

CAPITAL UNIVERSITY OF SCIENCE AND
TECHNOLOGY, ISLAMABAD



**Intellectual Capital, Firm's
Performance and Market Value:
An Empirical Study of South
Asian Emerging Economies**

by

Adnan Akhter

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Intellectual Capital, Firm's Performance and Market Value: An Empirical Study of South Asian Emerging Economies

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Dedicated to my beloved parents whose prayers always pave the way to success for me. May Allah Almighty Bless them always.



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This is to certify that the research work presented in the thesis, entitled “**Intellectual Capital, Firm's Performance and Market Value: An Empirical Study of South Asian Emerging Economies**” was conducted under the supervision of **Dr. Muhammad Mazhar Iqbal**. No part of this thesis has been submitted anywhere else for any other degree. This thesis is submitted to the **Department of Management Sciences, Capital University of Science and Technology** in partial fulfillment of the requirements for the degree of Doctor in Philosophy in the field of **Management Sciences**. The open defence of the thesis was conducted on **February 07, 2020**.

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List of Publications

It is certified that following publication(s) has been made out of the research work that has been carried out for this thesis:-

1. Akhter, A and Saeed, S.K. (2017). Human Capital and Performance of South Asian Economies: A Panel ARDL approach to Co-integration, *NICE Research Journal of Social Science*, 10, 116-133.

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“In the name of Allah, We praise Him, seek His help and ask for His forgiveness. Whoever Allah guides none can misguide, and whoever He allows to fall astray, none can guide them aright. We bear witness that there is no one worthy of worship but Allah Alone, and we bear witness that Muhammad (P.B.U.H) is His Rasool (P.B.U.H) and the seal of His Messengers.”

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Abstract

In today's knowledge economy information acquisition, knowledge management and information technology (IT) are prime resources. Now organizations around globe are more dependent on de-materialized forms of assets rather on tangible ones. Intangible assets are the sole source of competitive edge in hi-tech, IT and services sector of businesses. Earlier, acquisition of assets to increase the asset base were considered "the market maker" and "influencer", because of huge resources, now prospect is shifting from acquisition to efficient utilization-either its tangible or invisible asset. Mere ownership of intangible assets unable to make or create a difference in g-local markets, but efficient and effective utilization of these invisible resources matter. As [Grant \(1996\)](#) is of the view that the role of firms is knowledge application rather creation. Modern corporations in 21st century gain competitive edge through application of intellectual capital ([Kaplan et al., 2004](#)). Intellectual capital importance in current times can be discussed in paradigm of 'knowledge asset', which is essential factor of organization survival in competitive environment and borderless economies.

Keeping in view momentousness of intellectual capital (IC) for an organization in current belligerent environment of corporate arena, this study explore the linkage between intellectual capital and financial performance of firm. The aim of the study is to identify treble role of IC in affecting current financial performance, future performance and market value of firm. Research to explore such linkage is at nascent stage because of lack of standard mechanism to value IC. IC and performance, value nexus was investigated on three emerging economies of South Asia i.e. Bangladesh, India and Pakistan based on 100 firms each listed on respective stock exchange for the period 2009-2014. Literature documented divergent results regarding performance and IC nexus, which can be attributed to flawed estimation because of inherent stability issues in time series cross section data according to [Vogelsang \(2012\)](#). This study, after diagnosing all apparent econometric issues, applied fixed effect estimation with Driscoll and Kraay Standard error and panel corrected standard error (PCSE) estimation by following the guidelines of [Reed and Ye \(2011\)](#) and [Moundigbaye et al. \(2018\)](#).

Results revealed that human capital significantly impact current performance of the firm, which testify the resource based view of firm by Barney (1991). On the other hand, when it was empirically analyzed to ascertain the role of IC on future performance, structural capital came out to be the most influencing factor in determining future direction of firm which affirmed the organizational learning theory of firm. In last, role of IC in emphasizing market value was ascertained. It is well documented in literature that human capital i.e. component of IC impacts market value more than any other factor. Results testify this assertion to which human capital theory support.

There are two prospective of this study i.e. theoretical and practical. Theoretically this study is in line with resource based view of firm and human capital theory. Practically, this study emphasized the role of those resources which are inside an organization and can be exploited to get sustainable advantage for long term. Due to such importance of IC in current systems of knowledge based business environment, this study also provide a sense for organizations to follow integrated reporting framework. Integrated reporting will repose the confidence of not just shareholders but all the stakeholders on firms operation and will help to reduce the agency cost of firm. Secondly, this reporting will also help apex bodies to analyze the value addition in business through internal resources.

Keywords: Intellectual Capital, VAIC, PCSE, HAC robust, Knowledge assets.

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Abbreviations

Ban	Bangladesh
CE	Capital Employed
CEE	Capital Employed Efficiency
E-VAIC	Extended VAIC
HAC	Heteroskedastic autocorrelation corrected estimates
HACSC	Heteroskedastic autocorrelation spatial correlation corrected estimates
HC	Human Capital
HCE	Human Capital Efficiency
IBEC	International Business Efficiency Consulting
Ind	India
IC	Intellectual Capital
IT	Information Technology
LSDV	Least square dummy variables
MSCI	Morgan Stanley Capital International
M-VAIC	Modified VAIC
Pak	Pakistan
RC	Relational Capital
RCE	Relational Capital Efficiency
SE	Standard errors
SC	Structural Capital
SCE	Structural Capital Efficiency
VA	Value added
VAIC	Value Added Intellectual Coefficient

Chapter 1

Introduction

The 21st century is described by developing the grandness of knowledge and its impact on an organization. Now knowledge is considered to be the key source of economy and the only source of competitive advantage. Knowledge is the only asset an organization has, which becomes more valuable with its use and difficult to deplete completely. The purpose of this study is to analyze and compare the intellectual capital (IC) efficiency in listed firms operating in three South Asian emerging economies i.e. Bangladesh, India and Pakistan, as well as to empirically investigate the impact of IC on firm's value, performance and growth.

1.1 Background of the Study

In knowledge based world the intensity of globalization has come out so powerful that knowledge and communication have become the most important components for an organization. The gyration of information technology, globalization and mechanization require a need to identify the IC in firm's financial record. Unfortunately, the conventional accounting standards does not provide any comprehensive standard to report intangibles on financial report. This issue remained a hot topic for accounting standard setting bodies and the practitioners, which resulted in the spread between the market value (MV) and book value (BV) of the firm. According to [Edvinsson \(1997\)](#) organizations value creation is majorly based on intangible resources and capabilities i.e. IC.

In modern times of financial liberalization, border less economies and highly competitive markets the importance of physical and financial assets has decreased, whereas intangible assets are considered the decisive factor for a firm to get competitive edge in current scenario. Apex bodies of private and public entities centralized their focus on intangibles to generate sustainable competitive advantage (Cegarra-Navarro and Sánchez-Polo, 2010). Modern business factors of production do include intellectual capital, and IC impacts are fairly recognized Martín-de Castro et al. (2011). Modern knowledge based economies weigh IC as a key factor for companies sustainable competitive advantage Grant (1996). This transition process of traditional retail and manufacturing based economies towards knowledge based and intensive technological economy has increased from last few years Cañibano et al. (2000). Knowledge-based economy has not only opened new markets for companies but also defiled the old method of doing business where mere physical capital is considered the only aspect for competitive advantage. Modern businesses like Alibaba, Snapchat, Uber growing rapidly with huge profits and lower marginal cost than traditional companies, their business model focused primarily on intangibles rather just tangibles.

World Bank report (2005) reported that intangible resources account for 77% of the total global wealth. Stewart (1997) and Zack (1999) documented that company's sustainable ability to compete in the modern knowledge economy is increasingly derived from the exploitation of knowledge resources. Knowledge led business environments needs an approach that engraft the intangible resources i.e. innovation, knowledge of human resources, relation with customers, culture of organization, systems, processes etc. keeping this in view, the IC theory grasped the focus of scholars and managers of the organizations.

With increasing recognition of the importance of IC in driving the value of firm and competitive advantage, still there is no accounting standard which regulate IC completely. According to IAS 38, intangible assets, the recognition of internally generated intangibles like brands, publishing titles and customer lists are prohibited to report on financial statements. Which manifests that identification of intangibles and its measurement are not accommodated by traditional accounting

practices. It can be deduced from this discussion that financial statements may not be sufficient to provide relevant information regarding true corporate value. Financial statements only depict the financial and physical capital and ignore the intellectual capital. Land, Labor and physical capital which were considered backbone of production are being replaced by knowledge [Drucker \(1993\)](#) and in global market of competition the ability to handle and develop IC came up to be the main driver for sustainable competitive edge ([Marr, 2005](#)).

IC is known as knowledge-based equity an organization possess. It has attracted significant amount of interest in last decade ([Campisi and Costa, 2008](#)). In modern economy, intellectual not physical capital is considered to be the most important asset of corporation for sustainable existence. Firm's value is partly based on intangible capital that a firm possess ([Marr et al., 2003](#)). Despite of the fact that IC is the most important factor of an organization for sustainable competitive edge, its management and measurement is still an issue in corporate world ([Kim et al., 2009](#)). Literature on strategic management i.e. resource based theory, knowledge led firms, learning organization etc. posit the importance of knowledge based resources for achievement of sustained competitive edge.

The wide spread gap between firms market and book value attracted the academicians to explore this gap, which is missing in financial statements. IC is the unreported item that escapes from financial statements, and a reason for a gap between firm market and book value ([Ruta, 2009](#)). [Chen et al. \(2004\)](#) asserted that the limitations of financial statements in explaining the firm value revealed this fact that nowadays the source of economic value is not production of goods or service delivery but the creation of knowledge, skills, processes etc. It could be expected that efficiency of IC have direct impact on firm performance, thereby made this issue interesting to managers and shareholders ([Tan et al., 2007](#)) and an appealing area for research ([Clarke et al., 2011](#)).

Keeping in lime light the importance of IC as key factor for an organization success, the aim of this study is to explore IC-Performance link at one end and IC-Value link at other. In nutshell, the study will explore the relationship between IC, firm's market value and performance. This study will also provide a comprehensive

accounting measurement of IC, VAIC by modifying, extending and adopting the most discussed and utilized measurement tool given by Pulic (2000b) in this field of research.

1.2 Intellectual Capital

Natural resources are considered to be essential for economic growth, but empirical evidence has shown that mere ownership of natural resources does not help to grow. In modern world of knowledge management, IC is being increasingly recognized as an important factor of corporate and national growth. Abell (1999) asserted that in current time firms can effectively compete in its environment if they have new skills which help them to find, manage, share and use information as well as knowledge. It is well documented that competitive advantage increasingly relies on strategic assets i.e. knowledge and set of dynamic capabilities which lead to innovations (Tidd and Hull (2006); Wang and Ahmed (2007)). To value a firm, knowledge based intangibles are the most relevant factors (Lev and Daum, 2004).

Literature reveals number of definitions of intellectual capital. But there is a consensus that IC is an aspect of knowledge that brings competitive advantage and represents the invisible value of the corporation. According to Bontis (2001) there are three constructs of IC including human, structural and relational capital. He describes IC as a new resource-base for an organization to compete and win. Roos and Roos (1997) defines IC the hidden asset of the organization which constitutes human and structural capital. The most comprehensive definition of IC is given by Annie (1996) as IC *“is the term given to the combined intangible assets which enable the company to function”*. The most short form of defining IC is by Stewart (1997) as *“packaged useful knowledge”*. Further he elaborated this as organizations processes, technologies, patents, employees’ skills and information about customers, suppliers and stakeholders. It is extracted from the literature that IC is all monetary and non-physical resources that are wholly or partially owned or controlled by the corporation which contributes towards the value creation process.

Ulrich (1998) defines IC as “*competence multiplied by commitment*”. This simplest definition manifests that IC is competence, skills, knowledge etc. of employees within organization multiplied by willingness of workers to work hard. Earlier Klein and Prusak (1996) identified IC a material that could be captured, formalized and leveraged to develop valued assets. The pioneers of IC theory i.e. Edvinsson and Malone (1997) and Stewart (1997) define IC as “*the possession of knowledge, applied experience, technology, customer relationships and professional skills that provide competitive advantage in the marketplace and packaged useful knowledge*”. According to the pioneers in field of IC, human capital (HC), structural capital (SC) and customer/relational capital (RC) all sums up to IC. To get more value, an organization must be aligned and balanced in all three components that makes up IC. Once a best fit of all these components created by an organization, it is capable of creating better financial capital.

IC is an asset which could be defined as accumulation of all resources a company has at its disposal which could be used to boost profits, acquire new customer base, create new product/service or otherwise improve the business. To understand IC these all definitions and the underlying concepts provide a useful base. But the real issue in these definitions is the lack of specificity essential to identify, assort and measure individual assets. To deal with this problem, literature provides classification scheme to understand the components of IC.

1.2.1 Concept and Origin of Intellectual Capital

Galbraith (1967) was first who elaborated IC as value creation component for a company. Although researchers attempted to define IC in multiple ways because of its abstract and complex nature. At first, Galbraith (1967) than Sveiby (1997b) and Edvinsson and Malone (1997) described IC as the difference between book value and market value of a company. Later Stewart (1997) elaborated this concept of IC and concluded that knowledge, information, intellectual property all encompasses IC and impact a firm’s wealth. Further company’s brand and image, relationship with externals also embedded under IC by Teece (2000). Chan

(2009) finally summarized the IC concept as knowledge related intangible assets that impacts on wealth of company.

According to [Martín-de Castro et al. \(2011\)](#) there are two stages of IC evolution. First is its emergence in last decade of twentieth century where intangible assets i.e. goodwill, patent, trademark etc. remained the basic theme of IC. In second stage IC remained a focal area of research for academia from 2000 onward, researchers started examining IC and its facets. The focus of management world too changed from traditional physical resource based view to IC based concept for competitive advantage and sustainable development in business prospects ([Subramaniam and Youndt, 2005](#)).

As a concept, IC is invisible, subjective and hard to define precisely and accurately. It is subjective because its classification might differ depending on perspective of its evaluation. As physical assets throughout the years are valued at the reported financial figures whereas IC lacks concrete valuation. A firm can buy or sell physical capital and provide its evidence but IC can be brought up through relations, knowledge and expertise whose concrete valuation is difficult to solidify. From the emergence of IC, several classifications have been identified to characterize IC but the most renowned classification is of [Petrash \(1996\)](#) with collaboration of [Edvinsson \(1997\)](#) as “The Value Platform” which encompasses each component that makes up an IC for a firm. The value platform divided IC in three sub components which all contributes in creation of value for a firm. Figure 1.1 shows the continuum of value creation process by components of IC given through the value platform.

The value platform portrays the inter-relationship among the components of IC i.e. Human capital, Structural capital and Relational capital. Each component is independent of other, but to create value the knowledge must flow fluently amongst these ([Petrash, 1996](#)). According to the study HC comprises of knowledge, individuals in a firm have. Structural or organizational capital comprises of the knowledge which has been institutionalized within organization structure, processes and culture. While relational or customer capital is the customers perception of value obtained from doing business with supplier. In accounting perspective, Society

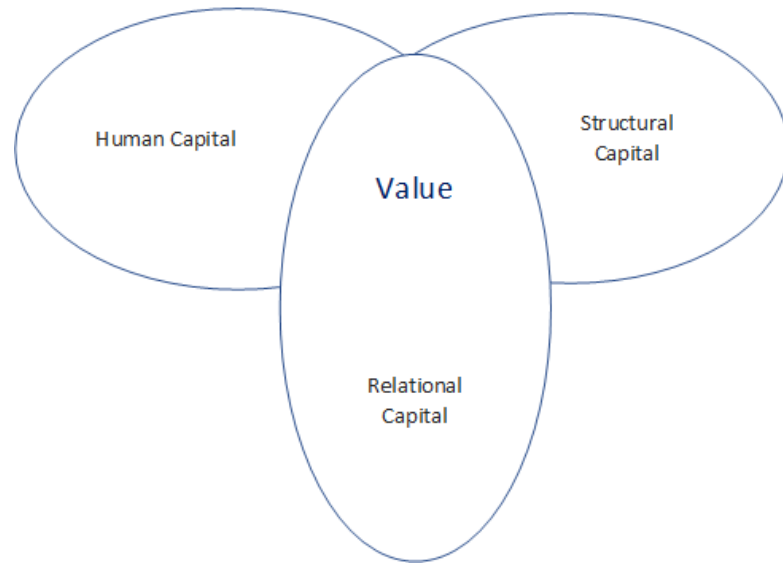


FIGURE 1.1: The Value Platform (Adapted from [Petrash \(1996\)](#)).

of management Accountants of Canada (SMAC) elaborates IC as all those items which are knowledge based and owned by a firm and will provide stream of benefits in future.

1.2.2 Components of Intellectual Capital

Literature categorized the IC in to three sub parts i.e. human, relational and structural capital. The definition of IC identifies three pillars of IC i.e. human, structural and relational ([Sydler et al., 2014](#)). While IC is also categorized in internal, external and financial capital in different studies but the ultimate components still remain the same as depicted above. Following sections will discuss in detail the components of IC.

1.2.2.1 Human Capital

HC is the place where all the ladders start the wellspring of innovation, the home page of insight ([Stewart, 1997](#)). The importance of HC can be traced back in 1960 by the noble laureate of 1992 in economic science, Grey Becker. According to Becker investment on humans in form of improvement in education, skills development through training, medical care etc. gives rise HC to a firm, not material capital (physical or financial), as it is not possible to separate knowledge, skills,

and values from a person, but it is possible to move financial or physical capital (Becker, 1967). HC depends in a certain way in the employee's talent (Čater and Čater, 2009). This capital doesn't own by a company permanently because as the employee leaves this capital also leaves the organization. Therefore it can be summarized that HC consists of all the tacit knowledge embedded in the company. According to SMAC HC includes know-how, occupational assessments, work related expertise, competencies and knowledge, psychometric assessments, innovativeness, proactive and reactive abilities and changeability. In a broader spectrum human capital constitutes both the human resource considerations of business workforce and the specific requirements of individual competence in the shape of knowledge, skills and values of employees (McGregor et al., 2004).

HC doesn't belong to organization permanently because employees are considered to be the owner of HC (Roos and Roos, 1997). HC is considered the origin of strategic innovation for an organization (Bontis, 2001). HC is defined as the intelligence of the members of the organization (BONT DJS, 1996), it mainly consist of employees intelligence, values, attitudes, know how, their intellect, creativity, education, expertise, behavior, loyalty, intellectual agility, learning and risk taking propensity (Bontis et al. (2007); Hsu and Fang (2009); Leitner (2011); Chien and Chao (2011)). The HC foundation led to the knowledge and skills embedded in and available to the employees.

1.2.2.2 Structural Capital

According to Edvinsson (1997), SC is established by creating and retaining knowledge that ultimately becomes company property. According to Cohen and Kaime-nakis (2007) and Longo et al. (2009) SC belongs to the organization as a whole and can be reported and shared. Extant literature on IC manifest that SC is the intellectual asset that remains with the organization when employees leave the company; therefore it is considered to be independent of individuals and generally explicit (Chen et al. (2006); Longo et al. (2009); Hormiga et al. (2011)). According to Nonaka and Takeuchi (1995), SC results from a knowledge spiral when implicit knowledge reaches the organizational level.

Structural capital is categorized in two parts by Society of Management Accountants of Canada i.e. intellectual property and infrastructure assets. First category includes trade secrets, copyrights, design rights, patents, trademarks and service marks which can be valued and reported by the organization. While second category includes management philosophy, corporate culture, processes and systems of networking within an organization.

SC is the supporting capital for HC i.e that support the HC to perform efficiently and effectively (Chen et al., 2004). In broader spectrum it consists of processes, procedures, corporate culture, information system and databases, business plans and strategies, intellectual property i.e. patents, trademarks and copyrights, organizational manuals (Wu and Tsai (2005); Hsu and Fang (2009); Kamukama et al. (2010)). For simplicity it is corroborated that what left behind when human leaves the organization after official duties is SC. According to Chen et al. (2004) regardless of influence of HC on SC, the existence of SC is objective and independent of HC, e.g. licenses, patents etc. but once it has been created then these all belongs to the company. Organizational capital and SC is used interchangeably because of their common features. Innovation capital which refers to the firm's ability to utilize existing knowledge to create new knowledge, ideas, processes and technologies (Tseng and James Goo (2005); Maditinos et al. (2010)). Innovative capital is considered to be the part of SC because of its features linked with the definition of SC.

1.2.2.3 Relational Capital

The third and the most important element, which received little attention in literature and more ignorance, of IC is RC which is considered part of IC in the 21st century. RC is the influential power of an organization to enhance interaction in a positive way with the members in the community to prompt the potential for wealth creation by enhancing HC and SC (Marti, 2001). RC as the name depicts is the knowledge embedded in the firms external relations (Wu et al. (2007); Cabrita and Bontis (2008)). In broader prospective, it includes the relation with customers, suppliers, members of the community, society, government (Jardon and

Martos (2012); Sharabati et al. (2010); González-Loureiro and Dorrego (2012)). RC is the value of a firm's relationships with people and organizations with whom it conducts business (Cabrita and Bontis (2008); Longo et al. (2009); Hormiga et al. (2011)). It could be at both individual and institutional level.

According to Society of Management Accountants of Canada (1998) relational capital includes but not limited to customer loyalty, distribution channels, social responsibility, external agreements etc. RC can be further divided in to two subpart i.e. customer capital and social capital. The subpart of RC is social capital which is the sum of actual and potential resources embedded within and derived from the relationships possessed at individual level or social unit level (Wang and Chen, 2013) which concerns internal and external relations of the firms. The second sub part of RC is customer capital which is the valuable knowledge embedded in customer relations and marketing channels (Čater and Čater (2009); Kim et al. (2012)).

According to International Federation of Accountants (IFAC) human capital, structural capital and relational capital of a firm comprises of multiple aspects as shown in table 1.1. While Pedersen (1999) holistic view of firm with respect to Chartered Institute of Management Accountants (CIMA) elaborated these capitals by addition of all invisible assets which fall under definition of respective category as shown in table 1.2.

TABLE 1.1: IFAC Intellectual capital components

Human Capital	Relational Capital	Structural Capital	
Know-how	Brands	Intellectual property	Infrastructure assets
			Management philosophy
Education	Customers	Patents	Corporate culture
Vocational qualification	Customer loyalty	Copyrights	Management processes
Work-related knowledge	Company names	Design rights	Information systems
Occupational assessments	Backlog orders	Trade secrets	Networking systems
Psychometric assessments	Distribution channels	Trademarks	Financial relations
Work-related competencies	Business collaborations	Service marks	
Entrepreneurial elan	Licensing agreements		
Innovativeness, proactive and reactive abilities, changeability			
(IFAC)			

TABLE 1.2: Rambolls Holistic view of firm IC

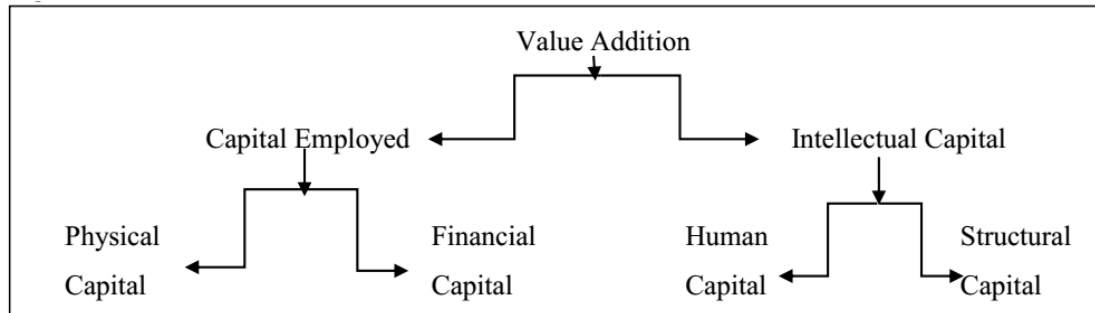
Human capital indicators	Relationship capital indicators	Structural capital indicators
Revenue generated per employee	Income per R&D expense	Growth in sales volume
Number of senior positions filled by junior staff	Individual computer links to database	Revenues per customer
Recruitment, development and training spend per employee	Number of times database has been consulted	Proportion of sales to repeat customers
Employee satisfaction	Upgrades of database	Customer satisfaction
Average length of service of staff	Contributions to database	Effectiveness of ad campaign
Staff turnover	Upgrades of SOPs	Brand loyalty
Educational level of staff	Value of new ideas	Brand image
Staff with professional qualifications	Ratio of new ideas generated to new ideas implemented	Product returns as a proportion of sales
New ideas generated by staff	Number of new product introductions	Customer complaints
Value added per employee	New product introductions per employee	Reputation of company
Post-training evaluation exercise - benefits accrued	Proportion of income from new product introductions	Proportion of customer's business that your product or service represents
Proportion of revenue-generating staff to other	Number of patents	
Image of company from employee's perspective	Average length of time for product design and development	

(Source: [Pedersen \(1999\)](#))

1.3 Value Addition

In business terminology value addition refers to change in the profit per unit earned. Both tangible and intangible resources play their role in value creation process. Studies empirically corroborated that IC components i.e. human, structural and relational capital, contributes in value addition. [Pulic \(1998\)](#), [Pulic \(2000b\)](#) developed a model named as Value added Intellectual Coefficient (VAIC here after) that furnishes information concerning value creation efficiency of firm resources (both tangible and intangible). According to this model, two fundamental factors are responsible of value creation in the firm i.e. capital employed and IC. IC is supposed to be affected by two major components as human and SC according to public's framework of value addition. But one component of IC i.e. RC which has received a lot of attention in knowledge based and customer oriented markets, remained neglected throughout the value creation process discussion. [Pulic \(1998\)](#) framework provides detailed information of value addition

sources in an organization. According to [Andreissen \(2004\)](#) physical (financial) and intangible capital both are responsible for value addition in a business as depicted in the following Figure 1.2.



Source: [Anderiessen, 2004](#)

FIGURE 1.2: Value Addition in a Business.

1.4 Problem Identification

IC role in shaping the company's success and future competitiveness is not hidden in modern economy. However some leaders are able to identify the initiatives within their organization that are designed to manage IC. Unfortunately, most of the executives of traditional corporations are unaware of how to invest in IC and recognize associated returns. They are still managing tangible assets instead of incorporating the mix of tangible and intangible assets to create wealth and shareholder value of the organization.

In developed economies it has been observed that IC helps to ameliorate the financial performance (FP) of an organization, value enhancement, and render sustainable environment for competitive advantage; the use of IC should be one of the priorities of all organizations ([Cohen and Kaimenakis, 2007](#)). The problem is that IC is not typically used effectively and may cost businesses millions of dollars a year ([Sudarsanam et al., 2006](#)). This could be possible that in knowledge economies, organization still focusing on tangible assets acquisition to become a large entity, but it is temporary state. According to [Bharathi \(2010\)](#), the financial sector specifically is not utilizing and managing the IC and major focus is on building and managing the tangible assets.

The gap between MV and BV of firm grasped wide research attention to explore that invisible value which is not reported on balance sheet of the firm (Lev and Zarowin (1999); Lev (2001); Lev and Radhakrishnan (2003)). Lev (2001) further asserted that over a period of five years (1997-2001) in US market the market to book ratio of S&P 500 companies increased from 1 to 5, which manifested that almost 80% of the corporate value is not reflected in financial reporting. According to traditional economy the source of economic value is production of material goods, services etc. Emerging economies has to meet the standards of developed economies to be in a developed list of countries. Developed countries are focusing on knowledge based system rather industrial based system. Therefore, in the world of knowledge based economy, the firms are considered to be repositories of knowledge. According to Chareonsuk and Chansa-ngavej (2008) a significant shift has been observed in developed economies as shown in the table 1.3.

