sophisticated models, analysis and principals.

- Many IC measures are usually customized to fit the need of individual firms and are mostly non-financial in nature. Hence they lose their ability to apply consistently across large diversified set of samples which in turn would make it difficult for external validation.

**Ante Pulic Model**

Business success in modern times is related to value creation efficiency. The same is applicable for intellectual capital valuation too. Ante Pulic developed Value Added Intellectual Coefficient VAIC™ (Ante Pulic 1998, 2000, 2000a, b) to measure intellectual capital value creation in an organization. This method finds an answer to those problems which are yet to be solved through other methods.

Small companies which are not listed in stock exchanges will find it difficult to find their market based Intellectual Capital. This method would benefit even these small companies as they can compute market based IC following this method.

This is a measurement system based on the real value and performance of a company, region or nation thus helping in benchmarking and predicting future capabilities. Tracking the value creation or destruction is easy through this method. Moreover it is useful to all participants who has contributed to the value creation process.
This method is unique since it employs the efficiency of both tangible and intangible assets in an organization. Pulic model determines that IC of a company will be VACA, VAHU and STVA. It shows the efficiency with which a company employs its resources. Better the resource utilization, higher the value creation efficiency (Pulic, 2000). This method is based on two resources namely capital employed and intellectual capital. These assets are considered as strategic investments and play a major role in enhancing the value of the company.

Firer and Williams (2003) mentioned that many developed models of IC measurement are customized to fit the profile of a specific firm and therefore limit comparability. Williams (2001) criticized other measures of IC for the subjectivity associated with their underlying indicators. Quick analysis of table 2.1 reveals that most of the quantitative studies in the IC area have utilized VAIC™ as a tool to measure Intellectual capital.

There has been some criticism against VAIC™. Group of researchers are of the opinion that VAIC™ does not fully capture all the elements of the intellectual capital like customer capital, relationship capital and Process capital. Andriessen (2004) suggested that the method’s basic assumptions are problematic and thus it produces dissatisfying results. VAIC™ does not present the monetary value of IC. Instead, it considers different efficiency factors related to IC, and in doing so, evaluates how effectively the organization’s IC adds value to the organization. VAIC™ figure is comparable among companies and can be reported to external stakeholders (Antola et al., 2005).
VAIC™ measure is executed as follows:

**STEP I**

For this research, the researcher goes by the stakeholder view on definition of VA (Value Addition). Value-added amount can be determined by adding pre-tax profit to payroll costs plus interest charges. Functionally, the *value-added statement may be conceived as a modified version of income statement*. Value Added could be defined as the sum of wages, corporate taxes, dividends, interest expenses, minority shareholders in subsidiaries, depreciation and profits retained. Here we go by Gross value Addition Concept. *In one word Value Addition could be defined as the wealth created by activities of a company.*

The first step in measuring intellectual capital efficiency is to measure the VA or Value Addition. This has been done using the following algebraic equation:

\[
VA = I + DP + Di + Ti + Mi + R + WS \tag{2.1}
\]

**VA for firm is Value Addition**

I is as the sum of interest expenses

DP is depreciation expenses

D dividends

T Corporate taxes

M Equity of minority shareholders in net income of subsidiaries

R- Profits retained for the year

WS - wages and salaries.
Value addition can also be represented as sales –input. In the above equation wages and salaries are a part of value addition. The highlight of this method is that intellectual potential (wage/salaries) is not treated as a cost but as a value creating entity.

**STEP II**

Second step is to find the **Value added capital coefficient** which is denoted by VACA – Value added efficiency of Capital employed. VACA gives you the value created by spending one unit of Physical capital. VACA can be calculated using the following equations.

Capital employed (CA) = Book value of net assets of firm (2.2)

Thus Value Added Efficiency of Capital Employed is

\[ VACA = \frac{VA}{CA}. \] (2.3)

If a unit of CA generates greater returns in one company than another, then the former company has better utilization of CA. Thus it reflects the ability of IC companies to better harness the physical capital to improve the intellectual capital capabilities.

**STEP III**

Third step is to find the relation between VA and HC. This is an indicator of the efficiency of value added by human capital employed which is named as Human capital coefficient. This indicates the ability of HC to create value to the company. Pulic is of the view that total salaries and wages of a firm are an indicator of a firm’s HC. Market determines salaries on the basis of performance hence, it is logical to equate success of HC with an increase in value addition. Thus the relationship between VA and HC talks about the ability of Human capital to create Value for the company.
Human Capital (HC) = Total Investment made in Employees which includes their salary, wages etc. \hspace{1cm} (2.4)

Value Added Human Capital coefficient can be calculated as

\[
\text{VAHU} = \frac{\text{VA}}{\text{HC}} \hspace{1cm} (2.5)
\]

VAHU when compared over a group of companies shows the quality of human resources to generate VA for every single rupee invested in human resource.