TABLE 1.3: Shift from industrial age to knowledge age, Source: Chareonsuk and Chansa-ngavej (2008)

Industrial Age		Knowledge Age
Production driven	→	Customer driven
Functional	→	Process (integrated)
Physical capital	→	Intellectual capital
Top down	→	Bottom up
Management	→	Leadership

There is no conflict amongst the corporate practitioners that physical capital plays important part in success of the corporation but what makes that physical capital a success is hardly discussed, that is efficient utilization of tangible-intangible mix.

In modern corporate world, the importance of intangible resources for competitive advantage is widely recognized in developed economies. In knowledge based economy of current time, knowledge is considered to be the key role in success of the firm which can be observed through importance of fields of knowledge management and learning organization. While old school of thought which prevailed in industrialization era, lost its worth in current times.

Resource based theory of competitive advantage and knowledge based view of firm asserts that organizational knowledge is the key source of competitive advantage in the long run. In literature, the concept of IC has been discussed comprehensively. However, majorly the focus of literature has been on the developed world, specifically within Anglophonic and Scandinavian economies ([Sharabati et al., 2010](#)). The problem is therefore identified from a gap in the literature and this study seeks to explore this gap and examine the relationship between IC, market value and performance of an organization in emerging economies.

Based on the discussion above and keeping in spotlight the importance of IC for firm in mind, there is a need to explore this link comprehensively in South Asian emerging economies i.e. Pakistan, India and Bangladesh. According to World Bank 2018 report on South Asia, from 2013 to 2016, the growth rate increased from 6.2% to 7.5% in South Asia and Pakistan, India & Bangladesh are the major contributors of this growth which comprises almost 80% of the region Nominal GDP. While growth in developed countries in same period remained stagnant in 1-3 percentages. According to [Shobhit \(2018\)](#), 7.1% real GDP of South Asia region in 2016 is due to three emerging economies i.e. Pakistan, India and Bangladesh. Based on such importance, this study selected these three countries.

According to BBVA research report 2015, these three countries are termed as emerging economies of South Asia and as world progressing towards modernization, developed countries majorly depends on emerging economies in terms of investment. According to World Bank fact book 2017, almost 30 percent of total population in all three countries comprised of young educated people. This youth bulge which according to economist not only help developing economies to grow but also bring innovation with themselves. This human capital in all three economies manifests that with innovation, technical education especially related to Information technology (IT) and data science will help corporations to prosper; which in turn will help the economy to grow at faster pace and will create opportunities for the economy.

1.5 Problem Statement

As the concept of IC is comprised of three sub-parts which need to be in balance. The youth population (available in South Asia) will provide not only human capital but will also contribute to build structural and relational capital. Therefore, this aspect of population in these three countries will help corporations to prosper as their intellectual capital grow. therefore, it is imperative to study in context of corporate arena that how internal available resource IC affect performance.

The second major problem regarding IC-Performance nexus in literature is ignorance of comprehensive measure of VAIC. In developing economies, relational capital remained out of discussion in VAIC composite measure. While in modern time of technological advancement, relational capital can not be ignored because of its importance in developing intellectual capital. Literature on developed economies regarding IC Performance nexus explored that relational capital solely affect firm performance as more and more corporations are involved in societal projects. Therefore, it is need of time to comprehensively measure IC and include all facets of RC in IC calculation to ascertain IC-Performance link.

Third major issue in IC-Performance literature is ignorance of VAIC calculus along with shortcomings in empirical testing. Therefore, there is a comprehensive need of a study which not only evaluates all possible pitfalls in econometric analysis but also provide the suitable technique according to the availability of data by employing the gist of VAIC calculus according to [Pulic \(2000b\)](#). As literature provides evidence to the fact that there are some studies which investigated IC-Performance link but gave less importance to the econometric issues regarding cross-sectional data analysis. Therefore, such studies also documented inconclusive results.

Hence, keeping these all issues in mind the motivation of this study is to explore the IC-Performance and IC-value relationship. At one spectrum, IC effect analyzed on current and future performance of firm. While at other end, IC role in market to book value difference was analyzed.

1.6 Research Questions

Theoretically IC influence the value of the firms, because only physical capital or financial capital are not the only sources for value creation, IC is the one and the most important factor for value creation. But the contribution of empirical research on this issue is limited. In developing and emerging economies the empirical investigation on impact of IC on one end at firm's performance and other at value has been scarce (Hermans and Kauranen, 2005).

The aim of this study is to empirically examine the relationship between IC, firm's market value (MV) and financial performance (FP) of listed companies operating in emerging economies of south Asia. To investigate the relationship in emerging economies stated above, this study will attempt to answer the following questions;

1. Do intellectual capital significantly impact the value of firm operating in Emerging economies?
2. Do IC have any impact on future performance of firm?
3. Do IC effect the financial performance of the firm?

1.7 Research objectives

On the basis of the research questions stated above, following are the objectives of the study as;

1. To investigate the impact of Intellectual capital on firm's market value.
2. To analyze the impact of Intellectual Capital on future performance of firm.
3. To analyze the relationship of Intellectual Capital and firms financial performance.

1.8 Contribution of the Study

The contribution of this study is divided in to three areas described below.

1.8.1 Contribution in Literature

The contribution of the study to the body of knowledge is threefold. First it provided empirical evidence on the relationship between IC, value and performance in emerging economies of Asia. Majority of the studies empirically tested the IC and performance relationship, but literature provided little evidence on relation between IC and future performance. Organizations investment to build IC provides return not completely in same period of investment but in future periods too. As [Zarei et al. \(2014\)](#) is of view that future growth of the corporation largely depends on IC and there is lead lag relationship exists between IC and performance. Therefore, this study also explored role of IC in future performance of firm., which will provide further insight and investigation in the role of IC in Asian emerging economies where there is different technological advancements.

Second the measurement of Value added intellectual coefficient, as different studies used either the same or with few modifications the model of measurement of IC as proposed by the [Pulic \(2000b\)](#). This study not only modified the measurement of VAIC based on different studies but also attempt has been made to respond to limitations of VAIC and possible remedy for it. According to this study, VAIC is sum of human, capital employed and structural efficiency, to which further different studies extended and included the RC too as part of VAIC. As elaborated above the components of IC are human, structural and relational capital, this study discussed relational capital too in measurement of IC for empirical investigation. RC is composed of social and customer capital. Social capital part in this study refers to the relationship of origination with the community outside i.e. donations to the society, the philanthropy, CSR initiatives etc., customer capital refers to the relation of organization with its customer base i.e. the marketing and advertising expenditures etc. But studies ignored this component of IC in calculation which makes the VAIC measure incomplete and results susceptible.

Third this study also tried to solve the econometric issues which literature mostly exhibits. After solving for all diagnostic econometric issues, this study provides a comprehensive empirical investigation which explored the IC-performance nexus at one end and IC-value at other. Based on empirical investigation, this study

also provides a guidance for cross-national regression of South Asian emerging economies to let the corporations exploit their internal resources i.e. HC to further their performance and shareholder's wealth.

Based on discussion above, this study provided comprehensive VAIC measure along with econometric best practices for meaningful results. Therefore, academicians can further explore the sector specific IC-Performance link to check how efficient utilization of internal resources are. Inclusion of comprehensive RC measure in VAIC calculation emphasized on the role of social capital, which manifests the importance of societal development/betterment for a corporation aside from only getting advantages from that society.

1.8.2 Contribution for Policy Makers

This study explored the positive linkage between IC and performance which justify the investment of corporations in HC, SC and RC. The major break through of this study is a significant link between human capital, relational capital with market value of firm. This assertion signifies the stance of earlier studies that the difference between market and book value is created by IC. For policy makers, it is eminent that there focus must be on development of skillful human capital through development and training etc. at one end. And secondly the link of relational capital is also significant for market, which manifest that management besides of focusing on human capital must also focus on building relation with outsiders and especially social welfare in a society where corporation operates.

1.8.3 Contribution for Financial Markets Participants

For investors this study provided an empirical justification to have social screening intact so that their returns can be enhanced. With social screening all those corporations will be screened out who have no contribution in societal welfare i.e. corporate social responsibility, philanthropy etc. As relational capital is relations of corporation with outside community, therefore mere focus on price taking by corporations can not sustain for long time period. Hence, empirically it is justified

for investors to invest in those corporations who not only focus on their profits or not just price taker in the market but also serve the society where they operate. This study also helped in analyzing the book value and market value difference due to IC components.

1.9 Significance of the Study

When entities are doing business in a weightless economies, they create value information, knowledge, expertise that can neither be touched nor seen or weighted against the tangibles, therefore need of time is to develop a model to value such intangibles so that real strength of company can be judged by the shareholders. With the passage of time the developing economies are also converging towards the knowledge based economy like the developed ones. Theoretically IC plays a fundamental role in value creation process for a firm where knowledge based economy prevails. IC is considered to have the capability to generate sustainable competitive advantage and to achieve remarkable corporate performance. The significance of this study will be twofold i.e. at firm level and at country level.

At firm level this study identified the importance of IC efficiency in generating value to the firm. Mangers, investors can use the extended VAIC model to check the IC of the firm, and also analyze the contribution of each component of IC in performance of the firm. The extended VAIC incorporate all components of IC, described in literature in this study, therefore it provided guidelines with respect to each component i.e. how much investment in a component is fruitful. Accountants and perpetrators of financial accounts of an organization may use it as guidance for IC measurement and internal report on IC. Investors and analysts employ the strategy of measurement of IC to assist in selecting the potential companies that have ability to create value in future on the basis of components of IC.

At country level, it has been observed from the comprehensive literature review undertaken that no study has selected South Asian emerging economies for IC performance and value. The limitation of [Young et al. \(2009\)](#) study was empirical evidence on financial sector of Asian economies but excluding Pakistan,

India and Bangladesh. While the study of [Phusavat et al. \(2012\)](#) explored the macroeconomic relations of national IC in Asian economies, ignoring the South Asian emerging economies. Therefore this study will be an addition to the body of knowledge of IC especially with respect to South Asian emerging economies. This study explored that how the IC affects the corporate world in South Asian economies, and how national corporate regulators develop their policies for IC reporting so to provide complete information with respect to firms internal resources. Such policies where integrated reporting for corporations are part of regulations, foreign investments flow with a confidence for long term.

1.10 Scope of the Study

According to Morgan Stanley Capital International (MSCI) emerging economies includes those nations which has some characteristics of developed economies, but doesn't completely meet the standards to be a developed economy. This includes counties that may be developed in future or were remained in developed list in past. [O'neill \(2011\)](#) introduced big four economies acronym as BRIC in a study, which is commonly known as "Big Four" in economic world. BRIC is combined economy of Brazil, Russia, India and China, which covers 25% of world land mass and 40% population of world and are on the same stage of advancement. Later in 2011, South Africa is added in this list and commonly known as BRICS. It is strongly considered that BRICS have potential to form an influential economic bloc.

Accordingly, N-11 countries that have potential of becoming, along with BRICS, among the world's largest economies in twenty first century. N-11 includes Bangladesh, Egypt, Indonesia, Iran, Maldives, Nigeria, Pakistan, Philippines, Turkey, South Korea and Vietnam. This study is specifically on South Asian emerging economies and according to BBVA research 2015, the emerging economies of South Asia are Bangladesh, India and Pakistan. This study will empirically test the IC effect on value and performance of firm in South Asian emerging economies. For the calculation of IC components, data will be extracted from the audited financial

statements, data set will be based on six years of time span i.e. 2009-2014. As data required for this study is based on published financial statements, therefore time period is limited to recent past six years available data.

1.11 Organization of Research

The remainder of the dissertation report is devised as follows. Detailed review of literature along with IC measurement, hypothesis developments and theoretical framework is presented in chapter 2. Further chapter 3 encompasses research methodology which includes data description along with variable measurement. Data analysis including descriptive and inferential stats are presented in chapter 4 of the report. While chapter 5 conclude the study along with policy implications, limitations and avenue for future research studies. Complete flow of research organization along with description is presented in figure 1.3.

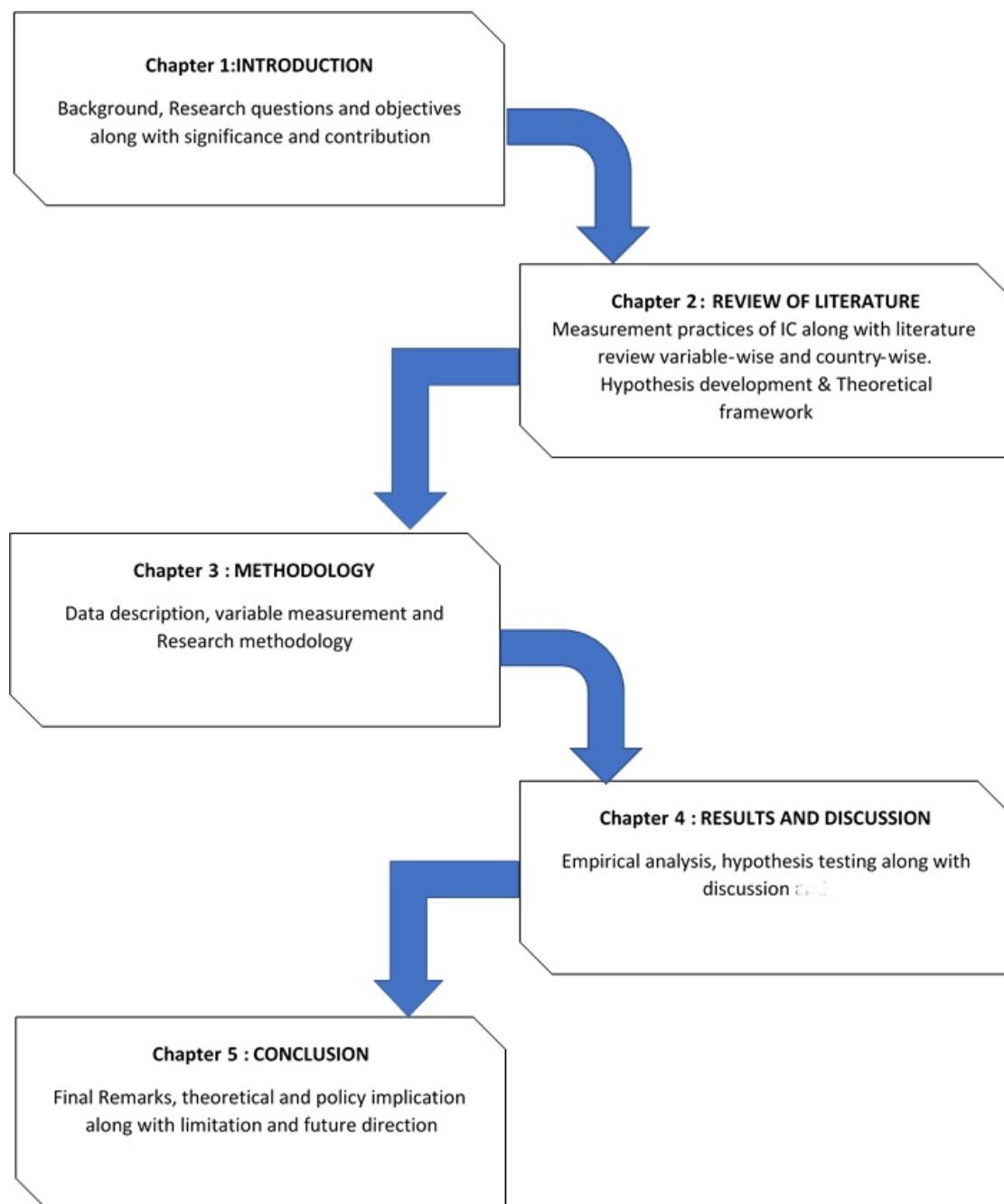


FIGURE 1.3: Organization of the study.

Chapter 2

Literature Review

In academic literature IC was firstly addressed by [Galbraith \(1967\)](#) as difference between market value of firm and its book value. He also named the IC as crucial part for company's value creation process. Later [Stewart \(1997\)](#) and [Teece \(2000\)](#) embedded intellectual property, innovativeness, expertise, knowledge management etc. to the concept of IC. From past two decades especially the debate on intangible assets of a firm as value creation component has increased. The nature of IC is intangible but there is consensus in corporate world that it is strategic asset that provides competitive advantage for long time period and superior FP [Barney \(1991\)](#). The difference between firms' BV and MV is due to IC, as IC remain hidden on financial statements ([Edvinsson and Malone, 1997](#)). According to [BONT DJS \(1996\)](#), HC and SC sum up to become IC. HC basically depends on employees i.e. their competence, commitment, loyalty, skills, knowledge etc. HC is considered to be the heart of IC, because HC disappears as employees leave the organization ([Bontis et al., 2000](#)). While SC links with firm i.e infrastructure of organization, their processes, policies, research for innovation etc.

2.1 Theoretical Background

The theoretical framework is based on four elements as;

- Intellectual Capital theory,

- resource and knowledge based views of the firm
- human capital theory, and
- Comprehensive literature on competitive edge and firm performance.

In modern era, the emergence of knowledge based economy has been witnessed that firms are considered to be repositories of knowledge and experience. While knowledge is declared as the critical factor that explain the growth of firms (Penrose and Penrose, 2009). The pioneering name in developing the foundations of IC theory includes Sveiby (1997b), Stewart (1997), Edvinsson and Malone (1997) etc.

2.1.1 Intellectual Capital Theory

“Information and knowledge are the thermonuclear competitive weapons of our time, success goes to those who manage their intellectual capital wisely (Stewart, 1997).

In modern times of industrialization, border less economies and competitive world to establish competitive advantage, accessibility of knowledge is viewed as the founding stone (Edvinsson and Malone, 1997). IC theory came under spot light in last decade in response to such advances within and outside the organization. Although research on IC is in early formative stages, theoretical foundations emerged as anchors of IC.

There are two prospective of IC theory i.e. static and dynamic. Static prospective can be ascertain as a stock, an asset that can be easily identified, moved and traded like patents, trademark, brands etc. (Annie, 1996). Static view conceptualized IC of organization as ‘systems of abstract knowledge assets’ while dynamic view conceptualized it ‘systems of knowing activity (Spender, 1989). Dynamic view proponents consider IC as knowledge that emerge from ongoing interactions between members of the organization and their sole emphasis is not just on intangible assets but the capabilities of organization to leverage, develop, change and innovate intangibles for value creation process. Dynamic prospective of IC

consider changes in IC due to time, need and environment which require a considerable adaption for an organization to survive and grueling campaign to be competitive in market place.

2.1.1.1 Static Theory of IC

According to [Allee \(2000\)](#) IC is gradually becoming viable option in establishing competitive leverage in a market because it's the foundational base of doing business in current time period. According to static theory view of IC, there is a need for consistent balance among all components in order to develop the optimal IC for an organization which creates value in market (Fig. 2.1). The path-breaker of this view, [Edvinsson and Malone \(1997\)](#) hypothesize that value doesn't create through any factor of IC but only from interaction among all three factors. If any one factor is weak, regardless of the fact that how strong the other factor(s) is(are), it is difficult for an organization to turn its IC in corporate value. Therefore, in order to develop higher value for an organization, strengthening of all factors along with their best fit is required.

With the advancement of knowledge, concept of IC evolved with passage of time. Technology plays a key role in utilization of knowledge, skills, expertise, it is also important to differentiate between two forms of knowledge i.e. tacit and explicit knowledge. According to [Allee \(2000\)](#) it is transformation from tacit to explicit knowledge that builds up IC which creates value in an organization. Tacit knowledge is knowledge in the heads of the people i.e. unspoken expertise that rests with the people and based on past knowledge and expertise of the individuals including perceptions, beliefs and values. While explicit knowledge is knowledge which is accessible to others and generally written down and can be transferred. It includes policies, databases, employee guides etc. therefore to build competitive leverage for an organization, one has to really strive for enhancement in explicit knowledge percentage by using tacit knowledge of others. Joint ventures, merger and acquisition are some basic tenets to transfer tacit knowledge in explicit knowledge ([Baughn et al., 1997](#)).

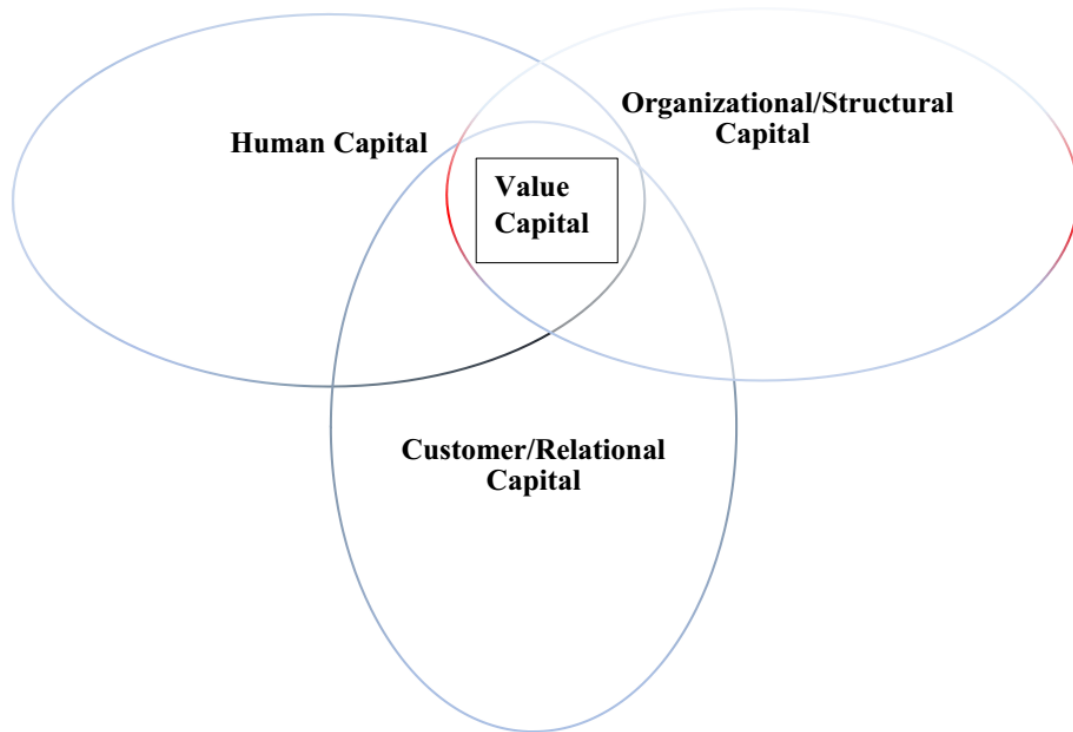


FIGURE 2.1: Value Capital. Source: [Edvinsson \(1997\)](#)

2.1.1.2 Dynamic Theory of IC

Dynamic view of IC manifests no clear cut identification of IC. As [Kianto \(2007\)](#) developed a comprehensive framework for understanding the various interpretations of dynamics of IC. According to her, there are three further prospective that sums up the dynamics of IC as value creation dynamics, Activities and change capabilities. Table 2.1 provides complete frame work of [Kianto \(2007\)](#) dynamic prospects of IC. Literature on this prospective unfolds that it is important to analyze something which organization practice rather focusing on knowledge that organization possess. An organization could have large stocks of valuable assets but lack of useful organization capabilities. *“firm capabilities need to be understood not in terms of balance sheet items but mainly in terms of organizational structures and managerial processes, which support productive activity”* ([Teece et al., 1997](#)).

2.1.1.3 Static vs Dynamic View of IC

[Kianto \(2007\)](#) in a comprehensive study identified the key differences between static and dynamic prospects of IC. Table 2.2 elaborates this view in detail. She

TABLE 2.1: Dynamic IC.

	Value Creation Process	Activities	Change Capabilities
Interpretation of Dynamic IC	Interaction of resources in value creation process	Intangibles embedded and demonstrated	Continuous learning
Background Literature	Resource-Based View	Knowledge-Based View	Innovation studies, dynamic capability approach
Research Focus	Strategic and casual	Influencing intangible resources	Transformation
Ideal Organization Characteristic	Managerial ability	Ability to function in knowledgeable manner	Continuous learning and innovation

identified the key areas which clearly differentiate static and dynamic proponents of IC theory. Literature distinguished both in terms of their contribution in value creation process for an organization.

Static IC comprises of those identifiable assets which can easily be valued through different accounting practices while dynamic IC comprises of all knowledge management practices which are basically tacit and depends on capabilities of an organization to convert it in explicit form so to identify or measure it precisely.

TABLE 2.2: Static vs Dynamic view of IC.

	Static Prospective	Dynamic Prospective
Essential Form of Knowledge	Explicit	Tacit
Main Interest	Identification and valuation of existing intangibles	Capability to use, modify and develop intangibles
Theoretical Focus	IC components	Firm ability to apply and develop knowledge
Managerial Focus	leveraging existing asset base	creating and developing capabilities
Measurement Focus	Existing statistical data	Social processes and organizational characteristics
Quantification	Easy	Difficult
Roots	Economics and accounting	Organizational science and strategic management

2.1.2 Resource and Knowledge Based View

Resource and knowledge based views of firms in 1980 and literature on organization learning in 1990 posits that organizational knowledge is the key source of competitive advantage in the long run. In simple it could be asserted that knowledge management plays a key role in success of the firm. Resource base view of firm to achieve competitive advantage emerged in 1980 after the seminal work of [Wernerfelt \(1984\)](#) and [Barney \(1991\)](#). According to their views, organization should look inside the organization to find the sources of competitive advantage instead of looking at competitive environment and other sources externally. There are two resources internally available with the organization i.e. tangible and intangible resources. Tangible assets are physical in nature i.e. land, building, equipment, capital etc. It is argued that physical resources could be easily bought for an organization from market, so they confer little advantage for origination in long run as rivals can imitate and get same asset from market.

Intangible resources are those assets which has no physical presence but still organizations own it i.e. brands, reputation, knowledge, processes, system, skills etc. Unlike tangible assets, intangible resources could not be easily bought from market by the rivals. These remain with the organization and become the main source of sustainable competitive advantage. It could be concluded that intangible resources impact the growth of the organization and the performance of business heavily depends on intellectual resources, company owns in a competitive environment.

2.1.3 Human Capital theory

HC theory can be traced back in labor economics. Theodore Schultz in 1960 introduced the concept of human values and capacities. According to him, HC is same as other capitals; invested could be in HC through education, training and enhanced benefits that leads to melioration in the level and quality of production. According to HC theory, some humans are more productive than others because of more invested resources in training, knowledge enhancement, skills development

on them, same as production unit that demands more resources to be efficient and productive enough (Müller and Raich, 2005). Like any business investment, an investment on human will accrue more sustainable returns. According to this theory, people invest on themselves in diverse ways, not for sake of present pleasure only but for sake of future monetary and non-monetary benefits (Schultz, 1993).

HC theory gave insight in development of theory of IC. According to Stewart (1997) the concept of IC has derived from the theory of human capital by specifically associating knowledge to capital. By singling out knowledge from the theory of HC, IC identifies individual's knowledge, skills as assets to an organization. According to Edvinsson (1997) IC is gradually becoming a viable alternative in making competitive leverage in the competitive environment, because it encompasses the foundational components to do business.

The main focus of IC theory is the need for a consistent balance among all elements of the IC that leads to value creation in the firm. Edvinsson and Malone (1997) corroborated that corporate value does not arise directly from any of the factors of IC, but through interaction of all the factors i.e. human, structural, organizational, reputation etc. Donaldson and Preston (1995) aligned the view of stakeholder theory with that of recognizing the IC of the corporation. As IC is broadly categorized in to human, structural and RC, therefore stakeholder view also posits to maintain the relationship of the company with its stakeholders i.e. employees, customers, suppliers etc.

While theoretical background enlists three major factors of IC i.e. human, relational and structural capital while majority of literature regarding IC measurement ignored relational capital. This theoretical gap documented in developed nations research studies and suggested a holistic view of IC which encompass the IC dynamically.

2.2 Measurement Practices of IC

There are different arguments in literature which differs in sense of measurement of IC by an organization. Marr et al. (2003) provided a motivational framework

that provides three main reasons for measurement of IC by an organization as;

- Strategy
- Influencing behavior
- External substantiation.

IC theories can be better explained through this framework.

2.2.1 Strategy

It has been observed that organizations mostly rely on their IC as a reservoir of competitive advantage. It is also documented that academician and industries developed different dimensions of Intellectual Capital. Now there is competition of organizations in an era of a knowledge led economy, knowledge workers have taken technical jobs, and learning organizations starts progressing in the knowledge economy. According to (Klein, 2009) in a competitive environment, there has been noticed an increase in market share of small firms through introduction of high-quality innovative products and services, organization's IC is considered to be the major element that increasingly determines its competitive position.

2.2.2 Influencing Behavior

It is documented that focus of many organizations remain on short term when they rely on financial measurements solely (Kaplan and Norton, 2001) if compensation system is linked with those measures (Bushman et al., 1995). There are different studies which corroborates that for long term performance non-financial measures are better predictors and thus managers should focus the long term aspect of their decision by employing these measures (Ittner et al., 2003). Johnson and Kaplan (1987) in their study corroborate that corporate reported earnings are unable to depict the company's stock price plummet when intangible resources depletes. The over emphasizing attitude on achieving combat performance in long-term is a matter of time when such performance has become a far less robust

indicator of changes in the company's long-term competitive position. Kaplan and Norton (1996) state that the collision between the irresistible force to build long-range competitive capabilities and the immovable object of the historical-cost financial accounting model, has necessitated for a new mechanism for performance measurement, whose focus is on non-financial performance measures.

2.2.3 External Substantiation

According to Marr et al. (2003) organizations are facing acute pressure to measure and report their IC in developed economies. There are number of theories extracted from the literature of social and environmental studies that warrant the disclosure of IC in corporation's annual report (Guthrie et al., 2004). The most discussed theories in this sense are legitimacy theory and stakeholder theory. As per legitimacy theory, the existence of organizations in societies is under an expressed or implicit social contract (Campbell, 2000). According to Dowling and Pfeffer (1975) "*Organizations operate in a super-ordinate social system in which organizations have legitimacy when their activities are congruous with the goals or expectations of that social system*". It can be summed that changes in the value system en-grafted in the super-ordinate social system leads to cause social changes in values. Based on hardliner crux of legitimacy theory, organizations should report different activities voluntarily if management comprehends that particular activities are expected by the communities in which the organizations exist. According to Guthrie et al. (2004) companies are prone to report voluntarily their IC if they feel a need to do this, as it might not legitimize their status through reporting of tangible assets that are considered as symbol of traditional corporate success. The traditional financial statements neglects many relevant information in reporting which are beneficial for users of the statements to understand completely the resources that helps in creation of value in future (Mouritsen et al., 2004). Based on the discussion it can be concluded that IC measurement and reporting will guide and help the users of statements to fill the gap by disclosing relevant information about resources (the majority of which might be intangibles), that create value for an organization.

The second most widely discussed theory extracted from social and environmental literature that endorse the disclosure regarding IC in annual reports of organization is the stakeholder theory. Freeman (2010) defines stakeholders as ‘any group or individual who is affected by or can affect the achievement of an organization’s objectives’. According to this theory, managers should work for in formulation and implementation of different strategies that satisfy almost all groups that have stake in business. The major job in this process is to manage and integrate the relationships and interests of shareholders, employees, customers, different communities and groups in such a way that assures the success of the firm in long-run (Freeman and McVea, 2001).

Hence, Marr et al. (2003) framework emphasized the need for identification and reporting of IC so that current and potential stakeholders can judge the real worth of organization so that their focus divert from accumulation of physical capital towards balance among physical and intellectual capital.

2.3 Intellectual Capital and Corporate Performance

Theoretically it is argued by eminent researchers in field of IC, that IC is important factor in growth of company and impact its performance. The pioneering work to inquire the relationship between IC investment and FP is of Bassi and Van Buren (1999), they identify a positive relationship between IC investment and FP of 500 US companies and opened a way for researchers to explore this deeply. Using similar concept of Skandia Navigator, Pulic (2000b) proposes Value added IC (VAIC) method that provides information regarding value creation efficiency if tangible and intangible assets in an organization. He empirically depicted the market value as function of capital employed and IC i.e. Human and structural capital. Pulic’s VAIC measures efficiency of firm’s three types of inputs i.e. financial, human and structural capital. Sum of these three efficiencies come up with VAIC, higher the VAIC, better the management and utilization of value creation

potential of organization. The advantage of VAIC model over other models is its cross company and cross country analysis usage. Therefore this model attracted much of the attention in past decade. Researchers and practitioners adopted either VAIC as it is or modified it according to country specific differences.

According to [Rastogi \(2000\)](#), HC is the most important input for organizations especially for employees, constant improvement mainly on knowledge, skills and expertise. HC mainly focuses on the two components as; individuals and organizations. This concept have further been explained by [Garavan et al. \(2001\)](#) that HC have four key characteristics as

- (i) flexibility and adaptability
- (ii) advancement of individual competencies
- (iii) development of organizational competencies and
- (iv) individual employ-ability.

Although, there are various findings that incorporate HC with higher business performance ([Nordhaug, 1998](#)). So, all this discussions primarily focuses on individual and organizational performance.

[Bontis et al. \(2000\)](#) documented that regardless of industry effect, SC contribute majorly in performance of corporation. While [Bontis and Fitz-enz \(2002\)](#) establish the relationship between HC management and economic & business performance. Twenty five financial services firm were the sample of the study, they measured HC effectiveness with respect to four metrics; revenue, expense, income and HC return on income (ROI). Empirical investigation reveals that HC played a vital role in performance of the business. HC has long been argued as an important resource in most business enterprises [Firer and Williams \(2003\)](#) adopted the original VAIC model to explore the relationship among IC and traditional performance measures for seventy five South African corporations, they conclude that only capital employed efficiency is statistically linked with performance and failed to empirically link IC with performance. Empirical results of the study deserve in-depth research

on the role of IC in emerging world because the advancement across the emerging countries may have different significance for IC in creation of value to firm and firm performance.

The study of [Firer and Williams \(2003\)](#) in South African listed firms reports effect of IC on performance while dividing IC in only two parts i.e. HC and SC. Knowledge based firms of the market are picked for empirical investigation. They are of the view that in highly knowledge based firms, structural and physical capital matters a lot than human capital. [Mavridis and Kyrmizoglou \(2005\)](#) investigate the impact of intellectual and physical capital on corporate performance of Japanese and Greek financial sector. They confirm a positive association among the variables of interest but also documented that IC impacts more than physical capital to the financial performance of the organization. [Chen et al. \(2006\)](#) empirically investigate the IC impact on firms value of market and FP in Taiwanese market and concluded that there is significant positive impact of IC on market value and FP of the firm. Their study also explore the degree of emphasis the components of IC received in creation of value. They empirically justify that IC significantly affects the profitability of an organization. The association among the IC and performance measure are not unanimous across the developed and developing economies. [Bontis et al. \(2005b\)](#) further this investigation and empirically tests IC impact on nine measures of performance of firms in cause and effect model. They empirically documented that all the factors of IC has direct impact on business performance except HC, which impacts indirectly.

[Seleim et al. \(2007\)](#) also examine the relationship between HC and organizational performance of software companies. They find a positive relationship between HC indicators and organizational performances. In today's business world HC is considered a valuable concept because employees of the firms should be treated as assets, rather than as expenditure. [Marimuthu et al. \(2009\)](#) study HC and firm performance and report strong evidence that HC development in organizations promotes innovativeness and greater firm performance. While [Chan \(2009\)](#) fails to establish a significant link between IC and financial measures of performance while moderate association among IC and profitability is documented. Same conclusion

has been empirically derived by different studies including but not limited to, Sofian et al. (2006), Tseng and James Goo (2005) and Mavridis and Kyrmizoglou (2005), Zhang et al. (2006) and Tan et al. (2007).

Tan et al. (2007) explore the IC relation with financial performance of listed firms at Singapore stock exchange. They document that IC directly affects the financial performance in a positive manner i.e. more IC of a firm helps to achieve better financial performance. While different industries document different rather contradictory results; few industries weigh more to human and structural capital in value formation but others weigh more just one aspect i.e. Human capital, in value formation for firm. On same grounds, Yalama and Coskun (2007) corroborate that firms profitability is dependent on its IC, if a firm has better employed human, structural and relational capital than it will be more profitable in absence of all other considerations that affect profitability.

While evaluating IC-Performance link Kamath (2008) investigates this relationship on top-notch pharmaceutical firms and concluded that in such sector human capital is major driving force that increases profitability and HC is the most important than other components of IC in such sector where tacit knowledge provides competitive edge for long time periods. Cabrita and Bontis (2008) investigate this same linkage in Portuguese banking sector and concluded that HC is major factor that not only drive financial performance but it also impact the structural and relational capital of banks. Laing et al. (2010) evaluate the role of IC in driving financial performance of motel industry of Australia and came up with the results that manifests that HC is only factor that matters in motel industry financial performance.

Sharabati et al. (2010) studies the role of IC in pharmaceutical sector performance of Jordanian market. He identified three major points i.e. investment in human capital is productive and returnable than physical capital, HC matters more in pharmaceuticals sector than any other capital and HC develops SC for growth and more productivity. While studying the IC and corporate performance link of listed firms at Athens stock exchange, Maditinos et al. (2011) empirically corroborate that the major component which impacted most significantly to financial

performance is human capital. The more efficient the human capital of organization will be, the more good it will perform not in current period but in future too. While other components of IC do impact financial performance but not as much as the HC did. A study led on same grounds by [Joshi et al. \(2013\)](#) also come up with same conclusion, while studying Australian services sector, that HC is driving force to boost the performance of an organization. Majority of the studies in services sector in developed markets corroborate human capital as the main pillar and driver for better performance in an organization. While other components of IC i.e. structural and relational capital do matters but differently in commercial vs Islamic banks or publicly vs privately owned business. While [Lv and Han \(2015\)](#) elaborate role of IC and its components in three sectors i.e. information technology, manufacturing and real estate. Empirical study concluded that IC and its components do impact corporate performance in information technology sector but results in other sectors are not similar. HC and SC is not significant for other sectors i.e. manufacturing and real estate.

Although multiple studies employ [Pulic \(1998\)](#), [Pulic \(2000b\)](#) VAIC as measure of intellectual capital efficiency of firm and come up with contradictory results regarding its impact of financial performance, which can be attributed to regions or industry specific perspective of the study ([Rehman et al., 2011](#)). On other hand [Dženopoljac et al. \(2016\)](#) vindicate that IC components not affect all profitability/performance measures of firm in short run but they do impact performance in long term. Greater value of IC helps to increase the financial performance of firm ([Rehman et al., 2012](#)) in a comprehensive study of Malaysian market, [Abdullah and Sofian \(2012\)](#) identify those components of IC which aids in enhancing financial performance, they state that all components of IC i.e human capital, structural capital and relational capital promotes the corporate performance of organization while relational capital impact is greater than any other factor. On same ground [Tseng and James Goo \(2005\)](#) come up with same positive association of HC i.e. component of IC and FP by using sample of Taiwanese firms.

Studies in emerging economies doesn't provide a conclusive relationship between IC, performance and value of firm. Majority of literature regarding emerging

economies IC relationship with performance is based on financial sector. The IC role in non-financial sector over the performance is ignored by majority of studies conducted in emerging economies.

By adopting the VAIC model of measurement, [Goh \(2005\)](#) investigates the IC and performance linkage in financial sector of Malaysia and found that HC plays a vital role in financial sector performance. [Tan et al. \(2007\)](#) study the relationship of IC and FP in Singapore by applying VAIC model, their findings posed that IC and past plus future FP are positively linked with each other. The interesting part of the findings demonstrated that IC performance behavior is different across industries.

The pioneering work in Asian economies is of [Young et al. \(2009\)](#), who compare the IC and performance relation in financial sector of Asian economies. After controlling the loan quality influence, fund utilization and financial crisis, they concluded that capital employed and HC plays a key role in value creation for financial sector. While [Phusavat et al. \(2011\)](#) investigate the same phenomenon in manufacturing sector of Thailand. Empirical results reveal that IC significantly impacts the performance measure of manufacturing sector including return on asset (ROA), revenue growth, employee productivity etc. Same relationship also analyze in Jakarta by [Mehralian et al. \(2012\)](#), there sample consists of consumer goods firms listed on stock exchange. Their findings are interested in a sense that they found significant impact of IC on current and future performance. [Phusavat et al. \(2012\)](#) conduct an investigation at macro level to determine role of IC in economic performance of country, and found significant role of IC in economic development of country. [Joshi et al. \(2013\)](#) conduct same study in Australian financial sector and observed that HC is the main influential factor on value creation capability of the sector.

The results regarding IC and performance of firms are inconclusive, there are some studies where no relationship between IC and performance is reported, but there are limited studies which posits negative relationship between IC and performance. [Lerroy et al. \(2014\)](#) uses VAIC to check interrelationship between IC and performance in Romanian companies, and significantly documented that there is

negative relationship between market value and VAIC components, which posits that utilization of IC is poor in the organization setup. It can further be asserted that capital market of Romania is unresponsive to IC, capital market is immature and financial crisis supersede all other factors impact on the market. This study explores different aspect of IC, one of them is negative association between HC and productivity of firm, which manifests that just employing the labors and investing on them doesn't make a firm profitable but a right person for a right job is the contributing factor in firm growth.

There are limited studies which report negative association between IC and FP in different time periods which are due to exogenous factors need to be controlled by the researcher. One pertinent study of [Lerro et al. \(2014\)](#) comes up with negative association, and observed that sample empirically tested include period of recession in economy when firms main focus is to remain stable with low profits and business. Concerning to one component of IC i.e. SC. [Zeghal and Maaloul \(2010\)](#) also document strong positive correlation between SC and FP of firm. As research and development expenses, patents, trademarks etc. are reported and identifiable items which contribute in building of structural capital, [Guo et al. \(2012\)](#) investigate the impact of patents and R& D on accounting performance of firm. They empirically argue that patents don't influence the financial performance of the firm while R&D expenses negatively impact the performance of the firm.

With respect to financial sector, recent studies of [Zin et al. \(2014\)](#) and [Sufian et al. \(2016\)](#) are of eminence, according to them Malaysian financial sector's performance is influenced by intellectual capital. Human capital and structural capital significantly affected the banking financial performance. Pertinent study of [Poh et al. \(2018\)](#) recently evaluated the impact of intellectual capital on Malaysian banking sector. Empirical analysis corroborated that human capital and structural capital significantly impacts the banking performance, which manifests that along with focus on physical capital, banking sector should efficiently utilize intellectual capital to enhance the performance.

To analyze IC-Performance link with reference to Islamic banks [Saruchi et al. \(2019\)](#) used modified VAIC model, proposed by [Ulum \(2014\)](#), to gauge the stated

linkage. Empirical analysis revealed that human capital is the sole performance enhancer indicator in the sector which manifests the role of HC in better performance. Majority of studies empirically corroborated that in financial sector the major enhancer of performance is human capital.

Specific literature on IC and FP linkage related to emerging South Asian economies i.e. Bangladesh, India and Pakistan is discussed further in preceding paragraphs to hypothesize the linkage of IC and its components on current and future performance of the firm.

2.3.1 Intellectual Capital and Corporate Performance in Bangladesh

There is limited research in perspective of intellectual capital reporting and limited studies investigate IC and performance link in Bangladesh. [Ali et al. \(2012\)](#) come up with inconclusive results while studying the IC disclosure level in firms listed at Dhaka Stock Exchange. While according to [Khan and Ali \(2010\)](#) there are different results of IC reporting in Islamic and commercial banking sectors, which negates all previous studies results on reporting of IC. Studies till 2010 were focusing on time series but to exactly know the linkage between IC and performance of firms, longitudinal study was required, to which many researchers emphasized including but not limited to; [Kamath \(2008\)](#), [Abeysekera \(2007\)](#) etc. On these grounds [Belal et al. \(2011\)](#) examine the role of IC in image building of Islamic banks, conducted longitudinal study and corroborate that IC positively build image of banks and repose trust of shareholders. They also conclude that IC disclosure increased over the period after 2006 due to growing disclosure requirement of external capital. [Mohiuddin et al. \(2006\)](#) conducts a study to examine the binding between IC and performance of financial sector of Bangladesh. VAIC is used to measure the intellectual efficiency of the sample. Results showed that human capital efficiency (HCE) played a significant role in explaining the performance of the sector than other facets of IC efficiency. While [Najibullah et al. \(2005\)](#) examines the role of IC in creation of firms value by examining 22 Bangladeshi banks, they concluded

that intellectual capital played a positive role in value creation process for all the banking sector. They explored the value added intellectual capital efficiency of commercial banks of Bangladesh and its impact on banks financial. They are of the view that commercial banks financial performance is directly and significantly link with HCE, SCE and CEE. Majority of the literature regarding IC-Performance link with respect to Bangladesh is of financial sector, because of accessibility to data.

2.3.2 Intellectual Capital and Corporate Performance in India

Human capital i.e. one component of intellectual capital received major research insight for a long time in India. [Chakraborty \(2003\)](#) model of HC valuation, Cost-Benefit model was considered a breakthrough to judge the importance of HC in good performing firms. Following his seminal work in Indian market regarding HC, different researchers developed other models to value IC of firm and then to check its link with the financial side of the firm. Majority of the researchers conclude that performance difference of different sectors is just due to different level of HC in a firm. [Das-Gupta \(1974\)](#), [Kolay \(1991\)](#), [Fagerlind and Saha \(1997\)](#) all followed the co-benefit model with few modifications and assessed the level of HC in an organization and its impact on financial performance. [Singal \(2014\)](#) named 21st century as ‘knowledge economy’ where building of tangibles i.e. physical assets solely are not key to success but knowledge assets are more weighed in such economy.

[Kamath \(2007\)](#) studies the difference in performance of Indian financial sector and concluded that the main difference that impacts the performance of banks is HC. She further extended his analysis to explore the reason behind good performing banks and bad performing banks in financial sector, and argues that good performing banks use IC and FC in conjunction than bad ones, whose focus remain on building of FC just. She also pointed out those banks working in financial sector of India which are owned by other nations and empirically document that Indian

banks are not up to mark to those international banks because of Indian banks focus on building of FC more than IC while international banks built FC and IC side by side. The crux of this study was that in knowledge economy the decisive factor that creates performance difference in competitive market is intellectual capital which provides sustainable and comparative advantage to a firm.

[Ghosh and Mondal \(2009\)](#) explore the relation of intellectual capital components on pharmaceutical sector firms of India. Two aspects were studied in this study, one to explore that either IC components affect profitability and second to check either IC affect market value of firm. In first objective, researchers conclude positive results i.e. IC do impact profitability of pharmaceutical sector firms. But IC doesn't significantly impact the market value of any firm in sector.

While [Choudhury \(2010\)](#) investigates all IC facets impact on IT sector performance of India and document that all facets of IC i.e. human capital, structural capital and relational capital enhance the performance of organization, each component of IC impacts independently to the performance.

On same line, [Pal and Soriya \(2012\)](#) evaluate the comparison of two Indian sectors namely textile and Pharmaceutical in terms of their IC and its impact on financial performance of firms. They come up with the same findings as of earlier studies that IC enhance the performance, which depicts in profitability of the firms. In a study by [Vishnu and Gupta \(2014\)](#), researchers explore the impact of two major components of IC i.e. structural capital and human capital on performance of pharmaceutical sector. As this sector require more knowledge base, processes, expertise etc., therefore this sector was targeted to ascertain the relation of IC with profitability. Empirical evidence concludes that both factor impacted positively to the return on asset of firms, human capital significantly affect profitability but not structural capital.

Based on the studies available in literature specifically with respect to Indian corporate sector, all have employed VAIC model of [Pulic \(1998\)](#) while calculating IC. While in financial sector where expertise of humans matter more than any other factor, human capital significantly affect performance.

2.3.3 Intellectual Capital and Corporate Performance in Pakistan

In Pakistani context [Bharathi \(2010\)](#) studies the role of IC in performance of banks operating in country. Value added intellectual coefficient (VAIC) was used to measure the efficiency of human, structural and relational capital to gauge intellectual capital. This study manifolds the pattern and behavior of banks operating in Pakistan. Results reveal that private banks are employing better human capital efficiency than other banks, private banks are being positively impacted by IC than other banks.

[Khan et al. \(2012\)](#) investigate the interconnection among IC efficiency and performance of banks in Pakistan financial sector. Results documented that IC efficiency positively associated with monetary related performance of banks. As IC efficiency will increase, the budgetary performance will increment in banking sector. While [Latif et al. \(2012\)](#) report the difference in impact of IC over different performance and operations aspect of commercial and Islamic banks operating in Pakistan. They report positive and significant connection between human capital efficiency and different segments of performance and operations i.e. productivity, profitability, value etc.

[Khalique et al. \(2015\)](#) examine the link between intellectual capital and performance of small and medium enterprises (SMEs) in electrical division of Pakistan. They elaborate IC in six components namely human capital, client capital, structural capital, social capital, innovative capital and profound capital. Empirical investigation reveals that all components are positively linked with authoritative performance of small medium enterprise (SME) except human capital. The most influential factor of IC remained insignificant in this study to explore its impact on performance of SME which is inconsequential for SME sector of Pakistan. In another study by [Khalique et al. \(2013\)](#) empirical analysis argue that in SME structural and relational capital significantly affect the performance. Earlier [Khalique et al. \(2011\)](#) also documented that in electronic sector also structural and client

capital are the major drivers that impact performance but no effect of human capital on electronic sector of Pakistan.

[Shumaila and Afza \(2014\)](#) explore link between IC and performance in two sectors of Pakistan i.e. textile and chemical. Empirical evidence concludes that in both industries intellectual capital components strongly impact the performance of a firm, But structural capital failed to affect substantially to the textile sector which manifests that chemical sector weigh more focus to technology information systems, processes than textile sector. On other side role of human capital is significantly strong positive with performance in textile sector than chemical sector, which manifests that performance can be improved by investing in knowledge/expert man-power.

[Latif et al. \(2012\)](#) study the role of intellectual capital in determination of firm market value. VAIC was employed to signify the efficiency patterns of IC, results proved that all components of IC significantly and positively impacted the market value of firms. While they also explore the importance of intellectual capital for banking sector in Pakistan and its relationship with financial performance. They analyze the advantages of IC for banking sector along with its role in productivity and market value. Empirical investigation corroborates that IC aids in financial performance along with other tangible assets, the major factor that provides a benefit or competitive edge rests with human capital.

[Rehman et al. \(2012\)](#) explore the relation between intellectual capital components and financial performance in services sector of Pakistan by employing VAICTM methodology. According to them the major driving factor that improves significantly and in great strength is human capital. In all forms of corporations studied i.e. government, private, Islamic and international etc. human capital comes out to be the significant factor that impacts the financial performance, while other components of IC impact differently in different forms of corporation. Earlier [Rehman et al. \(2011\)](#) studied the same bonding in Modaraba companies of Pakistan and concocted that modaraba companies can enhance their financial performance by focusing on the human capital they employed. While in same study they also

found that for modaraba companies structural and relational capital too has a role in financial performance enhancement.

From comprehensive literature generally and specifically to South Asian region i.e. Bangladesh, India and Pakistan it can be hypothesized that intellectual capital do impact the financial performance of firm.

H1: Firms with greater E-VAIC tends to have better financial performance.

H1a: Firms with greater Capital employed (CEE) tends to have better financial performance.

H1b: Firms with greater Human Capital (HCE) tends to have better financial performance.

H1c: Firms with greater Structural capital (SCE) tends to have better financial performance.

H1d: Firms with greater Reltional capital (RCE) tends to have better financial performance.

2.4 Intellectual Capital and Future Corporate Performance

Limited studies in the extant literature of IC and future performance is documented. [Namazi and Ebrahimi \(2010\)](#) investigate the impact of IC on the current and future FP of listed companies on Tehran Stock Exchange. The sample consisted of 120 companies (belonging to the automotive, metals, non-metallic minerals and chemical industries) for a period of three year from 2002 to 2004. Empirical investigation suggests that regardless of company size, debt structure and past FP, there is a significant positive relationship between IC and current and future FP of the company at company's level as well as industries level. But the relationship between debt structure and current and future finance performance at the company's level is documented as positive and significant and in chemical and pharmaceutical industries the relationship is positive as well. However, at the

level of automotive, metal and non-metallic minerals industries, the relationship is ambiguous.

Ahangar (2011) attempts to investigate the empirical relation of IC with firm market value and FP of 96 listed firms' on Athens Stock Exchange. He argues that only HC has significant positive relationship with FP (ROE) of firms. While Abdullah and Sofian (2012) documents positive relationship of IC with FP of firms and, the same findings are supported by Belkaoui (2003) who concludes that IC has a positive and substantive impact on corporate performance of US multinationals.

The most recent work of Vazifehdoust et al. (2014) investigates the association of IC with future performance of the firm on listed firms at Tehran stock exchange. Results explore that future growth of firm and earnings are significantly influenced by investment in intangible assets i.e. IC. Both components of IC as suggested by Pulic (2004) i.e. Human and SC plays significant role in shaping the future performance and growth of the firm. Intellectual capital doesn't built abruptly, but it took time and organizations strive to develop, nourish and innovate this capital to get future benefits. Limited literature also emphasized that current intellectual capital improves the future productivity of the organization which ultimately manifests in profitability and other performance measures of an organization. It can be hypothesized that IC and its components not only impact the current performance of organization but also future performance.

H2: Firms with higher E-VAIC tends to have better future performance.

H2a: Firms with higher capital employed (CEE) tends to have better future performance.

H2b: Firms with higher human capital (HCE) tends to have better future performance.

H2c: Firms with higher structural capital (SCE) tends to have better future performance.

H2d: Firms with higher relational capital (RCE) tends to have better future performance.

2.5 Intellectual Capital and Market Value

Widely increasing difference between market and book value of firm grasped broad research interest to investigate this phenomenon. To identify the reason for a gap between market value and book value of firm, different studies contributed their part in field of IC literature. According to conventional accounting practices, the book value calculation is based solely on financial statements of the organization. To calculate book value from financial statement, the user can subtract liabilities from firm's total assets. But this conservative accounting practice failed to account for, the most important asset of the organization i.e. human capital (Sveiby, 1997a).

With passage of time the accounting standards bodies provide different guidelines for incorporating intangibles on the face of the financial statements, but due to significant cost of implementation of such guidelines there is deterioration of intangibles reporting (Judge et al., 2010). As a result there is growing divergence between firm's book value and market value. Pulic (2000a) applies VAIC model on 30 companies from UK FTSE 250 and empirically documents that VAIC and firms market value exhibit high degree of linkage. Lev and Radhakrishnan (2003) developed a firm specific measure of organizational capital using 250 companies' data, and concluded that organizational capital contributes significantly in explaining the value of firm.

Belal et al. (2011) empirically investigates significant impact of IC on market value of firm in US market. According to him in an efficient market organizations with higher value of IC will have greater market values. Appuhami et al. (2007) reports this assertion in financial sector of Thailand by investigating the influence of IC on capital gains. Results confirm the literature that there exists significant positive association between IC and capital gains. According to Chen et al. (2006) market incorporates the value of intangibles in itself, and that become a reason of greater market value than book value of firm generally. Zeghal and Maaloul (2010) report the role of value addition as a proxy for IC and its impact on value of firm using sample of 300 companies of UK listed in technology domain. They documented a strong association of IC with the market value of the firm.