**STEP IV**

The fourth step is to calculate the *Structural capital coefficient (STVA)*. This shows the efficiency of structural capital in value creation. In Pulic model structural capital is calculated

\[
\text{Structural Capital (SC)} = \text{VA-HU}. \hspace{1cm} (2.6)
\]

The above equation gives a clear indication that structural capital is dependent on the Value added and has a reverse proportion with human capital. Hence it has been understood that more the share of human capital (HC) in creation of Value addition (VA), lesser would be the contribution of structural capital (SC) or in other words human capital and structural capital are reciprocals.

Value added efficiency of structural capital as can be found out as follows

\[
\text{SCVA} = \frac{\text{SC}}{\text{VA}} \hspace{1cm} (2.7)
\]

**STEP V**

The Final step is the calculation of Value added intellectual capital efficiency of the company. This is can be obtained as the sum of all the
previously mentioned coefficients. Thus we obtain a unique indicator - VAIC™.

- VAIC is the composite sum of the three separate indicators which is given as

\[
VAIC^{TM} = VACA + VAHU + STVA \quad (2.8)
\]

- VAIC™ has gained popularity among researchers (Bontis, 1999; Schneider (1999) Chen et al. 2005; Firer and Williams, 2003; Pulic and Bornemann, 1999; Roos et al., 1997; Sullivan, 2000 and the above given measurement is argued to provide certain advantages

- There is a total shift from the traditional cost control focus to modern value creation approach.

- It recognizes the value of employees and treats them as an important element of intellectual capital.

- Reliability of data is high when compared to questionnaires, since they are usually audited by professional public accountants.

*Intellectual capital has been defined for this study as an Index value which embraces three parameters namely Human capital, Physical Capital and Structural Capital. This research discusses IC from its value creation perspective.*

Many research studies have applied VAIC™ as a measure of Intellectual Capital. In the following section we look at both foreign and Indian studies that have utilized VAIC™ as a tool to measure IC and financial performance.
2.5 APPLICATION OF VAIC™ IN MEASURING INTELLECTUAL CAPITAL

In today’s information age, the assets which are measured are not really the ones which are valuable. Increasingly organizations are under pressure to value the intangibles also. VAIC™ has been argued to be one of the most easiest and reliable methods to measure IC. This section reflects studies in intellectual capital which has applied VAIC™ as a measure to evaluate Intellectual capital efficiency and corporate performance. Research works cited here are from all parts of the world.

Bornemann (1999) found a correlation between intellectual potential and economic performance on investigating Australian industries. Riahi-Belkaoui (2003) used VAIC™ as a measure to find the value of intellectual capital in his study where he compared the intellectual performance of selected multinational companies of USA with their financial performance. Results stated that there is a positive association between intellectual capital and financial performance. Firer and Williams used VAIC™ to measure the relationship between IC and traditional measures of corporate performance for a sample of 75 publically traded South African Companies. Anyhow results have failed to provide any evidence in support of the relationship between the values added IC components and corporate performance variable like productivity, profitability and market value. Thus in South Africa tangible assets still pay a major role in enhancing corporate performance than IC assets.

Van der Zahn et al. (2004) examined around 300 Singaporean incorporated companies which included nine major industry sectors. The analysis indicated sizeable variations and trends in the efficiency of value created by different industry sectors. The biggest advantage of VAIC™ is that it can be applied to multiple business situations ranging from valuation of
small business organization to valuation of nation’s intellectual capital efficiency.

A Croatian study covering 20 counties conducted by International Business Efficiency consulting (2002) included 56,987 cases for a period 1997-2001 found that there were only four counties which performed more efficiently than Croatian national average. Rest of the 16 counties which had VAIC™ less than the national average showed a diminution in value creating efficiency.

Another national analysis has been done using VAIC™ by international Business Efficiency Consulting (2003) has been with regard to assessing the IC efficiency of European Union Countries. The study revealed that small countries based on value added are ones which are the most efficient economies in EU, an exception is Italy. Findings show that in case of big EU countries a small increase in efficiency would lead to a considerable increase in value added.

Chen et.al (2005) found that IC has positive effect on market value and financial performance. He used a large sample of Taiwanese listed companies and concluded that companies with better IC efficiency obtained higher degree of profitability and revenue growth in the future. Chen et.al (2005) concluded that IC is a strategic asset and it can positively enhance the firm’s market value and profitability.

Research by Sofian et.al (2005) reveals that IC has a countable influence on corporate performance. The study was directed towards the impact of IC on management accounting practices, more specifically on the issue of performance measurement. An empirical study on Taiwanese Manufacturers by Tseng and Goo (2005), using VAIC™ found a positive relationship between IC and corporate value. Mavridis and Kyrizoglou
(2005) used data from the banking sector of Greece for the period 1996-1999 and found that there is a positive relationship between value added and physical capital, but more significant relationship is shown in case of value added and human capital.

Shiu (2006) studied the value creation efficiency of 80 Taiwanese listed technology companies using VAIC™. This empirical study tests the implications of VAIC™ model using quantile regression estimators developed by Koenker and Basset in 1978. Conditional quantile regressions show that while variables are significant throughout the distribution. There are considerable differences, including differences in sign, and in their impact on firms with different degrees of performance. This shows the nature of technology industry in Taiwan and its capability to transform intangible asset such as intellectual capital assets into high value added products or services which is very similar to the claim made by Pulic (2004).