On same pattern, [Rahman \(2012\)](#) investigates the role of IC in determination of market value of 100 UK listed firms at stock exchange, and found no association among these. [Nimtrakoon \(2015\)](#) explores the cross country difference of IC patterns across ASEAN countries i.e. Indonesia, Malaysia, Philippines, Singapore and Thailand but found no significant difference. While he documented that IC and firms market value is positively linked, the more the IC of the firm, the greater its market value would be.

The extant literature documented that Capital Employed Efficiency (CEE) is the key determinant of financial and stock market performance and found positive relationships. [Lerro et al. \(2014\)](#) applies the VAIC model to determine IC performance of the Romanian companies, and investigate the relationship between IC performance and traditional corporate performance, which was measured via profitability, productivity, and market value. The results indicate a significant negative relationship between VAIC and market value, implying that firms are not generating value from their intellectual, physical and financial resources, or at least this is not recognized by the capital market in that country. None of VAIC components, namely, capital employed, human capital, and structural capital, explain the variation in Romanian firm's profitability. They argue that this may be because of the limited depth and maturity of the markets and the impact of the global economic crisis. Additionally, they justify that capital employed efficiency (CEE) and SC efficiency (SCE) has no significant correlation with productivity while HC efficiency (HCE) is found to have negative relationship with productivity.

[Britto et al. \(2014\)](#) empirically analyze to explain whether IC elements or traditional accounting measures of efficiency can better evaluate value creation by Brazilian real estate companies. They point out a significant inverse relationship between IC and market value that is companies with higher value demonstrated lower levels of IC, except for CEE. Majority of studies empirically and conceptually identify IC as the reason for book value and market value difference. IC which is not directly reported and accounted for in performance appraisal by the users of the financial statements, therefore difference in book and market value

persists. From different studies concluded above, it can be hypothesized that market value is being impacted by intellectual capital of an organization. The more IC an organization have, the more difference will be visible in book and market value.

H3: Firms with higher E-VAIC tends to have higher market value.

H3a: Firms with higher capital employed (CEE) tends to have higher market value.

H3b: Firms with higher human capital (HCE) tends to have higher market value.

H3c: Firms with higher structural capital (SCE) tends to have higher market value.

H3d: Firms with higher relational capital (RCE) tends to have higher market value.

2.6 Theoretical Framework of the Study

Figure 2.2 depicts the theoretical framework of study with detail of hypothesis.

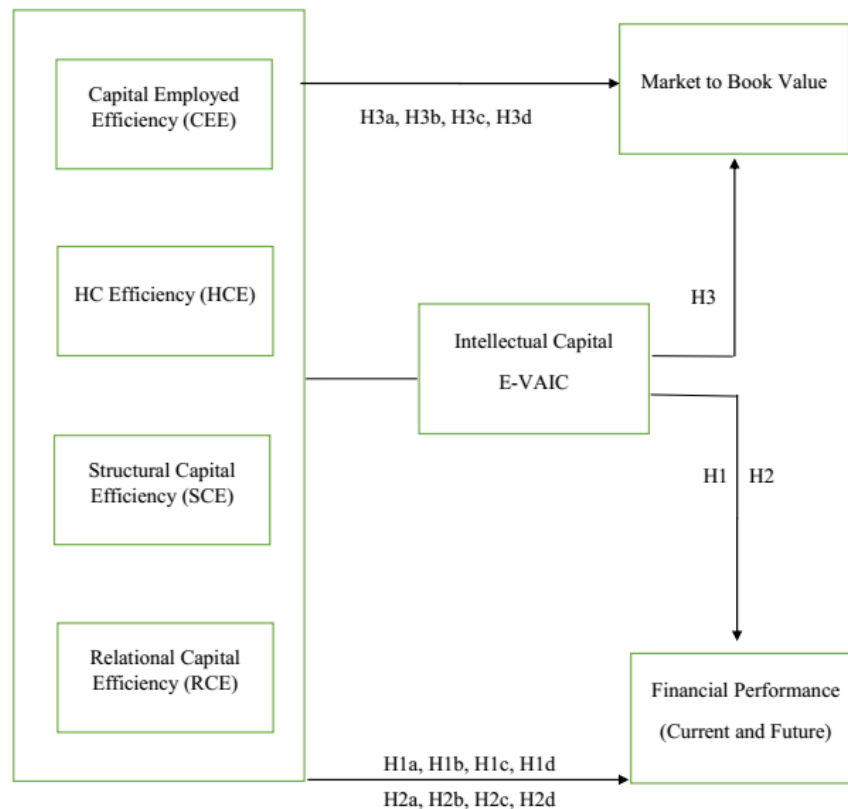


FIGURE 2.2: Theoretical Framework of Study

Chapter 3

Methodology

3.1 Data Description

The major sectors documented by extant literature for study of IC, performance and value relationship are information technology, communication, pharmaceuticals, Chemicals, engineering, automobiles etc. As described earlier that three countries of South Asia i.e. Bangladesh, India and Pakistan are focus of this study because majority of nominal GDP of region is comprised of these countries according to World Bank report 2018. Hundred companies from each country was selected which are listed at their national stock exchanges [Dhaka Stock exchange for Bangladesh, Bombay stock exchange for India and Pakistan Stock exchange for Pakistan]. Sample includes listed companies from non-financial sector as the dynamics and reporting of financial and non-financial sector are different. Data has been extracted from published financial reports of companies. Complete financial report is required for the extraction of financial data, therefore analysis is based on six years data from 2009 to 2014. Country-wise details of data is elaborated below.

3.1.1 Bangladesh

There are 565 listed firms on Dhaka Stock Exchange, hundred firms were selected from multiple sectors as shown in fig 3.1. Companies from these sectors represents

majority of DSE market Capitalization. One aspect was also considered while selecting the sample i.e. availability of six years data from 2009 to 2014. Those companies which lacks maximum data, necessary for the conduct of current study, were skipped from initiation to avoid survivor ship bias.

TABLE 3.1: Bangladesh Data Description.

Sectors	Total Listed Companies	Companies selected in sample
Cement	7	6
Engineering	34	24
Food and Allied	18	6
Fuel and Power	18	10
IT Sector	8	8
Pharmaceuticals and Chemicals	28	20
Telecommunication	2	2
Textile	48	20
Travel and Leisure	4	4

3.1.2 India

There are 5170 listed firms at Bombay Stock Exchange (BSE), hundred firms were selected from multiple sectors. Companies from these sectors represents a good portion of BSE market capitalization. Additionally, relevant data access was also considered while selecting the sample i.e. availability of six years data from 2009 to 2014. Those companies which lack data necessary for the conduct of current study were skipped from sample to avoid back fill and survivor ship bias. For statistical value, to generalize the findings of the study, it was ascertained that at least five years of data for each variable is available.

Sector-wise composition of sample is given in table 3.2, which depicts in detail the number of companies listed under the sector and also number of companies included in sample of the study.

TABLE 3.2: India Data Description.

Sectors	Total Listed Companies	Companies selected in sample
Broadcasting and Cable TV	20	3
Communication Printing /Stationary	4	2
Electric utilities	34	8
Construction & engineering	85	8
Cement and Cement products	43	10
Health care Facilities	8	2
IT Consulting & Software	48	15
Oil Marketing & Distribution	11	8
Packaged Foods	33	12
Pharmaceuticals	131	6
Refineries	6	3
Sugar	30	6
Textile	151	13
Telecommunication	15	4

3.1.3 Pakistan

There are 581 listed firms at Pakistan Stock Exchange (PSX), hundred firms were selected from multiple sectors. Like sample selection from other two countries, same practices applied here so to select only those companies in sample which have ample data with respect to main aim of this study and are representative of majority of PSX capitalization. Sector-wise composition of sample is given in table 3.3.

TABLE 3.3: Pakistan Data Description.

Sectors	Total Listed Companies	Companies selected in sample
Automobiles	22	2
Cement	21	5
Chemical	29	8
Engineering	19	15
Food and Personal Care	23	13
Oil and Gas	12	6
Pharmaceutical	11	11
Power Generation and Distribution	19	12
Technology and Communication	10	10
Textile	155	18

Sample selection emphasized on three main points;

- sample include those firms that represents majority of the national stock exchange capitalization,
- to represent all sectors in sample, multiple companies selected from different sectors based on data availability,
- those firms selected whose data for at least five years is available for all variables of the study.

As the aim of the study is to ascertain IC-Performance link without exploring the sectoral differences, therefore multiple sectors for all three countries were selected based on the criteria described above.

3.2 Variable Description

3.2.1 Intellectual Capital

To assess the intangible power of a company, measurement of IC is well accepted both in academia and practice. There are different ways to access the IC and literature provides different tools for its measurement. Extant literature on measurement of IC summed this up as it is still at an exploratory stage. Because of no general measurement approach or coherent theory there is lack of consensus on its measurement and reporting. IC is interdisciplinary topic, because of this different researchers from varying disciplines i.e. accounting, economics, finance, strategy, human resources, and psychology tried to measure IC using different theories to justify its measurement. On the basis of solely the audited financial statements it is not an easy task to measure IC with conventional tools objectively. The emergence of knowledge based economies has led to increase research on IC measurement tools. Existing literature grouped IC measuring methods under two categories: those that do not use a monetary valuation of IC, and those that put a monetary value on IC. IC measurement can be grouped into two parts internal measures and external measures (Bhasin et al., 2011).

3.2.1.1 Internal Measures of IC

Mostly discussed internal measures of IC focus on budgeting, training and human resources. The four most popular internal measures of IC are:

- Human Resource Accounting (HRA)
- The Intangible Assets Monitor (IAM)
- The Skandia NavigatorTM
- The Balanced Scorecard.

3.2.1.2 External Measures of IC

Most discussed and used external measures for facilitating the valuation of IC in pre and post modernization period i.e. 21st century, is described in detail in the following section.

- Market-to-book ratio (M/B): Market to book value shows the extent of market value in excess of its book value. That part of the MV of corporation in excess of its BV is considered the MV of its IC (Stewart, 1997). Simply the difference between market and book value of a corporation is taken as equaling the level of IC of the business. It is also documented that if the difference is abnormal then it depicts the mismanagement of the IC of firm. Critics on this measure of IC argue that this difference is not just only due to IC but other hidden factors too, Brennan and Connell (2000) endorse this view.
- Tobin's Q: Brainard and Tobin (1968) developed the ratio of MV to firm asset replacement cost which can be used for making comparisons among firms performance. The concept of replacement cost was aimed to besiege the varying depreciation policies used by accountants around the world (Jioa, 2000). If Q ratio exceeds 1, the company is probable to seek towards more acquisition of IC. But in knowledge based economy the estimation of the replacement cost is difficult with a lot of VA from IC.
- Calculated Intangible Value: CIV is a way of valuing a company's intangibles. Measurement of CIV employs industry norms to demonstrate returns for tangibles, and estimates the level of IC by assigning to it any return exceeding the norms of the industry. Usually the intangibles of a company is assessed by subtracting a firm's BV from its MV. This measure attempts to assign fixed value to intangible assets that is reluctant to change according to firms MV. Examples include brand equity and proprietary technology. Hitherto, critical analysis of this measure asserts that MV constantly changes, the value of intangible assets must vary accordingly, but this measure assume value of IC constant once measured, therefore making it an inferior measure.

- Return of Management (ROM): [Strassman \(1997\)](#) employed a measure to check the efficiency of management by using the whole capital an organization have. ROM is obtained by dividing management value, which is the value added by management to the operations of business, by the sum of sales and administrative expenses. The major shortfall of this measure is an assumption which states that only management is the part of an organization that adds value, therefore this measure neglects all other components contribution in corporate success.
- Value-Added Intellectual Coefficient (VAICTM): [Pulic \(2000b\)](#) germinal work to assess the value of IC by using the accounting information solely is most discussed and analyzed in IC literature. VAIC measure the efficiency components of both physical and intellectual capital. It provides information that how much contribution is of IC and tangible assets in value addition of business. The more the value of VAIC, the good is the management utilization of the potential value creation from physical and IC ([Williams, 2001](#)).
- Real Options Analysis: The most recent and nascent methodology in financial literature is of real options which employs theory of financial options to value intangible assets. A financial option is the right but not an obligation, to buy or sell an underlying asset at a fixed price for a predetermined period of time. A real option is an option that is based on non-financial assets. Real options can be applied to determine the value to proceed, defer, expand or abandon investment.

3.2.1.3 Approaches to Measure IC

As the measurement of IC is at exploratory stage, literature provides thirty varying monetary and non-monetary approaches to measure IC values. Due to difficulty in estimation of IC objectively by using traditional financial tools, the first phase of literature measures IC through questionnaire and surveys ([Bontis et al., 2000](#)). This method requires a reasonable time and sample size. Contrary to this approach, the second phase of literature provides evidence on measures of IC based

on standard accounting/financial information. For example, the Value-added intellectual coefficient (VAICTM) which employs a scheme to evaluate the value of tangible and intangible resources at corporate level (Pulic, 1998). The major advantages of employing the VAICTM approach includes;

- the calculation of VAIC is objective and verifiable because of its dependence on audited financial information (Pulic, 2000b),
- it can be applied on different businesses and at different level of operations because of its output oriented process method (Chen et al., 2004), and
- no other measure enables the comparative analysis across various industries or nations but VAIC, which provides standardized and consistent basis of measurement (Nimtrakoon, 2015).

VAIC is an evaluation system to measure IC quantitatively from accounting information. The VAIC model to measure the IC is widely used by many studies. The VAIC is said to be the convenient measurement tool for firms IC because data is easily accessible from audited financial statements. Literature on IC posits that there are different measures used to capture the IC of the corporation. But there is no single measure of IC except the VAIC that can be applied on multiple corporations without major modifications, or that can be used for cross country or cross company comparisons. VAICTM is solely based on the audited data provided by corporations, so there is no need to level the data due to company differences as other measures required. Table 3.4 provides glimpse of IC measurement established through review of literature.

3.2.2 Pulic VAIC Model

According to Pulic (1998), Pulic (2000b) and Pulic (2008) VAIC comprise of three components: the coefficient of material capital (capital employed efficiency or CEE) and the coefficient of intellectual capital, measured by human capital efficiency and structure capital efficiency, respectively.

TABLE 3.4: Measurement of IC.

Method	Pioneer
Balanced Scorecard	Kaplan and Norton (1996)
Skandavia Vaue scheme	Edvinsson and Malone (1997)
IC index TM	Roos et al. (1997)
Holistic Value Approach	Roos et al. (1997)
VAICTM	Pulic (2000b) , Pulic (2008)
Citation-Weighted Patent	Hall et al. (2001)
IC-Dynamic Value	Bounfour (2003)
E-VAIC	Nazari et al. (2011)
iB-VAIC	Ulum (2014)
M-VAIC	Nimtrakoon (2015)

- Capital Employed Efficiency (C.E.E): The VAIC model developed from the view point of value-addition to the firm from the utilization of IC, CEE indicates that the value-addition created by per unit of material capital. The higher the ratio, the more efficient the enterprise is in employing material capital in creating value.

$$\text{C.E.E} = \text{VA}/\text{CE}$$

Where;

VA = Value added = output-input

Output = Business revenues

Input = Business cost except wages to employees

CE = Capital employed = Total Assets-Current Liabilities

- Human Capital Efficiency (H.C.E)

HC relates to the capacity, attitude and creativity of employees. [Pulic \(2004\)](#) asserts reflection of contribution in VA should be shown by HC, thus HCE is the measure to evaluate the relationship between HC and the VA by the firm. Therefore, the total wages and costs of staff for a firm have often been

used to measure the HC investment by the firm. HCE refers to the VA brought by per unit of HC, thus it refers also to the quality of HC.

$$\text{HCE} = \text{VA}/\text{HC}$$

Where;

HC = Human Capital = Total costs employed on employees

- Structural capital efficiency (SCE)

SC facilitates business intellect by pertaining to the systems and structure of a firm. Majorly it consists of organizational routines, processes, strategies and knowledge embedded in organization. Pulic (2000a) assumed that IC is comprise of HC and SC. Therefore value addition is due to the both components only.

$$\text{VA} = \text{HC} + \text{SC}$$

By rearranging the equation, SC becomes,

$$\text{SC} = \text{VA} - \text{HC}$$

$$\text{SCE} = \text{SC}/\text{VA}$$

Where

SC = Structural capital According to Pulic (2008) VA Income Statement as given in Appendix (I) $\text{VA} = \text{SC} + \text{HC}$ The aim of the firm is to create value for its shareholders and stakeholders. If there is no value addition, then stakeholders (i.e. employees) will not be fully compensated for their services and gross operating profit (EBITDA) can be in negative figures. Thus, higher the VA for an organization, the higher the possibility of satisfying both shareholder and stakeholder. Therefore, to create value according to VA income statement, equation can be rearranged as

$$1 = \text{HC}/\text{VA} + \text{SC}/\text{VA}$$

Where according to Pulic (2000b),

$$\text{HCE} = \text{VA}/\text{HC}$$

and,

$$\text{SCE} = \text{SC}/\text{VA}$$

Therefore,

$$SCE = 1 - (1/HCE)$$

Which is the main proposal of Pulic's model. This equation links the relationship of shareholders (SCE) with the productivity of workers (HCE). It can be asserted that,

$$SCE > 0 \text{ leads to } HCE > 1$$

which is ultimately $VA > HC$.

The ultimate proposal of Pulic's model revolve around two aspect of IC i.e. HC and SC which are interlinked to provide value to an organization. If efficient knowledge workers are in the organization then value creation will be more than cost of knowledge workers (HC) which manifests the role of that extra VA to satisfy shareholders. For this reason Pulic used SA/VA for calculation of SCE.

Therefore according to Pulic (1998) VAIC is sum of HCE, SCE and CEE.

$$VAIC = HCE + SCE + CEE$$

Detailed calculus on Pulic's VAIC is provided in Appendix (I).

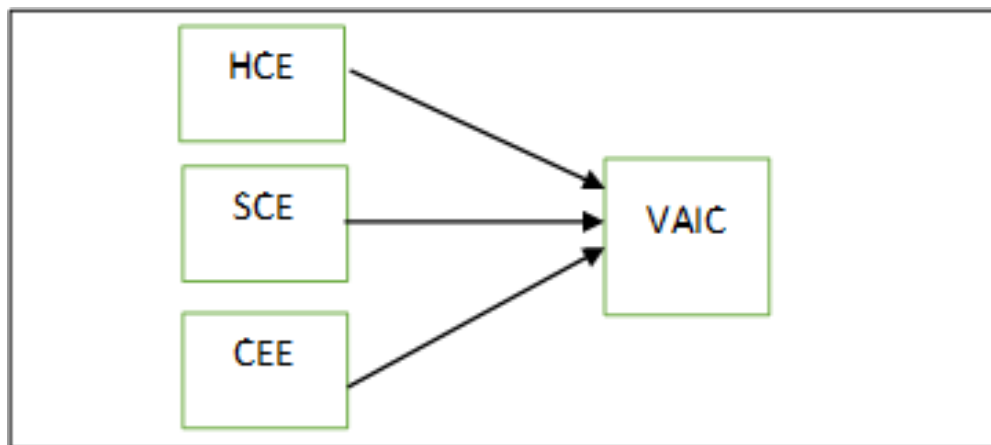


FIGURE 3.1: Pulic's VAIC model, Source: Pulic (2004)

3.2.2.1 Limitations of VAIC

In Pulic's model includes two components of VAIC only which is incomplete according to critics. Structural capital also includes the innovative capital which

must be separated from whole SC, but VAIC ignored to separate innovative capital from SC in calculation of VAIC. Research and development (R & D) refers to the innovative capital of an organization. R & D expenditure in knowledge management plays a major part in business. R & D expenditure promotes the technological advancements of firm and play its part in firm's growth. Different studies explored the role of R & D in value creation. [Lev and Sougiannis \(1996\)](#) documented significant connection between firms R & D and stock returns, consequently [Chauvin and Hirschey \(1993\)](#) found a positive influence of R & D on corporate value of firms. But Pulic's SC computation composites all such sub-capitals collectively. This criticism will be valid if specific sub-capitals are to be ascertained which are individually more important for enhancement of firm value or performance.

Secondly VAIC model doesn't discuss the relational capital, neither includes relational capital efficiency as part of IC efficiency. While literature reveals that IC is composed of human, structural and relational capital.

While analyzing weaknesses of VAICTM model [Stähle et al. \(2011\)](#) states that this model depicts the efficiency of labor and capital investment, but it ignores relational capital in its calculation straightforward. [Iazzolino and Laise \(2013\)](#) assert that VAIC is not conflicting methodology to other measures but it fail to account for all components of efficiency. Hence, it can be employed as an innovative indicator of IC efficiency which provides the base for IC calculation. According to them [Pulic \(2004\)](#) uses re-interpreted terms in calculation of VAIC by following Skandia navigator method. Due to these limitations of VAIC, several studies have modified VAIC model especially the work of [Chan \(2009\)](#) and [Ulum \(2014\)](#) is commendable. The VAIC has definite advantages over other measures of IC, as it is based on audited financial data, has verifiability and objectivity and could be used for cross sectional comparisons i.e. across companies ([Firer and Williams, 2003](#)). VAIC has one major advantage over other measures is accessibility to external stakeholders with respect to intangible value of the firm. Regardless of criticism, VAICTM is widely used model across the globe because of its cross-company analysis simplicity and comparability but brushing aside of relational

capital is bit problematic for the model (Stähle et al., 2011).

3.2.2.2 Extended VAIC Version

In the extended version of VAIC presented here along with Nazari (2010), Vishnu and Gupta (2014), Iazzolino et al. (2014) and Nimtrakoon (2015) versions, RC has been incorporated as a variable of VAIC. Literature reveals that RC has two subparts i.e. social and customer capital. Different studies including Nimtrakoon (2015), Vishnu and Gupta (2014) and Nazari (2010) used only customer capital in calculation of RC. This study will incorporate both sub parts of RC i.e. Customer capital and Social capital. The proxy of the customer capital is marketing, selling and advertising expenses. Social capital, part of relational capital comprises of value of all potential relations of organization with its major defined stakeholders in society. E-VAIC in this study will consider only that part of social capital which is comprised of community relation in terms of philanthropy, community development etc. As to financially capture the full picture of RC from financial data is cumbersome. Therefore social capital is measured through donations/CSR activities to community. Such expenses are incurred to establish and retain the bonding with external part of stakeholders (Nazari et al., 2011). Secondly the conflicting measure of structural capital measure is attempted to resolve in estimation of E-VAIC. As SC includes processes, trademarks, databases etc. Multiple studies use proxy of SC as research and development cost, which is actually part of SC named as innovative capital, therefore, such proxy cannot fully capture the SC of firm but innovative capital just. Therefore it can be concluded that part of SC is studied in different studies with name of SC as whole, ignoring other its facets. Selection of the proxies is guided by two factors i.e. according to the literature and availability of financial data.

Therefore extended value added intellectual coefficient (E-VAIC) will be estimated through IC components i.e. human, structural and relational capital along with physical capital as;

$$\text{E-VAIC} = \text{HCE} + \text{SCE} + \text{RCE} + \text{CEE}$$

$$E\text{-VAIC} = \text{ICE} + \text{CEE}$$

$$\text{Where ICE} = \text{HCE} + \text{SCE} + \text{RCE}$$

To arrive at a comprehensive measure of intellectual capital, current study will modify and extend the VAIC model by adding relational capital as part of IC while computing IC efficiency as shown above. Three different models has been elaborated in literature to capture the IC including [Pulic \(2008\)](#), [Nazari \(2010\)](#), [Iazzolino et al. \(2014\)](#), [Vishnu and Gupta \(2014\)](#) and [Nimtrakoon \(2015\)](#) extended and modified VAIC models. All models are discussed in detail along with their merits and demerits as;

- **Model 1**

VAIC model in which VA is used to assess the performance of an organization. In model proposed by this study VA has been kept as it is to verify efficiency of the IC components. In original model of VAIC given by [Pulic \(2004\)](#), there is discretion over using VA as numerator/denominator for efficiency computation. Ratio of output to input is the most simple definition of efficiency, therefore in extended model value addition is considered as outcome for any successful business, the E-VAIC and efficiencies are computed as;

$$\text{HCE} = \text{VA}/\text{HC}$$

Where HC = employee cost + directors remuneration including all perks and benefits

$$\text{VA} = \text{Value added}$$

where VA = Output - Input

$$\text{SCE} = \text{SC}/\text{VA}$$

Where SC = VA-HC

$$\text{RCE} = \text{RC}/\text{VA} \text{ according to } \text{Iazzolino et al. (2014)}$$

Where RC = marketing selling and advertising expenses plus donations

$$\text{CEE} = \text{VA}/\text{CE}$$

Where $CE = \text{Long term debt} + \text{equity}$

Therefore;

$$E\text{-VAIC} = HCE + SCE + RCE + CEE$$

Where the efficiency parameter for a business is VA. Model 1 is the most discussed (in its original and modified form) in literature and due to its vast acceptability, this study employed this model for data analysis.

- **Model 2**

According to [Stähle et al. \(2011\)](#) the use of VA by [Pulic \(2004\)](#) as efficiency parameter inflate the numerical values of VAIC, in capital intensive industry particularly which results in vague results to which [Iazzolino and Laise \(2013\)](#) deplored with mathematical proofs. Earlier to this discussion, [Nazari \(2010\)](#) proposed the use of net sales instead of value addition to compute the efficiencies as;

$$HCE = \text{Net sales}/HC \quad SCE = \text{Net sales}/SC$$

$$RCE = \text{Net sales}/RC$$

$$CEE = \text{Net sales}/CE$$

Therefore;

$$E\text{-VAIC} = HCE + SCE + RCE + CEE$$

Where the efficiency parameter for a business is NS. Literature of intellectual capital critique this model due to use of output measure without adjusting for input factor, which is basic assertion of Pulic's VAIC calculs.

- **Model 3**

The two models presented above which extend the VAIC model are efficiency based models where the efficiency parameters are net sales and value addition in business. [Vishnu and Gupta \(2014\)](#) proposed the intensity measures to compute the VAIC as;

$$HCI = HC/\text{net sales}$$

$$SCI = SC/\text{net sales}$$

$$\text{RCI} = \text{RC}/\text{net sales}$$

$$\text{CEI} = \text{CE}/\text{net sales}$$

Therefore model 3 is an intensity based model which provides;

$$\text{E-VAIC} = \text{HCI} + \text{SCI} + \text{RCI} + \text{CEI}$$

Model 2 and 3 are in conflict with the gist of Pulic's VAIC, as both models ignore output-input relation and consider only output factor on the basis of which efficiency parameters are measured.

- **Weaknesses of Model 2 and 3**

The main issue with model 2 and 3 is most debated in recent history after financial crisis which affected many business across the globe. Sales in raw form can't predict the exact value addition in company. According to International accounting standard number eighteen, there are generally multiple ways of recognizing revenue and it's on companies discretion and industry practice to use any one of it. While once a method of recognition is choose then any change in it retrospectively must be stated in notes to accounts of financial statements. As extant literature identified that sales can be inflated or deflated within limits of accounting standard. True value addition can be very different from sales, because without accounting for the cost related to sales just referring sales as value addition of business will be biased.

As Pulic (2000a) framework of VAICTM based on value accounting principle (given in Appendix I) therefore use of model 2 and 3 in calculation of VAIC can be misleading, therefore this study used extended model of VAIC by employing model 1. Secondly the computation of SCE in models 2 and 3 is criticized by Iazzolino and Laise (2013) which failed to capture the essence of Pulic (2008) VAICTM. Model 1 captures the true value added efficiency of all components according to value added income statement and gist of Pulic (2008) VAIC model to which Iazzolino et al. (2014) mathematically proofed as shown in Appendix I.

3.2.3 Value Addition

Extended VAIC measured VA by adopting [Pulic \(2008\)](#) principled approach. The first step in calculation of VAIC is computation of VA during a time period i.e. financial year, by evaluating all the resources of the firm. VA denotes as difference between inputs and outputs of the firm during a time period i.e. financial year. Positive value of VA means that output surplus is the creation of wealth.

$$VA = \text{Output} - \text{Input}$$

Output refers to the income generated by the firm from sale of products/services, while input refers to the expenses incurred by the firm excluding cost of labor, tax, interest, dividends and depreciation/amortization. Different studies modified the computation of VA as;

$$VA = O.P + E.C + N.C$$

Where;

O.P = operating profit

E.C = Employees cost including all benefits/perks

N.C = Non-cash charges (depreciation and amortization)

This calculation of value added by firm is derived from stakeholder theory [Donaldson and Preston \(1995\)](#) which posits that any entity which is being influenced by firm's activities or either influences have a stake in the firm. [Belkaoui \(2003\)](#) extended this view of value addition than simple measure of output and input. Accordingly value added is calculated as;

$$R = S - C - D - P - W - I - T - D$$

Where;

R = Retained Earning

S = Net sales

C = Cost of sales plus all operational expenses except labor, tax, interest

D.P = Depreciation or amortization charged during a period

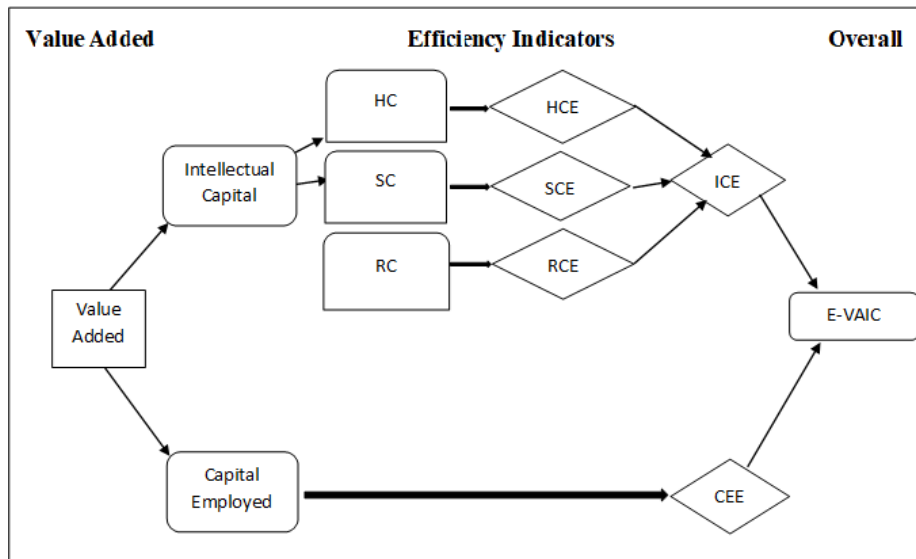


FIGURE 3.2: Extended VAIC Model Framework, Source : [Ulum \(2014\)](#)

W = Wages and salaries paid to employees including all fringe benefits

I = Interest expense

T = Taxes

D = Dividends

By rearranging the equation as

$$S-C = R + D.P + W + I + T + D$$

Where,

$S-B$ is value added as shown above,

therefore,

$$VA = R + D.P + W + I + T + D$$

According to stakeholder theory the above equation manifest the distribution of value to all stakeholders, generated by firm. It includes salaries paid to the employees, interest paid to debt-holders, taxes paid to the government, dividend and retained earnings paid to the shareholders and the provision for depreciation allocated to shareholders. According to theory of stakeholder, this method of calculating value addition in firm is logical and meaningful.

3.2.4 Dependent Variables

Following variables are used to capture the market value and financial performance of firm for this study.

- **M/B ratio:** Value of a corporation prevailing in market is called the market value. Market value determines the amount one can pay in market and acquire ownership stake in the firm. To capture the market value of firm M/B ratio is used as proxy. M/B ratio represents an index of market expectation of firm's performance in future with comparison to book value. Large number of studies including most recent studies of [Bontis et al. \(2005a\)](#), [Madininos et al. \(2011\)](#) and [Nimtrakoon \(2015\)](#) used M/B ratio as to capture the market value

$$\text{M/B ratio} = \text{MV of firm} / \text{BV of firm}$$

where,

MV = Market value of firm

BV = Book value of firm

Firm's market value = shares outstanding x market price at the end of period

Firm's book value = BV of equity - paid in capital of preferred stocks

- **Returns on Asset:** ROA is the capability of firm in utilization of its assets regardless of firms financing policy. It is widely used in multiple studies of IC as a proxy to gauge the financial performance. As Value addition in business was calculated as output-input relation without adjusting for taxes, on same grounds ROA was calculated without adjustment for taxes following [Iazzolino and Laise \(2013\)](#).

$$\text{ROA} = \text{Earnings before tax} / \text{Average total assets}$$

- **Margin Ratio:** Margin ratio demonstrates the ability of corporation to generate profit from the net sales. This ratio measures the efficiency of firm in generating income from core business (sales).

$$\text{Margin ratio} = \text{pretax profit} / \text{net sales}$$

- Return on equity (ROE): ROE refers to the returns to the equity holders, it is generally used as a profitability ratio for investors. Tax effect also not adjusted for ROE calculation for the reasons described above for ROA.

$$\text{ROE} = \text{pretax profit} / \text{Average shareholders' equity.}$$

- Revenue growth (RG): RG represents the variations in firm's revenues. Firm's growth is commonly signaled by a measure of increase in the revenues for the same reasons as described above.

$$\text{RG} = (\text{revenue}_t / \text{revenue}_{t-1} - 1) \times 100$$

3.2.5 Control Variables

According to limited literature on use of control variables while investigating the association between IC efficiency and firm's market value & performance, it is documented that control variables magnify the analysis and researcher can properly test the association or the linkage as stated earlier. Therefore, three control variables are incorporated in this study as;

- Firm Size: Larger firms have more resources and it can be argued that knowledge and skills level of larger firms will be much higher than the smaller ones. Hence larger firms may generate high M/B value and financial performance. To control this effect, firm's size is used as

$$\text{Size} = \text{Log (Total Assets of firm)}$$

- Firm's age: It is documented that age of the firm may have an influence on the performance of the firm. Well established companies may have had greater time and experience of business, that enhances their performance and value in an industry. Therefore Age of the firm is used as control variable to control the effect of long survived corporation in the community.

$$\text{Age} = \text{Firms age in years}$$

- Leverage: It is documented that leverage affects the performance of the organization. The results are not conclusive in developed and developing

economies. Some studies documented positive impact of leverage while others negative relationship along with their arguments. But one point is established that leverage impact the profitability of the organization. If the level of debt is high in an organization, then the focus of firm will be on debt holders (Williams, 2001). This view is conflicting with the view of stakeholder theory. Firms which heavily rely on debt financing lack the security required by investors because of high risk involvement, therefore it impact the market performance of a firm according to signaling theory. Different studies controlled the impact of leverage of an organization while studying the impact on performance including majorly Firer and Williams (2003); Shiu (2006); Chan (2009); Ahangar (2011) etc. On same argument leverage has been employed as control variable in this study and computed as;

Leverage is ratio of TD to TA.

Where,

TD = Total debt

TA = Total Assets

3.3 Methods

Panel data model has been used to inquire the role of IC on financial performance (current and future) and market value of firms on South Asian emerging economies i.e. Bangladesh, India, and Pakistan. Before applying any panel data model for empirical conclusion, this study also employed different diagnostics so that the results are free from apparent econometric errors and can be generalized. Linear panel data models can be estimated through three different methods as;

- (a). Common Effect Model
- (b). Fixed Effect Model
- (c). Random Effect model

Common effect model: The one of the technique of panel data analysis is common effect model which performs test with constant coefficients i.e. intercept is constant across cross section and time series.

Fixed effect model: The other model of panel data is fixed effect model, which performs test with varying intercepts which are cross sectional based. It is also known as least square dummy variable model (LSDV).

Random effect model: The third model of panel data is random effect model. It is special case of fixed effect model but it differs with fixed effect in a sense that its intercept behave randomly. It is also known as variance components model.

F likelihood test: Test used to analyze the data that which model of the panel data (Fixed vs. common effect) best suits and should be used.

$$F = \frac{(Rf^2 - Rc^2)/(N - 1)}{(1 - Rf^2)/(NT - N - K)} \dots\dots\dots(3.3.1)$$

Where; Rf^2 is R-square fixed effect model

Rc^2 is R-square common effect model

N is total number of cross-sections

T is time period

K is total explanatory variables

If Critical F-stat > tabulated stat then fixed effect model best fit for the data, and common effect otherwise.

Hausman test: Test used to analyze the data that either random effect model is superior to fixed effect.

$$H = (\beta^{FE} - \beta^{RE})[Var(\beta^{FE}) - Var(\beta^{RE})]^{-1}(\beta^{FE} - \beta^{RE}) \dots\dots\dots(3.3.2)$$

If the value of H-stat is large enough, than the difference between estimates is significant, so null hypothesis of random effect model will be rejected which says that random effect model is inconsistent. Alternatively fixed effect model is used.

Detailed analysis of the model chosen and basis of its selection is explained in detail in later section.

3.3.1 Econometric Model

By employing Panel data methodology to analyze the role of intellectual capital on firm's current and future performance along with its market value on South Asian emerging economies i.e. Bangladesh, India, and Pakistan, following econometric models were used.

3.3.1.1 Impact of Individual Components of E-VAIC on Firm Performance

$$\begin{aligned} ROA_{i,t} = & \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ & + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \end{aligned} \quad (3.1)$$

$$\begin{aligned} ROE_{i,t} = & \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ & + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \end{aligned} \quad (3.2)$$

$$\begin{aligned} MR_{i,t} = & \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ & + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \end{aligned} \quad (3.3)$$

$$\begin{aligned} RG_{i,t} = & \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ & + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \end{aligned} \quad (3.4)$$

3.3.1.2 Impact of E-VAIC on Performance Measures of Firm

$$ROA_{i,t} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.5)$$

$$ROE_{i,t} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.6)$$

$$MR_{i,t} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.7)$$

$$RG_{i,t} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.8)$$

3.3.1.3 Impact of E-VAIC and its Components on Value of Firm

$$M/B_{i,t} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.9)$$

$$\begin{aligned} M/B_{i,t} = & \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ & + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \end{aligned} \quad (3.10)$$

3.3.1.4 Impact of E-VAIC on Future Performance of Firm

$$ROA_{i,t+1} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.11)$$

$$ROE_{i,t+1} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.12)$$

$$MR_{i,t+1} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.13)$$

$$RG_{i,t+1} = \beta_0 + \beta_1(E - VAIC)_{i,t} + \beta_2(Age)_{i,t} + \beta_3(Lev)_{i,t} + \beta_4(Size)_{i,t} + \epsilon_{i,t} \quad (3.14)$$

3.3.1.5 Impact of E-VAIC Components on Future Performance of Firm

$$ROA_{i,t+1} = \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \quad (3.15)$$

$$ROE_{i,t+1} = \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \quad (3.16)$$

$$MR_{i,t+1} = \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \quad (3.17)$$

$$RG_{i,t+1} = \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} \\ + \beta_5(Age)_{i,t} + \beta_6(Lev)_{i,t} + \beta_7(Size)_{i,t} + \epsilon_{i,t} \quad (3.18)$$

Where;

$ROA_{i,t}$ = Return on Asset of firm i at period t

$ROE_{i,t}$ = Return on Equirt of firm i at period t

$MR_{i,t}$ = Margin Ratio of firm i at period t

$RG_{i,t}$ = Revenue Growth of firm i at period t

$ROA_{i,t+1}$ = Return on Asset of firm i at period $t + 1$

$ROE_{i,t+1}$ = Return on Equirt of firm i at period $t + 1$

$MR_{i,t+1}$ = Margin Ratio of firm i at period $t + 1$

$RG_{i,t+1}$ = Revenue Growth of firm i at period $t + 1$

$Size_{i,t}$ = Size of i at period t

$M/B_{i,t}$ = Market to book value of i at period t

$Age_{i,t}$ = Age of i at period t

$E - VAIC_{i,t}$ = Extended VAIC of i at period t

$Lev_{i,t}$ = Leverage of i at period t

$HCE_{i,t}$ = Human capital efficiency of i at period t

$CEE_{i,t+1}$ = capital employed efficiency of i at period t

$SCE_{i,t}$ = Structural capital efficiency of i at period t

$RCE_{i,t}$ = relational capital efficiency of i at period t

3.3.2 Robustness Check

Economic value added (EVA) is considered to be the internal performance assessment criteria of an organization. Stern Stewart & Co. in late 1980 devised EVA to capture the economic profit of the corporation in true sense. It is based on residual wealth which compares the net profit of an organization with the return on invested capital. Ideally origination should go for those projects which provide returns more than the cost of funds. The main idea behind EVA is the calculation of economic profit rather accounting profit. That's why other performance measures like return on investment which does not incorporate the changing levels of investment pattern in an organization are inferior to EVA.

$$EVA = NOPAT - (I.Cap \times K)$$

Where,

NOPAT = Net operating profit after taxes

I.Cap = Invested Capital

K = Cost of invested capital

A true profitable business has to create wealth for its shareholders and the superior and most used measure to capture the economic performance of an organization is EVA. Therefore EVA and IC relationship has been checked in this study for robustness i.e. how the factors of IC, human capital, structural capital, relational capital, financial capital, impacts the EVA and how these factors are linked together following the [Joorbonyan et al. \(2015\)](#).

$$EVA_{i,t} = \beta_0 + \beta_1(CEE)_{i,t} + \beta_2(HCE)_{i,t} + \beta_3(SCE)_{i,t} + \beta_4(RCE)_{i,t} + \beta_5(Ctrl)_{i,t} + \epsilon_{i,t} \quad (3.19)$$

Where,

$EVA_{i,t}$ = Economic Value Added of firm i at period t

$HCE_{i,t}$ = Human capital efficiency of firm i at period t

$CEE_{i,t}$ = capital employed efficiency of firm i at period t

$SCE_{i,t}$ = Structural capital efficiency of firm i at period t

$RCE_{i,t}$ = relational capital efficiency of firm i at period t

$Ctrl_{i,t}$ = control variables (size, leverage and age) of firm i at period t

3.3.3 Econometric Methodology

According to [Maddala \(1999\)](#) for unbalanced panel Fisher types test are more meaning full than other tests of unit root. Fisher type Augmented Dickey Fuller (ADF) and Philips-Perron (PP) tests were used both with and without linear trends. As there are some companies in data from south Asian emerging economies where relational capital was negligent or absent in some time periods, which makes the panel unbalanced and to apply a test specific for balanced data on such data

will be misleading. As [Levin et al. \(2002\)](#) unit root test assumes that there are large number of cross sections but small time period which gives asymptotically infinite ratio of panel to time period. While they also consider that panel is strongly balanced while [Breitung \(2005\)](#) also assume such type of pre-conditions before applying unit root test. Therefore for current study Fisher type tests are used for such data to ascertain either variables are stationary at level or at some difference level with trend and without trend. While [Breitung and Das \(2005\)](#) came up with a unit root test for such a panel which is also cross sectional dependence, they proposed panel fitted recursive mean for such type of data condition, but there pre-condition for such test application is that time period is greater than number of cross sections. In this study the pre-condition for such a test is violated, therefore this test was not applied. [Im et al. \(2003\)](#) panel unit root test which is applied just for balanced panel, the most suitable test that deals in cross-sectional units heterogeneity is IPS , which is based on following autoregressive model,

$$Y_{i,t} = \rho_i Y_{i,t-1} + \sum \theta_{i,j} \Delta Y_{i,t-1} + Z_{i,t} + \epsilon_{i,t}$$

having non-stationarity $\rho_i = 1$ for all i , null hypothesis.

[Frankel and Rose \(1996\)](#) argued that in long time period data structural changes are more likely therefore there exists issue of unit root and researcher should check dynamic relationship. While in shorter time span panel there is another issue which need attention i.e. cross-section dependence.

Second major issue needed to address before inferring to conclusion is spatial or contemporaneous correlation. In spatial literature, cross section dependence which is interaction between different cross section in a panel, is well discussed issue. Cross section dependence can be seen as serial correlation in time series data. Cross dependence can be happened because of some unobserved shocks or common factors popular in economy. In a panel data where corporate sector is being studied it could happen that different corporations belong to one same industry and are closely netted. As in time series data, serial correlation termed as a problem creator for t and F stats and leads towards loss of efficiency of least

square. Same in panel data, cross dependence correlation also lead to loss in efficiency of least square with biased F and T stat. In such cases total inconsistent results can come out which leads to spurious assertions (Lee (2002), Andrews (2005)).

Friedman (1937) identifies a data problem where cross sections are involved along with time dimension. He suggests a non-parametric test statistics based on spearman rank correlation to identify the cross section dependency. To which further Frees (1995) corrects with few adjustments which were lacking earlier. He identifies the test statistic based on sum of square ranked correlation with weighted Q-distributions. Breusch and Pagan (1980) propose a parametric test LM stat for cross section dependence when N is fixed but T approaches to infinity (rare case in financial econometrics analysis).

$$LM = T \sum_{i=1}^{N-1} \sum_{j=1+i}^N \rho_{ij}^2$$

Where ρ_{ij} = Sample estimate of pairwise correlation of residuals

$$\rho_{ij} = \frac{\sum_{t=1}^T \mu_{it} \mu_{jt}}{\sqrt{\sum_{t=1}^T u_{it}^2} \sqrt{\sum_{t=1}^T u_{jt}^2}}$$

While this test shows substantial distortion when N is large while T is small relative to N as in this study to which Pesaran (2004) scaled with relaxation of basic standard assumption of Breusch and Pagan (1979) test of normal distribution of $N(0,1)$.

He also identified two separate test stat for cross section dependence for balanced and unbalanced panel data. This test is considered the most suitable test to identify the cross section dependence in literature of panel data dependence of cross section. Pesaran (2004) test is closely related with the CD test developed by (Frees, 1995).

Therefore, based on discussion this study employed different cross-dependence test for all three countries separately. As cross-section dependent panel will produce

results which are not so meaningful for statistical inference. Pesaran (2015) CD and LM scaled test, Baltagi et al. (2012) bias - corrected LM test and Breusch and Pagan (1980) LM tests were used to identify cross section dependence across panels. If cross-section residuals are correlated then the efficiency of least square estimators will be biased and standard errors will not be consistent and robust, which will lead to inconsistent t and F stats. For balanced panel Pesaran (2004) defined CD as;

$$CD = T \sum_{i=1}^{N-1} \sum_{j=1+i}^N \rho_{ij} \sqrt{\frac{2T}{N(N-1)}}$$

And for unbalanced panel as;

$$CD = T \sum_{i=1}^{N-1} \sum_{j=1+i}^N \sqrt{t_{ij}} \rho_{ij} \sqrt{\frac{2T}{N(N-1)}}$$

According to literature on CD, if there is cross section dependence use of general fixed or random effect model will not provide consistent and robust standard errors. Before correcting for standard errors, it was identified which model of panel data will be best for current sample based on F-likelihood test and Hausman (1978) test. After selecting the model, standard errors of model were corrected through different approaches available in literature. As De Hoyos and Sarafidis (2006) propose that if cross section dependency is due to presence of common factor which is unobserved but uncorrelated with included regressor then one can rely on standard FE/RE methods implied that standard errors (SE) are corrected through Driscoll and Kraay (1998).

While one underlying assumption of Driscoll-Kraay SE correction method is large T-asymptotic i.e. T must be large than N. In such situation and in a case where unobserved factor which create inter dependency across panel also correlated with regressors than FE/RE estimates will be biased. Based on panel data literature of cross country macro-economic analysis or corporate analysis within a country, heteroskedasticity is inbuilt issue. While to identify empirically that either Heteroskedasticity is an issue or not, standard hetero Wald test was carried out. For

auto correlation or serial correlation evidence in data Wooldridge auto correlation test was carried out to check either first order auto correlation persists in panel or not. If a panel is cross section dependent along with heteroskedasticity issue too than a researcher has to account for these issues before moving in to the inference. Because these two issues create a major problem for standard errors which comes out to be inconsistent in presence of such issues. If standard errors are biased then significance of results are meaningless. Therefore literature address this issue separately and collectively in different manner as described in upcoming discussion.

According to [Born and Breitung \(2016\)](#) economic series with time series cross sectional data typically by default are affected by serial correlation, heteroscedasticity and spatial correlation. Therefore, robust standard errors under these problems remain a big issue. [Driscoll and Kraay \(1998\)](#) earlier identified a method which can better handle this issue. He modified the SE with correction of heteroskedasticity and serial correlation in residuals. But his model doesn't incorporate fixed effect and SE are robust in pooled regression only with a pre-condition of $T > N$. While [Vogelsang \(2012\)](#) identified a mechanism with fixed asymptotic theory of statistics based on both classes of SE in model with fixed effect estimation. Heteroscedasticity, Autocorrelation and contemporaneous correlation (HAC) corrected Robust SE are calculated on same grounds as Driscoll and Krayy (1998) but with fixed effect estimation for a panel and also for $N > T$. One issue which remains with the modified version of HAC robust SE is, methods do consider weak spatial correlation. If there is strong correlation across the cross section then this model loses its value. This study incorporated Driscoll and Kraay robust standard error in fixed effect estimation model. Secondly, plethora of literature on Driscoll and Kray (1998) identified that SE under these methods are understated which makes significance of a variable easily. Therefore strong grounds must be established to just rely on this method and infer from it. Therefore, besides this methodology, this study employed most suitable econometric model under such situation as described below.

[Parks \(1967\)](#) was first to identify feasible generalized least squares (FGLS) which

account for heteroskedasticity and spatial dependence in residuals of panel data. The major issue with FGLS is, it can be used only with medium to large scale panels due to two reasons identified by [Hoechle \(2007\)](#). First, if time period is less than number of cross sections in a panel this method loses significance. Second, according to [Beck and Katz \(1995\)](#) FGLS estimates unacceptably small standard error estimate. While they corroborated that panel corrected standard errors OLS estimates provides more efficient SE, which are consistent and robust in presence of heteroskedasticity and cross section dependency in a panel. Panel corrected standard error (PCSE) is considered an alternative to FGLS in case where $N > T$ and provides better and meaningful results ([Reed and Ye, 2014](#)). According to them PCSE is two stepped modified version of inconsistent OLS which performs substantially better than asymptotically efficient FGLS estimator in number of cases.

[Reed and Ye \(2011\)](#) attempted to resolve HAC issue; which panel estimation method is better for analysis under certain circumstances. As it is evident from panel data literature that time series cross section data inherently have serial correlation issues, which if not properly addressed can generate inefficient coefficient and biased standard errors (SE's). Cross sectional dependence came up to be the new issue which data can possess and if not accounted for in estimation can lead to spurious results ([Driscoll and Kraay \(1998\)](#); [De Hoyos and Sarafidis \(2006\)](#)). Serial correlation and cross section dependence can be an issue for time series cross section data simultaneously ([Jönsson, 2005](#)). As majority of the panel data estimators are not able to simultaneously handle both of these issues except [Parks \(1967\)](#) Feasible Generalized Least Squares (FGLS) estimator. However, pre-condition for FGLS is number of cross section (N) must be less than or equal to the time period (T) as normal case in economic series analysis across the globe. But this estimation method posits some serious concerns regarding SE's in finite samples. [Moundigbaye et al. \(2018\)](#) identified this issue with new two-step modified version of OLS known as panel corrected standard error (PCSE) estimation, which performs better than asymptotically efficient FGLS estimator in many circumstances.

PCSE widely adopted by researchers because of its efficient method of SE's calculation in case when $N > T$. Marques (2005), Lago-Peñas (2006), Bitzer and Stephan (2007) and Mosca 1 (2007) used this estimation technique along with FGLS and vindicate that FGLS underestimates SE's which makes a variable significant and results spurious. Reed and Ye (2011) performed Monte Carlo simulation by applying FGLS and PCSE estimation methods on panel with N less than 100 and T ranges from 10 to 25. They corroborate that there are two streams on which these methods can be judged i.e. Root mean square error (efficiency) and accuracy of estimated confidence intervals (coverage). They identify that FGLS is best in efficiency and worst in coverage in case T/N ratio is greater than 1. While PCSE or OLS corrected HAC estimator perform better in other scenario. Based on these observations it can be concluded that for hypothesis testing under condition when $N > T$, PCSE estimator is best to use when there is heteroscedasticity, auto correlation and contemporaneous correlation in time series cross section data.

PCSE produces OLS estimates of parameters when order of auto-correlation is not specified or if specified of first order than Prais-Winsten estimate can be used for panel data to correct SE's. But if a panel do have contemporaneous correlation across panels along with heteroskedasticity then PCSE estimates are feasible and trustworthy for inferential purpose of research. As PCSE estimates are based on OLS or pooled regression, and fixed effect models are typically feasible for economic series or corporate data studies. Therefore Least square dummy variable (LSDV) methodology or two way fixed effect model along with PCSE estimation have used for analysis of time series cross section data which have issues of heteroscedasticity, autocorrelation and spatial correlation (HAS).

If a panel have HAC issues then FGLS and GLS measures will give robust SE only when $N < T$. A case where fixed effect estimation is feasible and HAC issue still persist then simple LSDV or two-way fixed effect with robust standard errors will not produce results free from HAC. In such case Panel corrected standard errors (PCSE) along with Least Square Dummy Variables (LSDV) will be feasible and meaningful to infer on such results. This study after diagnosing Heteroskedasticity, Spatial correlation issues applied PCSE adjusted SE's in fixed effect model.

According to guidelines of [Moundigbaye et al. \(2018\)](#) , in current scenario where $N > T$, PCSE along with LSDV is most suitable econometric model. Therefore along with Driscoll and Klay modified fixed effect model, which has few limitations, this study generalised all the empirical analysis on the basis of PCSE LSDV.

Chapter 4

Results and Discussion

4.1 Analysis

To check role of composite measure of IC and its components on financial performance and value of firm, first it was checked which panel regression method will be most appropriate according to the nature of the data i.e. pooled regression, fixed effect or random effect etc. Before inferring the conclusion from empirical investigation, it was also checked that no serious violation of basic OLS assumptions were carried out by the data in sample related to South Asian economies i.e. Pakistan, India and Bangladesh etc. As if basic assumptions of OLS violated then standard error will not be robust which can make the whole analysis spurious and meaningless. Due to structural and corporate reporting differences across the region, each country analysis is presented separated with application of all econometric tests. Section 4.5 provides detailed discussion and explanation on limitations of regional IC-Performance link.

Recent limited literature also reported the endogeneity issue in IC-Performance link. Before applying any panel data model, this study performed all the diagnostics along with endogeneity tests to keep analysis free from any potential econometric errors. As [Gujarati and Porter \(2012\)](#) argued that application of fixed effect model produces biased and inconsistent results in presence of endogeneity (mainly because of simultaneity). [Davidson et al. \(1993\)](#) test of exogeneity was applied to explore the

true relation between the IC-Performance and IC-Value link. Appendix II provides detailed discussion along with tests regarding endogeneity.

Once it has been identified that endogeneity is not an issue for current panel data then Panel unit root tests were applied on each variable to check either variable is stationary at level or at difference of 1st or 2nd order. Basic panel data model estimation was applied with few adjustments according to available literature on panel data.