A study on Portuguese banking sector by Cabrita and Vaz (2006) used this method to identify the ability of IC in creating value for success of banking sector. Samiloglu (2006) in a study of Turkish banking sector tried to determine whether there exist a significant relationship between VAIC and market to book value ratio. The data used was from financial statements of banks listed in Istanbul Stock Market over the years 1998 to 2001. Analysis revealed that there was no significant relationship between the dependent variable (MV/BV) and the independent variables (VAIC and its three components).

In an exploratory study conducted by Mohiuddin et al. (2006) 17 commercial banks in Bangladesh were studied for a period 2002 to 2004. VAIC to measure the IC performance for these banks and findings revealed that all 17 banks of the sample had relatively higher human capital efficiency than other capital efficiencies which was a definite sign that intellectual
capital has started making an impact on the financial performance of even the lesser developed nations.

In a Turkish study Yalama and Coskun (2007) used VAIC™ to calculate the effect of IC on profitability of Turkish banking sector and found that it is an excellent tool to benchmark the IC efficiency of Banks.

Kujansivu and Lonqvist (2007) opined that the strength of VAIC™ method is the ability to measure the financial performance of IC within an organization thus helping in comparison. Appuhami (2007) utilized VAIC™ approach for an empirical research on companies listed in Thailand’s Stock exchange. He investigated the impact of the value creation efficiency on investors’ capital gains on shares and found that firms’ IC has a significant positive relationship with its investors’ capital gains on shares. Tan et.al (2007) used VAIC™ methodology to examine the data of listed companies in Singapore Stock Exchange and found that IC is correlated to company’s future and it positively affects the corporate performance.

Gan and Saleh (2008), reported that VAIC™ can explain the profitability and productivity, but failed to explain market valuation in a Malaysian study which drew data from technology-intensive firms listed in Bursa. Muhammad and Ismail (2009) used VAIC™ to investigate the efficiency of IC in Malaysian Financial sector and found that company performance measured by profitability and ROA are positively correlated to IC, but in Malaysian Financial Sector market value is created by capital employed than (physical and financial) than IC which is consistent with the study by (Goh,2005) who analyzed 16 commercial banks in Malaysia for a period 2001-2003 and found a falling trend of VAIC™ over the period of study indicating the diminishing value creating efficiency of banks.
Puntillo (2009) investigated the relationship between value creation efficiency and firm’s market valuation and financial performance of Italian banking sector. Data was drawn from 21 banks listed in Milan Stock exchange. Results showed that there is a significant relationship with capital employed efficiency (component of VAIC™) and different measures of financial performance, otherwise results failed to establish any positive significant relationship between the studied variables.

In one of the recent tri-sectoral study by Zeghal and Maaloul (2010), around 300 UK companies have been studied using VAIC™ as an indicator of firm performance. Firm Performance was studied from three angles namely economic, financial and stock market. Findings reveal that there is a positive relationship between firm’s economic and financial performance. But the relationship between share market performance and IC was not found to be significant except for the high-tech companies.

Research indicates that only very few studies have been conducted in Indian context which have tried to investigate the relationship between intellectual capital, its components and corporate performance. Kamath (2007) analyzed the IC performance of Indian Banking sector found that the top performers in Human Capital efficiency are foreign banks; on the contrary top performers in Capital Employed efficiency are public sector Banks which exposes the fact that there is large idle workforce in banking sector which has remained unutilized. Kamath (2008) found that there is no relationship between Intellectual capital(IC) components and traditional measures of corporate performance namely profitability, productivity and market valuation in her study based on top 25 Pharma companies in India.

Gosh and Mondal (2009) studied 80 companies belonging to both software and pharmaceutical sector and tested the relationship between performance of IC and corporate performance and found that Market Value
and Productivity are not significantly related to Intellectual capital but a IC is a positive predictor of Productivity. Venugopal and Subha (2012) studied the IC efficiency of Indian software firms quoted in National Stock exchange for a period of 10 years and found that Indian markets are not matured enough to capture the importance of performance evaluation based on new methods of evaluation especially those based on intellectual capital performance. Analysis shows that in the Indian context, structural capital and physical employed are significantly positively related to financial performance than human capital.

2.6 CONCLUSION

Above discussed reviews show that, while good number of studies on intellectual has been undertaken in the west, very few studies has been done in Asian countries especially India. Moreover most of the studies done in Asian countries have restricted themselves to just finding the relationship if any between intellectual capital and corporate performance. Reading these reviews shows that there is a wide gap which is unfilled. Hence this study takes a strong foot forward by analyzing the relationship between intellectual capital and corporate performance and attempting to study the impact of intellectual capital on corporate performance and its predictive relevance which are not found in earlier studies. Moreover this study employs SEM (Structural Equation Modeling) by using PLS-Path modeling which is considered to be an advanced and robust method for analyzing such intricate theory on intellectual capital and its underpinnings. Use of advanced statistical tool like SEM helps to build and confirm the theory.