Results of unit root test from whole sample of three countries depicted that all variables are stationary at level according to Fisher PP test with and without trend as their chi-square value are highly significant. While according to Fisher-ADF all variables are stationary at level with trend and without trend except few which are not stationary at level but at first difference. Therefore it can be asserted safely that all the variables in sample are stationary at level, and dynamic relationship will be of little meaning in such scenario. According to [Rendón \(2012\)](#) if series are stationary at level then mean and variance is not time dependent, hence OLS produces meaningful results.

Country-wise detailed analysis along with discussion is given in subsequent portion.

4.2 Analysis of Pakistan

This subsection will discuss and tabulate all the results regarding Pakistani sample to infer role of IC and its components on firm performance and value.

4.2.1 Descriptive Statistics

Table 4.1 provides the descriptive stats of Pakistani data for whole time period. Mean and standard deviation were checked year wise to identify any outlier in data and general pattern for further analysis, while maximum, minimum, skewness and kurtosis stats provide general data information.

While Figure 4.1 provides yearly pictorial description of IC components i.e. HCE, SCE, RCE, CEE etc.

TABLE 4.1: Descriptive Statistics (Pakistan).

	Mean	Std. Deviation	Min	Max	Skewness	Kurtosis
HCE	3.34	7.08	-55.99	57.02	-0.24	31.16
RCE	0.18	1.26	-10.53	35.67	13.67	20.81
CEE	0.73	3.55	-2.28	18.03	1.05	20.1
SCE	0.69	1.03	-0.71	1.08	1.07	19.7
ROA	0.11	0.10	-0.29	0.5	0.84	4.82
MBR	1.01	1.00	0.7	7.38	2.82	14.99
Lev	0.62	0.35	0.13	1.49	0.94	3.47
FS	15.50	1.99	0.51	20.41	-1.39	9.42
Age	1.30	0.29	0.31	1.78	-0.28	2.42
ROE	0.17	0.61	-1.12	1.59	-0.14	2.69
MR	0.04	0.52	-0.68	0.21	-0.92	1.16
RG	0.24	1.58	-0.09	0.16	0.16	3.25

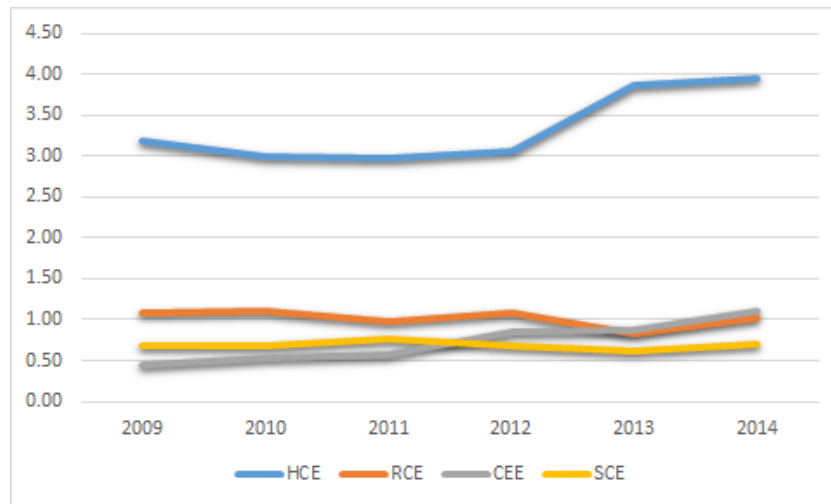


FIGURE 4.1: Yearly Mean IC Components

4.2.2 Panel Unit-Root Test

To check the stationary level of panel data variables, panel unit root test was applied. Fisher type panel unit root tests were used to check the level of stationary. As to apply regression it is necessary to ascertain either variables are stationary at level or not. Results of the test are shown in table 4.2.

TABLE 4.2: Panel Unit Root Test (Pak)

	Fisher-ADF		Fisher-PP	
	With Trend	Without Trend	With Trend	Without Trend
	Chi-Square	Chi-Square	Chi-Square	Chi-Square
Age	1823.65*	1823.65*	1857.27*	1828.88*
	(0.000)	(0.000)	(0.000)	(0.000)
HCE	250.040*	448.090*	342.77*	441.72*
	(0.006)	(0.000)	(0.000)	(0.000)
LEV	285.61*	445.77*	338.65*	388.52*
	(0.000)	(0.000)	(0.000)	(0.000)
MBR	171.890	290.73*	198.37	234.64*
	(0.910)	(0.000)	(0.470)	(0.000)
MR	230.036	423.970*	400.01	522.530*
	(0.057)	(0.000)	(0.050)	(0.000)
RCE	265.22*	425.41*	298.77*	361.50*
	(0.001)	(0.000)	(0.000)	(0.000)
ROA	238.51*	445.120*	288.53*	372.86*
	(0.026)	(0.000)	(0.000)	(0.000)
ROE	354.65*	610.99*	334.46*	430.14*
	(0.000)	(0.000)	(0.000)	(0.000)
SCE	301.44*	499.34*	394.66*	466.68*
	(0.000)	(0.000)	(0.000)	(0.000)
CCE	259.30*	465.57*	264.045*	330.75*
	(0.002)	(0.000)	(0.001)	(0.000)

	Fisher-ADF		Fisher-PP	
	With Trend	Without Trend	With Trend	Without Trend
	Chi-Square	Chi-Square	Chi-Square	Chi-Square
SG	266.10*	446.65*	265.087*	309.85*
	(0.000)	(0.000)	(0.000)	(0.000)
Size	309.86*	459.67*	333.98*	439.52*
	(0.000)	(0.000)	(0.000)	(0.000)

Table above shows the result of unit root test of all variables in sample along with their significance and level of integration. Fisher ADF and PP type Unit root test was checked with trend and without trend as reported in the table. All variables are stationary at level except MBR and MR which are not stationary according to Fisher-ADF and PP test with trend but are stationary at level without trend factor. From this analysis it can be asserted that variables are stationary at level and regression analysis can be handled securely after checking for basic assumptions of OLS. Before checking for basic assumption violation of OLS, which method of testing i.e. common effect, fixed effect or random effect will be employed was tested through F-likelihood test and Hausman test. Table below clearly manifest that for such data in sample, fixed effect estimation is more preferable than other.

TABLE 4.3: Fixed vs Random effect model.

	Redundant Fixed Effect Test			Hausman Test	
	statistics	Prob.		statistics	Prob.
Cross section F	7.783735	0.0000	Cross section random	16.629	0.0228
Cross section Chi-square	559.0894	0.0000			

As redundant fixed effect cross section F and chi-square is significant which employs that Fixed effect model is preferable than pooled regression model. Then Hausman test was applied to ascertain either fixed effect model is significantly better than random effect model. Null hypothesis of Hausman tests the unique errors

(u_i) are not correlated with the regressors. Result clearly depicts that null hypothesis was rejected significantly which ultimately assure that fixed effect model is preferable than random effect model.

4.2.3 Diagnostics Tests

4.2.3.1 Wald Heteroskedasticity Test for Panels

Modified Wald test for group-wise heteroscedasticity test was applied on each model to check the level of heteroskedasticity. The null hypothesis of this test is; square of residual is same across the panels. If the test is significant then we can reject the null hypothesis and conclude that there is group level heteroskedastic issue and standard OLS estimate for a panel will be biased in such case. Table below shows the result of heteroskedastic issue, and it can be safely and confidently corroborated that there is group wise heteroskedastic issue, panels are not homoskedastic and for this panel data standard fixed effect regression will be biased and inconsistent. Equations 3.1 to 3.10 were tested and results are reported accordingly.

TABLE 4.4: Wald heteroskedasticity Test (IC Components)

Performance Measure	Chi-Square	Prob.
ROA	780.26	0.0000
ROE	540.50	0.0000
MR	240.55	0.0000
SG	210.98	0.0000
MBR	922.75	0.0000

Secondly same test was applied for composite E-VAIC on;

As it is evident that in both models of testing for impact of VAIC and its components on performance and value of firm, heteroskedasticity is major issue. Therefore panel data analysis must incorporate correction of this issue for robust results.

TABLE 4.5: Wald heteroskedasticity Test (E-VAIC)

Performance Measure	Chi-Square	Prob.
ROA	847.67	0.0000
ROE	360.7	0.0000
MR	210.25	0.0000
SG	480.77	0.0000
MBR	640.75	0.0000

4.2.3.2 Wooldridge Autocorrelation Test

Before analyzing the models empirically and deducting inferences, another issue that may cause results meaningless is to check serial or autocorrelation in panel data. If there is presence of serial or autocorrelation then serially corrected standard errors required for analyzing impact of one variable over the other. Equations 3.1 to 3.10 were tested and results are given below in tables.

TABLE 4.6: Wooldridge Autocorrelation Test (IC Components)

Performance Measure	F-stat	Prob.
ROA	22.447	0.0000
ROE	14.856	0.0002
MR	3.965	0.0494
SG	5.583	0.0202
MBR	5.646	0.0195

Results showed that residuals are serially correlated with each other, and in such situation standard errors will be biased which will make the significance level meaningless.

4.2.3.3 Cross-section Dependence Test

As discussed earlier in start of analysis section, it is evident that contemporaneous correlation in data required correction before analysis. It is typically found in

TABLE 4.7: Wooldridge Autocorrelation Test(E-VAIC)

Performance Measure	F-stat	Prob.
ROA	19.787	0.0000
ROE	10.409	0.0017
MR	4.18	0.0438
SG	6.573	0.012
MBR	12.427	0.0007

corporate panel that they are linked with each other in some or other way. It could be due to firms in sample related to one industry, or firms interlinked with each other in terms of input-output structure etc. Four tests were employed to check cross-section dependence in panel sample. Results after testing equation 3.1 to 3.10 are as under;

TABLE 4.8: Cross Section Dependence test(IC Components)

Performance Measure	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
ROA	7965.91*	31.95*	22.15*	-0.52
ROE	8245.62*	34.82*	25.02*	8.90*
MR	7071.10*	22.77*	12.97*	8.01*
SG	6703.31*	19.00*	9.20*	2.21*
MBR	7866.44*	30.93*	21.13*	16.48*

*significance at 99%

Due to presence of Heteroskedasticity, Autocorrelation and Spatial correlation (HAC, adjusted standard errors will be required for inference. As Driscoll and Kraay (1998) provided a framework to test a relation in panel in presence of such big issues. Recently [Vogelsang \(2012\)](#) provided an in-depth analysis on [Driscoll and Kraay \(1998\)](#) procedure of HAC robust SE in linear panel regression with fixed effect after relaxing the basic assumption of Driscoll method i.e. $N < T$. This study also employed panel linear regression in fixed effect with Driscoll and Kray HAC

TABLE 4.9: Cross Section Dependence test(E-VAIC)

Performance Measure	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
ROA	7986.89*	32.16*	22.36*	-0.31
ROE	8339.27*	35.78*	25.98*	8.47*
MR	8171.17*	34.05*	24.25*	38.45*
SG	6693.58*	18.90*	9.10*	2.64*
MBR	7876.65*	31.03*	21.23*	16.50*

*significance at 99%

robust SE to check the relationship of intellectual capital and its components with firm performance and its value.

4.2.4 Driscoll-Kraay Fixed Effect Regression with HAC Adjusted SE's

Table 4.10 provides the fixed effect panel regression results in which dependent variables are ROA and ROE. As within R-squared shows the goodness of fit measure for the individual mean de-trended data, so it lost its meaning in such a framework because it disregards all the between information in data. That is also eminent from the table, that value is at lower side. As table shows that how each component of VAIC affects the performance measure i.e. ROA and ROE in presence of control variables. Getting Driscoll and Kraay robust SE adjusted by [Vogelsang \(2012\)](#), results conclude that on both measures of performance, components of VAIC impact differently. Taking ROA first, the major performance enhancer component of VAIC is structural capital. As whatever left behind after human capital is considered to be the structure of an organization. As people and experts can leave an organization but a structure build by such expertise and innovative ideas strengthen an organization and aid in good value. While relational capital and human capital too affect return on assets. As there are two forms of assets i.e. tangible and intangible. Relational and human capital are considered as

intangible asset and not incorporated in calculation of ROA. Results corroborated that human capital efficiency and relational capital efficiency both affect ROA of a firm. Just creation of intangible assets can't make a firm profitable in terms of performance. Efficient use of both tangible and intangible assets do affect the performance of an organization. The major breakdown of analysis is conclusion of the fact that efficient physical capital as well as intellectual capital of firms impact positively performance of a firm in terms of ROA.

Results from ROE (performance measure) is not much different from ROA. All components of value added intellectual coefficient affect the performance of firm in terms of ROE, positively. Here again it is eminent that structural capital is the most important and influencing factor that can be considered as performance enhancer.

TABLE 4.10: Driscoll and Kraay estimation(Dep:ROA&ROE)

	Dep Var: ROA			Dep Var: ROE		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
HCE	0.068	2.98	0.031	0.044	3.83	0.012
RCE	0.001	5.46	0.003	0.23	4.54	0.006
SCE	0.164	3.41	0.019	0.75	2.29	0.071
CEE	0.03	2.59	0.066	-0.028	-2.43	0.059
Age	-0.59	-3.55	0.016	0.075	3.28	0.022
Size	0.053	0.54	0.613	-0.104	-3.3	0.021
Lev	-0.227	-0.37	0.728	0.143	0.85	0.434
Within R-Squared	0.1			0.1		
F-Stat	723.55			835.46		
Prob. of F	0.00			0.00		

Table 4.11 shows impact of efficient value added intellectual capital on other two performance measures for a firm i.e. margin ratio and sales growth. As this measure is solely income statement based measure, it can produce different result in terms of income-expense paradigm. As results showed that only efficient human

capital aids in enhancing margin and growth of a firm. While structural and relational capital shows positive relation but without any significance. This can be due to income statement performance measure, as relational capital is advertising and philanthropic measures of a firm.

Human capital which is the necessary expense for a firm which can't be cut down completely even in period of crisis. But advertising expense and philanthropic measures can be avoided in crisis period. Results showed that relational capital doesn't enhance the performance of Pakistani firms. In tough times human capital strive to enhance the sales and profits of the organization by avoiding unnecessary relations or cost, so it can be inferred that efficient human capital affect the growth and margin ratio of firm but relational capital at wrong time or inefficient relational capital which doesn't add value to a firm and not aid in performance enhancer. It can be significantly inferred that one rupee value addition in human capital brings 1.3% increase in margin ratio and 0.13% in sales growth.

TABLE 4.11: Driscoll and Kray estimation(Dep:MR&RG)

	Dep Var: MR			Dep Var: RG		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
HCE	1.326	5.30	0.003	0.13	2.14	0.085
RCE	0.002	1.65	0.16	0.006	0.01	0.99
SCE	2.52	0.57	0.593	-0.47	-0.32	0.76
CEE	15.3	2.08	0.092	2.87	3.04	0.029
Age	-0.487	-1.75	0.14	-0.25	-2.41	0.061
Size	-7.04	-1.76	0.139	3.44	1.55	0.181
Lev	1.42	1.93	0.111	2.22	1.26	0.264
Within R-Squared	0.18			0.03		
F-Stat	7.75			10.12		
Prob. of F	0.019			0.011		

Table 4.12 shows result of equation 3.17 where it was checked that either VAIC

components affect the market value of a firm. Results corroborated that in Pakistani corporate culture relation building through philanthropic measures and marketing/advertising are seen as negatively by the investors. According to [Jensen and Meckling \(1979\)](#) there is asymmetry of information in inside and outside of the firm stakeholders. Shareholders or investors usually discount all such factors which are deemed unnecessary in their point of view. Investors consider their agents are using their capital in unnecessary issues i.e. philanthropy and market advertisement which have no value for a firm but just an expense that reduce their per share earnings. Therefore market participants discourage all such activities which reduce their earnings. Secondly, it can be argued that RC not add much value addition in business to satisfy shareholders, therefore negatively priced. Human capital expense and structural capital which are deemed necessary for firm development are not penalized in same way as relational capital. Therefore it can be asserted that due to such issue market value is being impacted negatively by relational capital but positively by human capital.

TABLE 4.12: Driscoll and Kray estimation(Dep:MBR)

Dep Var: MBR			
	Co-eff	t-stat	Prob.
HCE	0.012	2.84	0.036
RCE	-0.04	-3.33	0.021
SCE	0.42	1.62	0.167
CEE	0.199	2.62	0.047
Age	0.095	0.82	0.449
Size	0.024	1.2	0.284
Lev	0.78	0.82	0.017
Within R-Squared	0.1		
F-Stat	18.24		
Prob. of F	0.0028		

It was hypothesized that value added intellectual capital as a whole do impact the financial performance and value of the firm after controlling for firm size,

leverage and age. Table 4.13 shows the result of all performance measures. Further tabulation of results regarding impact of VAIC on ROA and ROE of firm after controlling for few factors are enlisted hereunder. Results corroborated that VAIC as a whole impact positively and significantly to both performance measures of the firm i.e. ROA and ROE. As VAIC constitutes of all components which add value to the firm, composite measure affect positively ROA and ROE.

TABLE 4.13: Driscoll and Kraay estimation(ROA&ROE and VAIC)

	Dep Var : ROA			Dep Var : ROE		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
VAIC	1.53	5.74	0.002	0.84	4.77	0.005
Age	-1.35	-3.58	0.016	0.71	3.93	0.011
Size	0.11	2.44	0.058	-1.6	-4.28	0.008
Lev	-0.04	-0.69	0.52	1.6	0.99	0.37
Within R-Squared	0.1			0.1		
F-Stat	102.44			128.34		
Prob. of F	0.000			0.000		

Table 4.14 presents impact of composite VAIC on income-statement related performance of a firm i.e. MR and SG. Results revealed that VAIC significantly impact growth of firm with 95% confidence level while MR is being impacted by VAIC at 90% confidence level. As HCE and CEE was significantly impacting individually MR and SG while VAIC also impact significantly which asserts that majority of the VAIC is comprised of HCE and CCE in Pakistani firms. As corporate culture of Pakistan is nascent in terms of technology, relations with external community and stakeholders which ultimately posits that SCE and RCE is not of such importance in terms of firms margin and sale growth.

Analysis of VAIC impact on market value of firm is interesting in a sense that 40% of the market value which is more than book value is due to VAIC. As the coefficient of VAIC is highly and positively significant manifested in table 4.15, which depicts that market give value to hidden capital of a firm which is not reported in

TABLE 4.14: Driscoll and Kray estimation(MR&RG and VAIC)

	Dep Var: MR			Dep Var: RG		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
VAIC	1.62	2.17	0.082	1.54	2.6	0.048
Age	-0.58	-3.15	0.025	-0.71	-1.8	0.132
Size	0.53	1.74	0.142	2.34	2.33	0.067
Lev	-0.08	-2.08	0.092	0.15	2.39	0.062
Within R-Squared	0.18			0.1		
F-Stat	6.19			30.47		
Prob. of F	0.0340			0.0010		

published financial statements. While it is imperative to check role of individual IC components on market value to ascertain which component is more valued by market participants. Following section analyzed this assertion along with detail analysis.

TABLE 4.15: Driscoll and Kray estimation(MBR and VAIC)

	Dep Var: MBR		
	Co-eff	t-stat	Prob.
VAIC	0.4	5.35	0.003
Age	0.1	3.88	0.012
Size	0.25	3.3	0.021
Lev	0.07	0.78	0.47
Within-R ²	0.1		
F-Stat	16.65		
Prob. of F	0.0043		

As the major drawback reported in literature regarding Driscoll and Kray linear panel regression under fixed estimation with HAC corrected standard error is that with $N > T$ the standard error lean towards downward. SE's are deflated structurally which makes the significance level achievable for a variable. Therefore, robust estimates are required without sacrificing the current position of panel framework. Least square dummy variables with panel corrected standard errors

is suitable econometric methodology for a panel data where $N > T$ and where standard errors are adjusted for HAC.

4.2.5 Least Square Dummy Variable with Panel Corrected Standard Errors (PCSE)

According to [Bailey and Katz \(2011\)](#) time series cross section data typically displays contemporaneous correlation across units and also unit level heteroskedasticity, which produced biased SE for inference in ordinary least square. As the diagnostics tests of panel data revealed that data is heteroskedastic, serially correlated with contemporaneous correlation, therefore standard errors will be biased in case of simple regression analysis. Along with these diagnostics, Fixed effect likelihood test and Hausman test was applied to ascertain estimation method according to nature of data. Fixed effect estimation comes out to be most feasible in current scenario. The next issue addressed is; how to get corrected standard errors in HAC panel data. As one of the main critic on Driscoll and Kraay robust standard errors is presence of weak contemporaneous correlation. If there is strong correlation as in the case under discussion, SE will be biased to some extent. [Beck and Katz \(1995\)](#) documented that to estimate linear panel data models a sandwich type estimator of covariance matrix of estimated parameters to which they named PCSE will be robust to the possibility of non-spherical errors. To incorporate fixed effect in this suggested linear OLS model, dummy variables of units are added which is commonly known as least square dummy variable estimation by econometricians. The general equation for LSDV is as;

$$Y_{it} = \alpha + \beta'X_{it} + \sum_{i=1}^N \mu_i D_i + v_{it} \quad (4.1)$$

for $i = 1, \dots, N$, $t = 1, \dots, T$ and D is dummy variable for i^{th} unit.

LSDV PCSE estimation method has been applied on each model under consideration. Following the LSDV method of estimation with PCSE is accurate in case

data possess heteroskedasticity, autocorrelation and contemporaneous correlation [Gonçalves \(2011\)](#). IC impact on current & future performance and also on value of firm is discussed in detail in Pakistani context hereunder.

4.2.5.1 Impact of IC on Current Performance

Four performance measures namely ROE, MR, RG and ROA were used in this study. Following portion will identify the econometric model to test along with results tabulation that shows the impact of IC on current performance measures, followed by discussion.

To check the impact of IC components and E-VAIC on ROE, equation 3.2 and 3.6 was tested using LSDV PCSE estimation technique. Table 4.16 depicts the result in detail.

TABLE 4.16: LSDV estimation with PCSE (Dep:ROE)

Dep Variable = ROE _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.408	0.202	2.02	0.04	VAIC	4.143	1.209	3.43	0.00
RCE	-0.160	0.056	-0.35	0.73	Age	1.171	0.170	6.89	0.00
SCE	4.030	1.980	2.04	0.04	Lev	1.275	1.776	0.72	0.47
CEE	1.321	0.239	5.53	0.00	Size	0.344	1.392	0.25	0.81
Age	5.560	8.510	0.65	0.51					
Lev	0.240	1.200	0.20	0.84					
Size	-3.450	2.690	-1.28	0.20					
R-Sq	0.84					0.79			
Wald Chi-Sq	3996.91					277.53			
Prob.	0.00					0.00			

First half of table manifests the result of IC components impact on ROE of firm. As R-square of model is 0.84 which manifests that 84% of the variation in ROE is due to the regressors i.e. Intellectual capital along with control variables. Wald Chi-square value is highly significant which also attests that model used is efficient. Most influential factor on ROE is physical capital, as the z value is highly significant and co-eff value is more than others. As for as intellectual capital components are concerned, the most prevailing components which affect ROE of

firm is structural capital. As Pulic (2004) defined SC as all value added minus the human capital expense which aid a firm to develop and furnish in future. As humans come and go in a firm but its innovation, structure and practices rests with the firm. Therefore it is also ascertained empirically that SC if employed efficiently aids in enhancing return of shareholders. Human capital is also significant at 95% confidence interval, which manifests that efficient human capital enhance the return on equity of firm. The negative sign of relational capital efficiency with ROE is insignificant, this can be said that relational capital composed of philanthropic, CSR activities along with advertising and marketing expenses which all reduce the net income of the firm and leads to lower return on equity. Three components if E-VAIC i.e Human capital, Structural capital and Physical capital are significantly impacting performance measure i.e. return on equity.

Next it was also checked that in presence of control variables, either composite measure of E-VAIC significantly impact the return on equity. Empirical investigation revealed that E-VAIC significantly impact the performance of firm. It is evident that as components are significantly impacting ROE so E-VAIC should be, as E-VAIC is simple addition of all the capital according to Pulic (2008) and Nadeem et al. (2018).

Next impact of VAIC and its components were checked on performance measure i.e. revenue growth. As revenue growth depicts that how much sales are increasing or growing in a firm. As main focus of any business remains with increase in sales which is the sole earning source for any firm. Equation 3.4 and 3.8 were tested to vindicate IC and RG link. Table 4.17 provides complete picture of link in econometric terms.

R^2 value shows that 73% of variability in growth of firm is due to VAIC components along with control variables. While model efficiency is shown by Wald statistics: significant value posits efficient model. Efficient capital employed which is proxy of physical capital came out to be the most influential factor in determining revenue growth. As for as intellectual capital components are concerned, human capital and structural capital are two basic influential invisible assets which affect and enhance positively the growth of a firm. These results are not different from

TABLE 4.17: LSDV with PCSE (Dep:RG)

Dep Variable = RG_t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.323	0.135	2.39	0.02	VAIC	0.017	0.010	1.70	0.09
RCE	0.143	0.101	1.42	0.16	Age	-0.054	0.101	-0.53	0.60
SCE	0.403	0.156	2.58	0.01	Lev	-0.031	0.301	-0.10	0.92
CEE	0.606	0.262	2.31	0.02	Size	0.974	2.255	0.43	0.67
Age	0.054	0.105	0.51	0.60					
Lev	-0.061	0.313	-0.19	0.85					
Size	1.072	2.320	0.46	0.64					
R-Sq	0.73					0.42			
Wald Chi-Sq	523.97					114.65			
Prob.	0.00					0.00			

the previous performance measure i.e. ROE. While the second portion of the table displayed result when composite effect of VAIC was checked on RG of firm. VAIC impacts positively but the level of significance is changed from ROE as it is significant at 90% level. All components of IC are significantly impacting growth in firm except relational capital, which manifested that VAIC model framework significantly impact growth in Pakistani context. Pragmatically, this relationship is affirmed through human capital theory which posits humans are an integral part of an organization which step in to a firm with a set of skills and expertise that shape up the structure of firm; aka structural capital.

Next measure of performance was taken as Margin ratio of firm which depicts that how much earnings represent the sales of the firm. If MR increases this means either sales increase or costs decrease or both processes at the same time. Ultimate objective of any organization is to increase the sale base along with achieving economies of scale so that cost of business and production be less than other competitors in the industry. It was ascertained the role of IC and its components on margin ratio of firm through empirical testing of equation 3.3 and 3.7;

Table 4.18 shows the result of IC as whole and its components effect on margin ratio. Result is different from other performance measure in a sense that relational

capital positively impacts the margin ratio of firm but human and structural capital fail to impact significantly. The major influence seems to be of human capital as its coefficient is greater than all other factors. It can be argued that relationship matters in enhancing the financial performance of the firm as in case of sales growth too RC matters positively but failed to justify this relation significantly. As relational capital was significant which was calculated numerically with relational capital employed that is how much internal value creation is due to advertising, CSR activities and philanthropic measures. An efficient value addition purposefully impacts the financial performance of a firm, as evident from the results. Linking this performance measure MR result with RG result, it is evident that relational capital shows insignificant impact with RG but becomes significant to impact MR, it can be augmented that firms are more concerned towards cost reduction than sales maximization in competitive environment. Relationship build on the basis of societal welfares help to reduce the cost of business which ultimately increases the profit for shareholders and so the MR.

TABLE 4.18: LSDV with PCSE (Dep:MR)

	Dep Var = MR _t					Co-eff	PCSE	z	P>z
	Co-eff	PCSE	z	P>z					
HCE	0.052	0.029	1.81	0.07	VAIC	0.040	0.013	3.03	0.00
RCE	0.019	0.009	2.14	0.03	Age	-0.003	0.025	-0.11	0.91
SCE	0.022	0.056	0.39	0.70	Lev	-0.019	0.020	-0.97	0.33
CEE	0.041	0.020	2.05	0.04	Size	-0.031	0.021	-1.47	0.14
Age	0.008	0.002	3.64	0.00					
Lev	-0.025	0.017	-1.45	0.15					
Size	-0.004	0.002	-1.69	0.09					
R-Sq.	0.84					0.81			
Wald Chi-Sq.	4140.85					624.47			
Prob.	0.00					0.00			

Table 4.19 reports the result of composite IC and its components impact on performance measure i.e. ROA. Equation 3.1 and 3.5 were tested and results are tabulated with discussion further.

TABLE 4.19: LSDV with PCSE(Dep:ROA)

	Dep Var = ROA _t								
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.196	0.105	1.87	0.06	VAIC	0.039	0.016	2.38	0.02
RCE	0.039	0.016	2.36	0.02	Age	-1.008	4.483	-0.22	0.82
SCE	0.304	0.113	2.69	0.00	Lev	-0.471	1.700	-0.28	0.78
CEE	0.393	0.133	2.95	0.00	Size	0.011	0.313	0.04	0.97
Age	0.061	0.465	0.13	0.99					
Lev	-0.498	1.680	-0.30	0.77					
Size	-0.318	0.188	-1.69	0.09					
R-Sq.	0.63					0.632			
Wald Chi-Sq.	4883.35					1474.42			
Prob.	0.00					0.00			

In this model 63% of the change in ROA is due to VAIC component individually and compositely. While results corroborated that all components of IC individually impact the performance of firm. Major impact is of physical capital as coefficient of CEE is 0.39 and highly significant too. Second major influence on ROA is from structural capital which too is highly significant, which depicts that structural capital impacts positively ROA of firm. While human capital impact positively but significance level is below 95%. Relational capital too shows significant impact on ROA. When all components are showing significant impact on ROA, so composite measure should also impact positively and significantly as composite measure is addition of all the components. As second half of the table shows that E-VAIC is also positively impacting return on asset of firm. Results of this performance measure is not different from previous measure i.e. ROE where relationship was negatively related but here it is positively related and significant.

4.2.5.2 Value and IC Nexus

Earlier we checked the role of IC and its components in determining performance of the firm. The second phase of this study also tried to vindicate the role of IC and its components on value of firm. This study hypothesized that market value more than book value is due to all those invisible assets which are not part of

books but market value them more and price it. As it is evident from literature that appointment of directors, CFO's and board as whole impact the market value of firm with news infusion but not book value. Therefore empirically this study tried to explore this nexus to vindicate or deplore this bond. Equation 3.9 and 3.10 were tested to identify this nexus empirically.

TABLE 4.20: LSDV with PCSE (Dep:MBR)

Dep Variable = MBR _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.222	0.083	2.67	0.00	VAIC	0.013	0.006	2.20	0.03
RCE	0.001	0.003	0.29	0.77	Age	1.230	0.595	2.07	0.04
SCE	0.127	0.128	0.99	0.32	Lev	0.050	0.128	0.39	0.70
CEE	0.181	0.083	2.18	0.03	Size	0.281	0.107	2.63	0.00
Age	1.207	0.577	2.09	0.04					
Lev	0.037	0.129	0.29	0.77					
Size	0.312	0.115	2.70	0.00					
R-Sq	0.58					0.58			
Wald Chi-Sq	1489.45					1064.57			
Prob.	0.00					0.00			

As market to book ratio is used as proxy for market value, value of MBR greater than 1 depicts that market value of firm is more than book value of firm. Results in table 4.20 corroborated that human capital efficiency i.e. proxy for human capital significantly impacts the value of firm. One rupee invested in human capital which produce a value for firm ultimately affect the MBR and 0.22 value more than book value is due to human capital factor. Other two components of IC i.e. SC and RC doesn't have significant impact on value of firm. Physical capital do impact value of firm. As physical capital comprise of financial and tangible assets which increase the balance sheet of a firm that leads to increase in both book and market value. But results showed that physical capital increases value of market more than book value. As only two measures of VAIC comes out to be significant which impact market value of firm, in composite measure impact, VAIC do impact positively the market value of firm but the coefficient value is low.

4.2.5.3 Future Performance

To ascertain the role of IC and its components on future performance, equation 3.11 to 3.18 were tested and results are reported subsequently.

Capital employed proxy of physical capital is no doubt the significant factor for any firm to perform better in competitive market. Extant literature also documented that physical capital is important and crucial factor but a balance between physical and intellectual capital is required to sustain in competitive market. Results in table also confirm this assertion, all three components of value added intellectual capital according to Pulic (2000b) are significantly impacting the future performance of firm. But relational capital, an addition to VAIC component according to Nimtrakoon (2015) and Nazari (2010) along with also computational change apropos to this study, failed to affect future performance too.

TABLE 4.21: LSDV with PCSE (Dep:ROE_{t+1})

Dep Variable = ROE _{t+1}									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.350	0.170	2.13	0.03	VAIC	2.760	1.028	2.68	0.00
RCE	-0.510	0.760	-0.67	0.51	Age	0.503	0.534	0.94	0.847
SCE	0.815	0.328	2.48	0.01	Lev	-0.261	1.994	-0.13	0.876
CEE	1.291	0.239	5.40	0.000	Size	-0.695	2.338	-0.30	0.657
Age	0.130	0.680	0.19	0.85					
Lev	-0.310	1.970	-0.16	0.88					
Size	-1.360	3.080	-0.44	0.66					
R-Sq	0.80					0.78			
Wald Chi-Sq	981.24					466.40			
Prob.	0.00					0.00			

As described in literature and theoretically that investment on any assets doesn't impact that period just, but following periods may impact through it. As in case of physical assets which provide maximum benefits in early years and diminishing benefits with passage of time due to wear and tear. Same can be argued that intellectual capital doesn't provide full benefits in a year but these benefits are spread over years. To ascertain role of IC and its components on future growth of firm, equations 3.14 and 3.18 was tested.

TABLE 4.22: LSDV with PCSE (Dep: RG_{t+1})

Dep Variable = RG_{t+1}									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.366	0.232	1.58	0.11	VAIC	0.208	0.079	2.62	0.00
RCE	-0.174	0.093	-1.87	0.06	Age	0.356	0.125	2.84	0.00
SCE	0.359	0.194	1.85	0.07	Lev	-0.759	0.311	-2.44	0.01
CEE	0.791	0.209	3.78	0.00	Size	-0.581	0.128	-4.53	0.00
Age	0.368	0.116	3.17	0.00					
Lev	-0.722	0.317	-2.28	0.02					
Size	6.056	1.252	4.84	0.00					
R-Sq	0.71					0.78			
Wald Chi-Sq	222.34					466.40			
Prob.	0.00					0.00			

Physical capital employed do impact future growth of firm as it is evident from results. CEE significantly enhance the growth in future years. Second most influencing factor in future growth is SC, which is evident from extant literature that SC defines the whole processes and strategies what a firm use which benefits if not in current period then in future period. Human capital do impact positively but not significant. It can be argued that investment on human capital impacts the growth of a firm in a period in which investment was done but not in future. This is a setback to the firms because skills, knowledge or talent which human capital acquired is of such time specific that it affects one period and not in future.

With VAIC, future growth is significantly and positively related, one percent investment in value additive factors of intellectual capital compositely enhance 0.2% future growth of firm. As VAIC is heavily influenced by physical capital component which make it significant though all components of IC displayed insignificant relation with future growth of firm.

Equations 3.13 and 3.17 were tested to ascertain impact of IC and its components on performance measure.

When IC and its components were regressed against the future MR, results are not different from other measures. Structural capital which includes investment in all processes, mechanisms, innovations, R&D, the left about after humans leave

TABLE 4.23: LSDV with PCSE (Dep: MR_{t+1})

	Dep Var = MR_{t+1}						Co-eff	PCSE	z	P>z
	Co-eff	PCSE	z	P>z						
HCE	0.013	0.429	0.03	0.99	VAIC	0.030	0.019	1.58	0.09	
RCE	0.003	0.003	1.01	0.30	Age	-0.012	0.007	-1.79	0.07	
SCE	1.673	0.413	4.05	0.00	Lev	-0.025	0.024	-1.05	0.29	
CEE	0.784	1.628	0.48	0.63	Size	0.018	0.030	0.60	0.55	
Age	-0.811	0.431	-1.88	0.06						
Lev	-0.403	1.221	-0.33	0.82						
Size	1.437	2.372	0.61	0.55						
R-Sq.	0.71					0.56				
Wald Chi-Sq.	1104.74					533.11				
Prob.	0.00					0.00				

an organization, is the most influential factor which aids in enhancing future MR of the firm. While all other factors help to enhance one period performance of firm while SC effects last more than one period.

In case of performance measure ROA, equation 3.11 and 3.15 were tested with results thereafter;

TABLE 4.24: LSDV with PCSE (Dep: ROA_{t+1})

	Dep Var = ROA_{t+1}						Co-eff	PCSE	z	P>z
	Co-eff	PCSE	z	P>z						
HCE	0.227	0.156	1.45	0.11	VAIC	0.003	0.018	0.16	0.88	
RCE	0.006	0.019	0.32	0.75	Age	-0.364	0.807	-0.45	0.65	
SCE	0.261	0.126	2.06	0.04	Lev	0.313	0.137	2.29	0.02	
CEE	0.610	0.307	1.99	0.05	Size	0.231	0.293	0.79	0.43	
Age	-0.614	0.735	-0.84	0.40						
Lev	1.834	1.600	1.15	0.25						
Size	0.279	0.281	0.99	0.32						
R-Sq.	0.67					0.66				
Wald Chi-Sq.	3031.380					745.14				
Prob.	0.00					0.00				

When IC and its components impact were checked on future ROA of firm, results are not different from other measures of performance as shown in table 4.24. Physical capital and structural capital significantly and positively impacts the future

performance (ROA) of firm. In this future performance measure case, physical capital too contribute in future. As return on asset shows how much return earned on the basis of firm's average asset in a period, therefore results revealed that physical capital which includes financial and tangible assets positively impact the future ROA.

4.2.6 Robustness Check

Following [Joorbonyan et al. \(2015\)](#) it was empirically investigated that either intellectual capital and its components have any effect on economic performance of the firm, which represents the true shareholders value. As EVA accounts for the cost of capital providers while other accounting performance measures (base on income statement) which only accounts for cost of debt providers. Equation 3.19 was tested to empirically evaluate the role of IC components in determination of true economic value of firm.

Modified Wald test for group-wise heteroskedasticity was applied to check empirically hetero issue. Secondly Wooldridge test of autocorrelation and [Pesaran \(2004\)](#) cross dependence test was applied to ascertain either residuals are serially correlated and cross sections depend on each other or not. Additionally VIF was checked to identify the multicollinearity issue which can make the analysis spurious. Results of all these tests are given in following tables.

TABLE 4.25: Diagnostic Tests (Dep:EVA)

Modified Wald Test		Wooldridge Autocorrelation test		PesaranCD test	
Chi-Square	5533.64	F-stat	40.758	Stat	28.998
Prob.	0.000*	Prob.	0.000*	Prob.	0.000*

*Significance at 99%

After diagnostics test it is evident that independent variables in time series cross section data doesn't have problem of multicollinearity as VIF values of all variables are below 5 (VIF>5 is considered to be problematic, when two independent variables are expected to be significantly correlated with each other), results are

TABLE 4.26: Multicollinearity test (Variance Inflation Factor).

Variable	VIF
HCE	1.33
RCE	1.04
SCE	1.28
CCE	1.05

shown in table 4.26. On other hand, data do have issues of heteroskedasticity, serial correlation and contemporaneous correlation, therefore under such circumstances pooled OLS or fixed effect/Random effect estimation method will be biased. Therefore an estimation procedure which provides heteroskedastic, serial correlation and contemporaneous correlation (HASC) adjusted standard errors (SE's) are required. [Beck and Katz \(1995\)](#) procedure will be best in this case as our time series cross sectional data is not time period long but long in cross section, therefore $N > T$ which is feasible for OLS PCSE estimation.

It was ascertained through F-Likelihood test and Hausman test that which panel data estimation will be feasible in current form of panel data. Results of F-stat and Hausman test stat are strongly significant which manifests that fixed effect or least square dummy variable is best estimator in current scenario as shown in 4.30. Therefore fixed effect estimation with cross section dummy variables or LSDV with PCSE will be used to test either intellectual capital components add true value in firm significantly or it's just a myth created by studies through dubious estimation method. Hausman test identified that fixed effect estimation is the best estimation method for current panel study. As shown in table the cross section random chi-square value is significant at 99% confidence interval which leads to rejection of Hausman test null hypothesis i.e. random effect model is preferable.

In this section two way fixed effect estimation and LSDV along with PCSE estimators were employed. In panel data literature there are cases when both effect of time and cross section need to be fixed because they are significantly impacting the results. Results from both estimation techniques are given below in table 4.28 and 4.29, following with discussion.

TABLE 4.27: Panel estimation method test (EVA)

Cross section F. test			Hausman test		
	Stat	Prob.		Stat	Prob.
Cross section F	31.040	0.0000	Cross section random	24.237	0.0000
Chi-Sq.	1162.464	0.0000			

TABLE 4.28: Two-way Fixed effect model with PCSE (Dep:EVA)

Dep Var: EVA				
	Co-eff	PCSE	z	P>z
HCE	0.014	0.006	2.05	0.04
SCE	0.602	0.095	6.32	0.00
RCE	0.019	0.017	1.11	0.27
CEE	0.176	0.042	4.16	0.00
Size	0.302	0.112	2.68	0.00
LEV	0.745	0.255	2.92	0.00
Wald Chi-sq.	1396.05	Rho	0.726	
Prob.	0.0000			

In two-way fixed effect estimation with panel corrected standard error estimation, framework of VAIC components are significantly and positively impacting the true value of firm. While relational capital impacts positively to economic value of firm but fail to justify this relation empirically. It can be argued that in time of crisis or unstable situations, firms decide not to invest more in public relation development i.e. philanthropic activities, marketing and advertising etc. and their focus remains on stability through development of structural capital which can aid in sustaining crisis period smoothly. As the major effect builder is structural capital which is the most crucial capital of an organization. As human come and go in an organization but once a structural capital through these human investments once made, it's hardly to deplete this with turnover of humans. Capital employed is no doubt a decisive factor in value addition but it can be seen that capital employed efficiency is second major contributor in enhancement of value but first

one is the intellectual capital component i.e. SC. Two control variables namely size and leverage were used to correctly identify the relation of economic value added with intellectual capital components. Both factors are impacting positively and heavily to the economic value of firm. As big size firms have more capacity to generate more true profit than small size firms and levered firms are considered as more profitable because they have capacity and history to pay their liabilities along with also fulfilling the return requirements of equity shareholders.

TABLE 4.29: Least Square Dummy Variables with PCSE (Dep:EVA)

Dep Var: EVA				
	Co-eff	PCSE	z	P>z
HCE	0.019	0.010	1.85	0.06
SCE	0.588	0.169	3.48	0.00
RCE	0.024	0.017	1.42	0.16
CEE	0.229	0.066	3.47	0.00
Size	0.445	0.147	3.02	0.00
LEV	1.201	0.397	3.03	0.00
Wald Chi-sq.	1174.180			
Prob.	0.0000			
Rho	0.3520			

Secondly Least square dummy variable with panel corrected standard error estimation technique was used to check fixed effect within panels after controlling for cross section effect only. These results are also not so different from the two-way fixed effect estimation.

Human capital which was significant in two-way fixed effect at 95% confidence interval becomes insignificant in one-way fixed effect model at the same level. But its impact is positive and significant at 90% level. Structural capital in this model is also value enhancer and no abrupt change in coefficient noticed. For given sample it can be concluded that VAIC components according to [Pulic \(2008\)](#) model are not time dependent.

4.2.7 Epilogue

From Pakistani prospective, it was checked that either intellectual capital and its components individually affect the performance measures of Pakistani firms significantly or not. Pulic (2008) model of intellectual capital came out to be significant with performance measure. Nimtrakoon (2015) added a new component relational capital, this study also followed him and added additional component of RC to which other studies ignored i.e social capital. This study also enhance the computational scope of RC to incorporate big picture for better analysis. But RC came out to be insignificant with all performance measures while in some cases it turn out to be negatively associated with performance measure but fail to signify this relation. Therefore, accordingly it can be corroborated that relational capital fail to reduce the cost of firm and conked out to enhance sales. Consequently, it can be concluded that intellectual capital as whole is important and its balance is also important for better performance of firm. Human capital is the major component of IC which depicts significant relation with firm performance measures. As Iazzolino and Laise (2013) supported the assertion that just building of IC without their efficient use means nothing for an organization in such competitive environment of technological changes whose stride is unpredictable.

The main hypothesis of the study was to check the role of IC and its components in performance enhancement of firm. All of the hypothesis H1 are accepted except H1d, which states that RCE enhances performance. Results reveal that in Pakistani corporate sector there is phenomenon of conversion of tacit knowledge in explicit one as SCE significantly and positively affect the current performance.

Secondly, impact of IC and its components on market value was checked in Pakistani context. Human capital and physical capital both contributed positively in enhancement of market value. As it is well debated in IC literature and value of firm, that difference between market value and book value of firm is due to invisible assets which are not recognized in financial position of firm. Researchers named these invisible hands as intangible assets. Therefore it was hypothesized that market to book value more than one is due to invisible assets and IC incorporation can vanish this difference. Results corroborated that only human capital

along with physical capital impact the market value. If corporate board is well organized so the market value will be more than book value due to expertise the board possess and the confidence investors have on such human resource (Bhana, 2016).

In last, it was also empirically tested that either future performance is also being impacted by IC and its components. Tangible assets are of long term nature, therefore its benefits are of long term to the firm. As IAS-16 named all long term assets as 'non-current assets' which also incorporate intangibles in its scope. Therefore it was postulated that as tangible provide benefit in more than one period, same can be said for intangible assets i.e. intellectual capital, which provides benefit not for single period but spread on many years. On same sense it was also hypothesized that either future performance measures do have any impact due to IC components. Results corroborated that future performance is impacted by structural capital in all cases almost. As humans come and go but structural capital remain the constant part of the firm, therefore SC significantly impact the future performance of the firm. While relational capital comes out to be insignificant in all cases.

4.3 Analysis of India

This subsection will discuss and tabulate all the results regarding Indian sample to infer role of IC and its components on firm current & future performance and value.

4.3.1 Descriptive Statistics

Table 4.30 provides the descriptive stats of Indian data for whole time period. Mean and standard deviation were checked along with range of data to identify any deviation in data and general pattern for further analysis. Figure 4.2 provides year-wise pictorial description of IC components for sample.

TABLE 4.30: Descriptive Statistics (Ind)

	Mean	Std. Deviation	Min	Max	Skewness	Kurtosis
Age	3.00	0.58	0.69	3.93	-1.01	4.44
Lev	0.47	0.23	0.00	0.87	-0.34	2.24
Size	4.87	0.98	3.03	7.05	0.22	2.26
ROA	0.12	0.13	-0.20	0.57	1.04	4.44
ROE	0.24	0.25	-0.46	1.46	1.92	9.36
HCE	1.23	1.99	0.93	3.07	4.94	42.35
RCE	0.86	1.53	-19.84	11.78	-3.74	32.86
SCE	0.95	0.11	0.13	0.67	0.79	7.74
CEE	0.90	0.12	0.45	1.18	-0.43	5.21
MR	0.52	3.30	-1.00	0.89	1.63	6.26
RG	0.24	0.79	-0.82	0.86	1.07	3.46
MBR	4.11	8.15	0.19	6.95	4.07	12.60

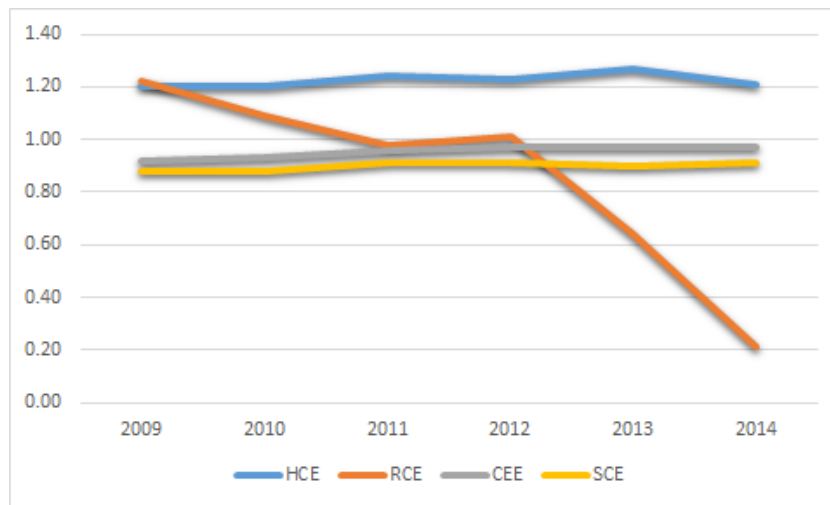


FIGURE 4.2: Mean IC Components(Year-wise)

4.3.2 Panel Unit-Root Test

To check the stationarity of panel data variables, panel unit root test was applied. Fisher type panel unit root tests were used to check the stationarity of the data. As to apply regression it is necessary to ascertain either variables are stationary at level or not. Results of the test are shown in table 4.31.

TABLE 4.31: Panel Unit Root Test (Ind)

	Fisher-ADF		Fisher-PP	
	With Trend	Without Trend	With Trend	Without Trend
	Chi-Square	Chi-Square	Chi-Square	Chi-Square
ROA	228.51* (0.020)	221.76* (0.046)	374.24* (0.000)	374.69* (0.000)
ROE	211.55 (0.096)	242.54* (0.000)	365.80* (0.000)	307.94* (0.000)
MR	254.44* (0.001)	302.64* (0.000)	468.43* (0.000)	394.06* (0.000)
RG	255.56* (0.001)	253.66* (0.001)	430.88* (0.000)	297.25* (0.000)
MBR	236.095* (0.001)	230.77* (0.018)	387.062* (0.000)	277.05* (0.000)
HCE	228.05* (0.015)	198.04 (0.259)	371.77* (0.000)	258.16* (0.000)
SCE	214.13 (0.070)	235.65* (0.010)	338.77* (0.000)	313.04* (0.000)
RCE	212.54* (0.006)	250.52* (0.000)	337.79* (0.000)	316.47* (0.000)
CEE	223.01* (0.026)	221.40* (0.048)	393.29* (0.000)	275.22* (0.000)
Age	1731.54* (0.000)	1712.92* (0.000)	1731.54* (0.001)	1704.41* (0.000)
Size	202.87 (0.210)	184.84 (0.550)	340.15* (0.000)	291.77* (0.000)
Lev	286.064* (0.000)	281.32* (0.000)	471.57* (0.000)	325.35* (0.000)

Table 4.31 shows the result of unit root test of all variables in sample along with their significance and level of integration. Fisher ADF and PP type Unit root test

was checked with trend and without trend as reported in the table. All variables are stationary at level except Size which is not stationary according to Fisher-ADF but highly significant results according to PP test with and without trend. Similarly SCE and ROE shows unit root in ADF test with trend but without trend and in PP test, they have no issue of unit root. Generally there is not a single variable which shows unit root problem through ADF and PP test of unit root, so it can be argued that all variables are stationary at level. Before checking for basic assumption violation of OLS, which method of testing i.e. common effect, fixed effect or random effect will be employed was tested through F-likelihood test and Hausman test. Table 4.38 clearly manifest that for such data in sample, fixed effect estimation is more preferable than other.

TABLE 4.32: Fixed vs Random effect model (Ind)

Redundant Fixed Effect Test			Hausman Test		
	statistics	Prob.		statistics	Prob.
Cross section F	13.04	0.000	Cross section random	15.21	0.033
Cross Section Chi-square	232.74	0.000			

As redundant fixed effect cross section F and chi-square is significant which employs that Fixed effect model is preferable than pooled regression model. Then Hausman test was applied to ascertain either fixed effect model is significantly better than random effect model. Results stated that fixed effect model is preferable than random effect model.

4.3.3 Diagnostics Tests

4.3.3.1 Wald Heteroskedasticity Test for Panels

Modified Wald test for group-wise heteroscedasticity test was applied on each model to check the level of heteroskedasticity. The null hypothesis of this test is;

square of residual is same across the panels. If the test stat is significant then we can reject the null hypothesis and conclude that there is group level heteroskedastic issue and standard OLS estimate for a panel will be biased in such case. Table 4.33 shows the result of hetero issue, and it can be safely and confidently corroborated that there is group wise hetero issue, panels are not homoscedastic and for this panel data standard fixed effect regression will be biased and inconsistent. Equations 3.1-3.4 and 3.10 were tested.

TABLE 4.33: Wald heteroskedasticity Test (IC Components)

Performance Measure	Chi-Square	Prob.
ROA	180.31	0.0000
ROE	330.44	0.0000
MR	410.29	0.0000
SG	760.01	0.0000
MBR	850.11	0.0000

As it is evident from the results that all models possess heteroskedasticity. Therefore panel data analysis must incorporate correction of this issue for robust results.

4.3.3.2 Wooldridge Autocorrelation Test

Before analyzing the models empirically and concluding its main findings, another issue that may create issue for inferencing, to check serial or autocorrelation in panel data will affirm the sound analysis. If there is presence of serial or autocorrelation then serially corrected standard errors required for analyzing impact of one variable over the other. Using same equations for which hetero issue was tested, auto correlation diagnostic tests were applied on all those equations.

Results showed that residuals are serially correlated with each other, and in such situation standard errors will be biased which will make the results and corroboration meaningless.

TABLE 4.34: Wooldridge Autocorrelation Test (IC Components)

Performance Measure	F-stat	Prob.
ROA	5.85	0.0170
ROE	1.43	0.0240
MR	23.3	0.0000
SG	3.35	0.0070
MBR	81.31	0.0000

4.3.3.3 Cross-section Dependence Test

As discussed earlier in start of analysis section, it is evident that contemporaneous correlation in data required correction before analysis. It is typically found in corporate panel that they are linked with each other in some or other way. It could be due to firms in sample related to one industry, or firms interlinked with each other in terms of input-output structure etc. Four tests were employed to check cross-section dependence in panel sample through testing of equation 3.1-3.4 along with equation 3.10.

TABLE 4.35: Cross Section Dependence test.

Performance Measure	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
ROA	751.89*	9.73*	6.72*	-1.43
ROE	1097.18*	21.43*	18.43*	17.28*
MR	1007.99*	18.41*	15.41*	-0.784
SG	620.90*	5.29*	2.29*	2.68*
MBR	1039.97*	19.49*	16.49*	15.61*

*significance at 99%

Results depict that all models are contemporaneously correlated. According to Pesaran CD test, model which used ROA and MR as dependent variables are not contemporaneously correlated but other tests stat rejects this point of view and concluded that cross sections are correlated with each other.

In such case linear pooled OLS or fixed/random effect will provide biased estimates

of SE's. Due to presence of Heteroskedasticity, Autocorrelation and contemporaneous correlation (HAC) adjusted standard errors will be required for inference.

4.3.4 Driscoll-Kraay Fixed Effect Regression with HAC Adjusted SE's

Table 4.36 provides the fixed effect panel regression results with Driscoll and Kraay SE's in which dependent variables are ROA and ROE. Getting Driscoll and Kraay robust SE adjusted by [Vogelsang \(2012\)](#), results conclude that on both performance measures of performance, components of VAIC impact differently.

Taking ROA first, the major performance enhancer component of VAIC is physical capital. As whatever left behind after human capital is considered to be the structure of an organization. As people and experts can leave an organization but a structure build by such expertise and innovative ideas strengthen an organization and aid in good value. Therefore results corroborated that structural capital positively impacts the firm performance i.e. ROA of firm. As there are two forms of assets i.e. tangible and intangible. Relational and human capital are considered as intangible asset and not incorporated in calculation of ROA. Results corroborated that human capital efficiency and relational capital efficiency both have no impact on ROA. Just creation of intangible assets can't make a firm profitable in terms of performance. Efficient use of both tangible and intangible assets do affect the performance of an organization. The major breakdown of analysis is conclusion of the fact that efficient physical capital as well as intellectual capital of firms impact positively performance of a firm in terms of ROA. Investment on human capital and relational capital is not efficient that could enhance the return of firm. As [Iazzolino et al. \(2014\)](#) corroborated that it is possible;

$$HC(A) > HC(B)$$

But,

$$\text{Performance}_A < \text{Performance}_B,$$

therefore efficient use of IC links with enhancement of performance.

Results from ROE (performance measure) is much different from ROA. All components of value added intellectual coefficient affect the performance of firm in terms of ROE, positively except structural capital. Physical capital's impact on ROE is highly significant.

TABLE 4.36: Driscoll and Kray estimation (Dep: ROA & ROE)

	Dep Var: ROA			Dep Var: ROE		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
HCE	0.21	0.26	0.80	0.17	2.83	0.03
RCE	-0.04	-1.89	0.12	0.04	2.84	0.03
SCE	0.2	4.08	0.01	0.31	0.58	0.59
CEE	0.3	5.76	0.00	0.27	4.08	0.01
Age	-0.11	-4.7	0.00	0.35	6.57	0.01
Size	0.1	3.69	0.01	-1.51	-2.82	0.03
Lev	-0.36	-4.7	0.00	-1.02	-6.06	0.00
Within R-Squared	0.28			0.1		
F-Stat	127.93			163.85		
Prob. of F	0.000			0.000		

Table 4.37 shows impact of efficient value added intellectual capital on other two performance measures for a firm i.e. margin ratio and sales growth. These measures are income statement based performance measure, therefore, results can be different from other measures. As results showed that only human capital aids in enhancing margin and growth of a firm. While structural and relational capital shows positive relation with low level of significance. This can be due to income statement performance measure, as relational capital is advertising and philanthropic measures of a firm. Human capital which is biggest asset of any firm can not be get rid of in times of crisis. But advertising expense and philanthropic measures can be avoided in crisis period. Results showed that relational capital does enhance the performance of Indian firms. In tough times human capital strive to enhance the sales and profits of the organization through relations with the society which help to lessen cost structure of firm or aids in growth.

TABLE 4.37: Driscoll and Kray estimation (Dep: RG & MR)

	Dep Var: RG			Dep Var: MR		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
HCE	0.15	0.02	0.99	0.28	1.49	0.20
RCE	0.05	3.4	0.02	-0.19	-0.65	0.55
SCE	0.24	0.49	0.65	0.46	1.63	0.1
CEE	0.31	2.18	0.08	0.13	2.16	0.05
Age	-0.11	-2.17	0.08	0.05	1.77	0.14
Size	1.06	1.35	0.23	1.14	-2.67	0.04
Lev	-0.13	-0.14	0.89	-0.61	1.06	0.34
Within R-Squared	0.22			0.10		
F-Stat	674.38			295.13		
Prob. of F	0.000			0.000		

Table 4.38 shows result of model 3.17 in which looked into nexus of IC and value in market terms. Results corroborated that in Indian corporate culture relation building through philanthropic measures and marketing/advertising are seen as positively by the investors and they priced it accordingly. Shareholders or investors usually discount all such factors which are deemed unnecessary in their point of view as philanthropic measures are not necessary component for an organization usually. But here in Indian corporate culture, investors encourage societal welfare projects of organizations. It can be argued that social screening in Indian market is prevalent and investors priced such activities because RCE significantly impacts market value of firm. Physical capital which is capital employed by an organization is the major influencer in enhancing firm's market value followed by human and relational capital.

Widely discussed drawback of Driscoll and Kray estimation methodology is sacrifice of contemporaneous correlation when cross sections exceed time periods in sample. SE's are deflated structurally in such situation which makes the significance level achievable for a variable. Therefore, robust estimates are required without sacrificing the current position of panel framework. Least square dummy variables

TABLE 4.38: Driscoll and Kray estimation (Dep: MBR)

Dep Var: MBR			
	Co-eff	t-stat	Prob.
HCE	0.65	3.01	0.03
RCE	0.07	2.54	0.04
SCE	0.64	1.06	0.34
CEE	5.29	2.3	0.07
Age	0.43	3.58	0.02
Size	1.18	0.77	0.48
Lev	-1.35	-1.26	0.27
Within R-Squared	0.03		
F-Stat	156.56		
Prob. of F	0.000		

with panel corrected standard errors is the ideal econometric methodology for a panel data where $N > T$ and where standard errors are HACs adjusted.

4.3.5 Least Square Dummy Variable with Panel Corrected Standard Errors (PCSE)

Keeping in view of shortcomings, this section employed [Beck and Katz \(1995\)](#) to estimate linear panel data models: a sandwich type estimator of covariance matrix of estimated parameters to which they named PCSE will be robust to the possibility of non-spherical errors.

To incorporate fixed effect in this suggested panel linear OLS model, least square dummy variable estimation will provide robust results free from any bias. Using logic of equation 4.1, LSDV PCSE estimation method has been applied on each model under consideration. All econometric models described in chapter 3 has been tested through LSDV PCSE estimation. Subsequent section will discuss results of models along with detailed discussion.

4.3.5.1 Impact of IC on Current Performance

Four performance measures namely ROE, MR, RG and ROA were used in this study. Following portion will identify the econometric model to test along with results tabulation that shows the impact of IC on current performance measures, followed by discussion.

To check the impact of IC components and E-VAIC on ROE, equations 3.2 and 3.6 were tested using LSDV PCSE estimation technique. Table 4.39 depicts the result in detail.

First halve of table manifests the result of IC components impact on ROE of firm. As R-square of model is 0.61 which manifests that 61% of the variation in ROE is due to the regressors i.e. Intellectual capital along with control variables. Wald Chi-square value is highly significant which also attests that model used is efficient. As wald test hypothesize that value of all regressors are zero significantly while results reject this postulation and concluded that variables affect the performance measure. Most influential factor on ROE is physical capital, as the z value is highly significant. As for as intellectual capital components are concerned, the most prevailing components which affect ROE of firm is human capital which is significant at 90% level as z value is 1.56. In Indian corporate cultures human capital do impact the performance of firm, as according to [Bounfour and Edvinsson \(2012\)](#) India is in top 40 countries of world which are blessed with human capital that create value for firm. On the other hand world economic forum (WEF) global human capital index report 2017, ranked Indian economy at 103rd number across the globe which is a good rank in comparison to other neighboring south Asian economies i.e. Pakistan and Bangladesh. In corporate prospective, human capital theory supports this evidence i.e. human capital aids in enhancing performance of a firm. Composite measure IC i.e. E-VAIC significantly impact the return on equity at 90% level of confidence interval.

Apropos to VAIC and its components relation with performance, RG was taken as performance measure and ascertained its linkage with IC. As revenue growth shows growth of firm in terms of sales. As firms main business is to expand its sales

TABLE 4.39: Fixed Effect estimation with PSCE (Dep:ROE)

Dep Variable = ROE _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.419	0.268	1.56	0.08	VAIC	0.249	0.129	1.93	0.05
RCE	0.241	0.183	1.32	0.19	Age	0.262	0.076	3.46	0.00
SCE	0.237	0.494	0.48	0.63	Lev	-0.242	0.133	-1.82	0.07
CEE	0.539	0.222	2.43	0.01	Size	0.199	0.066	3.02	0.00
Age	0.203	0.083	2.45	0.01					
Lev	-0.303	0.131	-2.31	0.02					
Size	0.256	0.069	3.71	0.00					
R-Sq	0.614					0.607			
Wald Chi-Sq	2280.49					969.82			
Prob.	0.00					0.00			

in relation to previous period and targets are set to achieve a specific growth in normal conditions of business. The sole earnings of any firm is its sales regardless of its nature of business. Therefore, to check link of physical and intellectual capital on growth of firm is imperative to judge performance IC nexus. Equations 3.4 to 3.8 were tested to vindicate IC and RG link. Table 4.40 provides complete picture of link in econometric terms.

TABLE 4.40: Fixed Effect estimation with PSCE (Dep:RG)

Dep Variable = RG _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.158	0.241	0.65	0.51	VAIC	0.42	0.211	1.99	0.05
RCE	0.153	0.043	3.56	0.00	Age	-0.202	0.373	-0.54	0.59
SCE	0.195	0.105	1.86	0.06	Lev	1.02	1.12	0.91	0.36
CEE	0.447	0.251	1.78	0.06	Size	0.729	1.649	0.44	0.66
Age	-0.208	0.367	-0.57	0.57					
Lev	0.365	0.858	0.44	0.67					
Size	0.899	0.372	2.42	0.01					
R-Sq.	0.45					0.22			
Wald Chi-Sq.	1995.91					1027.65			
Prob.	0.00					0.00			

Efficient capital employed which is proxy of physical capital came out to be the

most influential factor in determining revenue growth as the case was earlier tested through Driscoll and Kray, but result is significant at 90% level. Relational capital is considered to be the major factor as it came out to be significant factor in determining growth of firm. While the second portion of the table displayed result when composite effect of VAIC was checked on RG of firm. VAIC impacts positively but the level of significance is changed from ROE.

Next measure of performance was taken as Margin ratio of firm which depicts that how much earnings represent the sales of the firm. If MR increases this means either sales increase or costs decrease or both processes at the same time. Ultimate objective of any organization is to increase the sale base along with achieving economies of scale so that cost of business and production be less than other competitors in the industry. It was ascertained the role of IC and its components on margin ratio of firm through testing of equation 3.3 and 3.7.

TABLE 4.41: Fixed Effect estimation with PSCE (Dep:MR)

Dep Variable = MR_t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.605	0.340	1.78	0.07	VAIC	0.391	0.206	1.90	0.05
RCE	-0.299	0.413	-0.73	0.47	Age	0.515	0.768	0.67	0.50
SCE	0.691	1.031	0.67	0.50	Lev	2.299	2.217	1.04	0.30
CEE	0.397	0.156	2.55	0.01	Size	-2.340	1.079	-2.17	0.03
Age	0.476	0.479	0.99	0.32					
Lev	-0.016	0.737	-0.02	0.99					
Size	-1.508	0.945	-1.60	0.11					
R-Sq.	0.721					0.636			
Wald Chi-Sq.	1418.21					685.47			
Prob.	0					0			

Table 4.41 shows the result of IC as whole and its components effect on margin ratio. Result is different from RG (performance measure) in a sense that physical capital which includes tangible and financial capital positively impacts the margin ratio of firm but human and structural capital fail to impact significantly. As margin ratio is specifically income statement based ratio, which shows that how much

income is generated from turnover of a firm. Relational capital which comprises of philanthropic, CSR activities along with marketing and advertising actions, results show that margin ratio decreases through such activities but results failed to testify this assertion. As RG is significantly impacted by RC but fail to affect significantly MR. This can be ascertained that RC help to enhance sales of firm while fail to reduce the cost through such bonding which is manifested through negative link of RC with MR.

Lastly, performance measure i.e. ROA was taken to empirically investigate IC influence on it. Equations 3.1 and 3.5 were used for empirical analysis using LSDV PCSE methodology.

TABLE 4.42: Fixed Effect estimation with PSCE (Dep:ROA)

Dep Variable = ROA _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.650	0.241	2.70	0.00	VAIC	0.262	0.079	3.32	0.00
RCE	0.136	0.133	1.02	0.31	Age	-0.221	0.609	-0.36	0.72
SCE	0.477	0.416	1.15	0.25	Lev	-0.268	0.091	-2.95	0.00
CEE	0.355	0.095	3.74	0.00	Size	0.276	0.475	0.58	0.56
Age	-0.790	0.250	-3.16	0.00					
Lev	-0.360	0.087	-4.14	0.00					
Size	0.970	0.490	1.98	0.05					
R-Sq	0.87					0.84			
Wald Chi-Sq	1669.43					7969.64			
Prob.	0					0			

Table 4.42 reports the result of composite IC and its components impact on performance measure i.e. ROA. Following two models were tested and results are tabulated with discussion further. As humans expertise, innovative ideas and knowledge help a firm to differentiate itself from the competitors. But problem arises when knowledge of humans in a firm remain tacit and doesn't convert in to explicit knowledge, which make up structural capital. Results manifested that structural capital in current period failed to affect the margin ratio of firm, one reason could be of failure in conversion of tacit knowledge of employees in to explicit knowledge.

While composite measure of IC, VAIC has an impact on margin ratio of firm which is not highly significant but to some extent. As VAIC is addition of all IC components, in individual form only physical and human capital is significant, but as whole VAIC is not highly significant. It can be argued that the balance between physical and intellectual capital is not optimal in Indian corporate sector on average.

Results corroborated that two major components of IC failed to impact the performance of firm. Major impact is of human capital and physical capital as coefficient of HCE and CEE are 0.65 and 0.36 and highly significant too. Secondly composite measure of VAIC too is highly significant and positively impact the financial performance of Indian corporate sector. From empirical investigation, one aspect is very evident that structural capital and relational capital generally failed to affect the performance of the firm. It can be ascribed as difficulty.

4.3.5.2 Value and IC Nexus

Earlier we checked the role of IC and its components in determining performance of the firm. The second phase of this study vindicated value and IC nexus. This study hypothesized that market value more than book value is due to all those invisible assets which are not part of books but market value them more and price it. As it is evident from literature that appointment of directors, CFO's and board as whole impact the market value of firm with news infusion but not book value. Therefore empirically this study tried to explore this nexus to vindicate or deplore the bond. Equations 3.9 and 3.10 were tested to identify this nexus empirically.

As market to book ratio is used as proxy for market value, value of MBR greater than 1 depicts that market value of firm is more than book value of firm. Results in table 4.43 corroborated that human capital significantly impacts the value of firm. Investment in human capital leads to enhance the market value of firm. Other two components of IC i.e. SC and RC show different pattern. Relational capital which is investment in philanthropic and marketing related actions, are priced by market. As relational capital significantly impact the market value of firm. While structural capital failed to impact market value of firm. Physical

TABLE 4.43: Fixed Effect estimation with PSCE (Dep:MBR)

Dep Variable = MBR _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.194	0.081	2.40	0.02	VAIC	0.421	0.221	1.905	0.056
RCE	0.047	0.023	2.05	0.04	Age	5.660	2.460	2.301	0.022
SCE	0.276	0.923	0.30	0.77	Lev	-0.166	2.343	-0.071	0.943
CEE	1.190	0.332	3.58	0.00	Size	1.568	1.080	1.452	0.149
Age	-0.208	0.367	-0.58	0.57					
Lev	0.365	0.858	0.43	0.67					
Size	0.899	0.372	2.42	0.01					
R-Sq	0.631					0.628			
Wald Chi-Sq	4098.400					3789.600			
Prob.	0.000					0.000			

capital significantly impact value of firm, as physical capital comprise of financial and tangible assets which increase the balance sheet of a firm that leads to increase in both book and market value. But results revealed that importance of IC is not less in market, as HC and RC both impact the firm's market value. As three measures of VAIC comes out to be significant which impact market value of firm, in composite measure impact, VAIC do impact positively the market value of firm but the coefficient value is low.

4.3.5.3 Future Performance

Next a new dimension was also checked that either intellectual capital affect the future performance of the firm. As intellectual capital is considered an invisible asset, and according to definition of long term asset by IAS-16, its benefits are spread over many periods than just one year in which it was installed. It can be ascertained that benefit diminish with use of asset with time. Therefore on same grounds it was hypothesized that IC do have an effect on future performance of firm. Its impact may diminish but not obsolete completely. First ROE and ROA were taken as performance measure and equation 3.15 and 3.16 were tested.

Tangible capital is no doubt the significant factor for any firm to perform better in competitive market. Extant literature also documented that physical capital

is important and crucial factor but a balance between physical and intellectual capital is required to sustain in competitive market. Results in table 4.44 also confirm this assertion, components of value added intellectual capital are significantly impacting the future performance of firm.

TABLE 4.44: Fixed Effect estimation with PSCE (Dep: ROA_{t+1} & ROE_{t+1})

Dep Var:	ROA _{t+1}				ROE _{t+1}				
	Co-eff	PCSE	z	P>z	Co-eff	PCSE	z	P>z	
HCE	0.115	0.215	0.53	0.59	HCE	0.357	0.271	1.32	0.19
RCE	0.026	0.125	0.21	0.83	RCE	0.03	0.11	0.27	0.7
SCE	0.577	0.322	1.79	0.07	SCE	0.105	0.054	1.93	0.05
CEE	0.752	0.109	6.90	0.00	CEE	0.171	0.087	1.97	0.05
Age	0.429	0.244	1.76	0.08	Age	-0.43	0.24	-1.79	0.07
Lev	-0.127	0.076	-1.67	0.09	Lev	-0.177	0.122	-1.45	0.14
Size	0.475	0.459	1.03	0.30	Size	0.142	0.0877	1.62	0.11
R-Sq.	0.865				0.73				
Wald Chi-Sq.	2162.68				1176.02				
Prob.	0.000				0.000				

As ascertained earlier that in Indian caproate sector structural capital failed to impact current performance of firm. It is evident from table 4.44 that structural capital in both case (ROA and ROE) is significant at 90% confidence interval. Which can be ascertained as conversion of tacit knowledge in explicit knowledge takes time in corporations which aids future performance not current one. As structural capital is legacy capital of humans, human join and leave an organization but their knowledge and expertise which gave competitive edge for time being, become part and parcel of an organization which aids in developing future performance. I both performance measure cases, SC is significant at 90% level.

As described in literature and theoretically that investment on any assets doesn't impact that period just, but following periods may be impacted through it. As in case of physical assets which provide maximum benefits in early years and diminishing benefits with passage of time due to wear and tear. Same can be argued that intellectual capital doesn't provide full benefits in a year but these benefits are spread over years. To ascertain role of IC and its components on future growth of firm, equation 3.17 and 3.18 were tested empirically using LSDV PCSE.

TABLE 4.45: Fixed Effect estimation with PSCE (Dep: MR_{t+1} & RG_{t+1})

Dep Var:	MR_{t+1}				RG_{t+1}				
	Co-eff	PCSE	z	P>z	Co-eff	PCSE	z	P>z	
HCE	0.556	0.415	1.34	0.18	HCE	0.321	0.173	1.86	0.05
RCE	0.248	0.101	2.46	0.01	RCE	0.646	0.840	0.77	0.44
SCE	1.798	0.791	2.27	0.02	SCE	0.296	0.052	5.69	0.00
CEE	3.750	1.750	2.14	0.03	CEE	1.740	1.330	1.31	0.19
Age	2.310	0.999	2.31	0.02	Age	0.322	0.412	0.78	0.44
Lev	-1.316	2.572	-0.51	0.609	Lev	2.110	0.976	2.16	0.03
Size	-1.308	1.164	-1.12	0.261	Size	-2.940	1.435	-2.05	0.04
R-Sq	0.824					0.686			
Wald Chi-Sq	4704.6					7830.48			
Prob.	0.00					0.00			

In case of income statement related performance measure for a firm, physical capital employed do impact future growth of firm as it is evident from results. CEE significantly enhance the growth in future years. Second most influencing factor in future growth is SC, which is evident from extant literature that SC defines the whole processes and strategies what a firm use which benefits if not in current period then in future period. While it is determined that RC which was negatively impacting MR in time t, affects positively MR in t+1, but earlier investment in relationship building significantly impacts future performance.

Generally, when IC and its components were regressed against the future MR and RG, results are not different from other measures. Structural capital which includes investment in all processes, mechanisms, innovations, R&D is the most influential factor which aids in enhancing future MR of the firm. While all other factors help to enhance one period performance of firm while SC effects last more than one period.

4.3.6 Robustness Check

To check that either IC components affect the true value of firm i.e. EVA, equation 3.19 was empirically tested after all diagnostics testing. As EVA accounts for the cost of capital providers vis-à-vis other accounting performance measures base on income statement only accounts for cost of debt providers.

Modified Wald test for group-wise heteroskedasticity was applied to check empirically hetero issue. Secondly Wooldridge test of autocorrelation and Pesaran cross dependence test was applied to ascertain either residuals are serially correlated and cross sections depend on each other or not. Results of all these tests are given in table 4.46.

TABLE 4.46: Diagnostic test (EVA)

Modified Wald Test		Wooldridge Autocorrelation Test		Pesaran CD test	
Chi-Square	2346.79*	F-stat	31.01*	Stat	-0.440
Prob.	0.0000	Prob.	0.0000	Prob.	0.666

Data have issues of heteroskedasticity, serial correlation and contemporaneous correlation, therefore under such circumstances pooled OLS or fixed effect/Random effect estimation method will be biased. The value of pesaran CD test is insignificant which states that there is no contemporaneous correlation while other CD tests i.e. Pesaran LM test, Breuch pagan LM test and Bias corrected LM tests etc. As Pesaran CD test in case of robustness check of Indian market is insignificant but other tests stat as shown in table 4.47 depicts that there is cross section dependence for equation 3.19.

TABLE 4.47: Cross Section Dependence (EVA)

Test	Statistics	Prob.
Breusch-Pagan LM	861.85	0.0000
Pesaran scaled LM	13.454	0.0000
Bias-corrected scaled LM	10.455	0.0000

Therefore an estimation procedure which provides heteroskedastic, serial correlation and contemporaneous correlation (HASC) adjusted standard errors (SE's) are required. [Beck and Katz \(1995\)](#) procedure will be best under such situation.

Next F-test and Hausman test was applied to ascertain which panel data estimation will be feasible in current form of panel data. Results of F-stat and Hausman test stat are strongly significant which manifests that fixed effect or least square

dummy variable is best estimator in current scenario. Therefore we applied LSDV with PCSE along with two way fixed effect model with PCSE to test linkage between true economic value of firm and IC of firm.

Hausman test identified that fixed effect estimation is the best estimation method for current panel study. As shown in table the cross section random chi-square value is significant at 99% confidence interval which leads to rejection of Hausman test null hypothesis i.e. random effect model is preferable. Results are reported in table 4.48.

TABLE 4.48: Panel estimation method test (EVA)

	Cross section F. test		Hausman test	
	Stat	Prob.	Stat	Prob.
Cross section F	17.60	0.0000	Cross section random	24.34 0.0005
Chi-Sq.	272.51	0.0000		

As stated earlier this study incorporated two way fixed effect estimation and LSDV along with PCSE estimators. In panel data literature there are cases when both effect of time and cross section need to be fixed because they are significantly impacting the results. Results from both estimation techniques are given below in table 4.49 and 4.50, following with discussion.

In two-way fixed effect estimation with panel corrected standard error estimation, VAIC components are significantly and positively impacting the true value of firm. While structural and relational capital impacts positively to economic value of firm but not significant at 95% confidence level. As the major component which adds value in company regardless of humans and relation, which instills performance of the organization is physical capital. In Indian economy the major value addition is from the capital employed as one dollar investment in efficient capital employed will leads to increase in \$9.9 in true value of the firm.

Secondly role of human capital too affect the true value of firm while SC link is eminent with 90% level of significance. As human come and go in an organization but once a structural capital through these human investments is made, it's hardly

TABLE 4.49: Two-way Fixed effect model with PCSE (EVA)

Dep Var: EVA				
	Co-eff	PCSE	z	P>z
HCE	0.192	0.092	2.09	0.04
SCE	0.167	0.086	1.95	0.05
RCE	0.410	2.330	0.19	0.86
CEE	9.910	0.455	21.9	0.00
Size	1.910	0.145	13.2	0.00
LEV	-1.128	0.151	-7.47	0.00
Wald Chi-sq.	364.29			
Prob.	0.000			
R-Sq.	0.86			

to deplete this with turnover of humans. Capital employed is no doubt a decisive factor in value addition. Two control variables namely size and leverage were used to correctly identify the relation of economic value added with intellectual capital components. Both factors are impacting heavily to the economic value of firm. As big size firms have more capacity to generate more true profit than small size firms and levered firms are considered as more prone towards risk which reduce the value of firm. In Indian corporate culture it can be argued that more levered firms fail to add any economic value in firm. The leverage shows negative link with EVA, which can be due to over burdening with gearing of corporations which posits extra threat in the value of shareholders.

Further Least square dummy variable with panel corrected standard error estimation technique was used to check fixed effect within panels effect after controlling for cross section effect only. These results are not so different from the two-way fixed effect estimation.

structural capital which was insignificant in two-way fixed effect at 95% confidence interval becomes significant in one-way fixed effect model at the same level. Its impact is positive and significant at 90% level previously, therefore no big change in terms of sign. While other factors are same and significant as in previous two

TABLE 4.50: Least Square Dummy Variables with PCSE.

Dep Var: EVA				
	Co-eff	PCSE	z	P>z
HCE	0.182	0.087	2.09	0.04
SCE	0.179	0.085	2.10	0.04
RCE	0.100	0.239	0.42	0.68
CEE	9.870	0.418	23.61	0.00
Size	1.822	0.069	26.41	0.00
LEV	-1.116	0.155	-7.20	0.00
R-Sq.	0.86			
Wald Chi-sq.	570.79			
Prob.	0.000			

way model. It can be corroborated that IC components are not time dependent.

4.3.7 Epilogue

This epilogue will discuss from Indian perspective, either intellectual capital and its components individually along with physical capital affect the performance measures of firms significantly or not. Human capital in all cases and relational capital in few, affect the performance of a firm. One major aspect which came out through empirical evidence is knowledge conversion process. As in all performance measure cases, structural capital positively impacts the performance but this impact is statistically insignificant. Which alludes its role in determining performance. It can be conceived that organizations conversion cycle of knowledge - from tacit to explicit is slow. As humans capital enter in organization in two forms i.e. tacit and explicit. Organizations are duty bound to convert expediently that tacit knowledge in to explicit knowledge, so that structural capital widens with passage of time, which furnish growth and profitability for an organization not just in one period but in future period too.

The main hypothesis with respect to financial performance and intellectual capital was that either IC and its components affect FP of firm. Empirical investigation

reveal that IC and two major components of IC i.e. CEE and HCE significantly affect the financial performance of Indian corporate sector.

Accordingly, second hypothesis was to ascertain either difference in MV and BV of firm is due to IC. Human capital and physical capital both contributed positively in enhancement of market value, while RE is significant and positive. As it is well debated in IC literature and value of firm, that difference between market value and book value of firm is due to invisible assets which are not recognized in financial position of firm. Researchers named these invisible hands as intangible assets. Therefore it was hypothesized that market to book value more than one is due to invisible assets and IC incorporation can vanish this difference. Results corroborated that composite VAIC along with all components except SCE affect the market value. Therefore, it can be asserted that IC enhances the market value of firm, but due to lack of measurement and reporting of IC on books of firm, BV remain low. A good director, chief executive, managerial staff and above all board of directors keep their influence in market. If board is well organized in terms of expertise, knowledge, skills which they possess, so the market value will be more than book value due to such characteristics the human capital has and the confidence of investors reposes.

Thirdly, it was hypothesized that IC and its components not only affect current performance but future performance too. Therefore, it was empirically tested that either future performance is also being impacted by IC and its components. Tangible assets are of long term nature, therefore its benefits are period dependent while according to definition of long term assets, its benefit are spread over its life. Pragmatically, intellectual capital's life is uncertain as learning-relearning is a continuous process. Structural capital with passage of time improves, while human capital rejuvenates with infusion of new skills and expertise in an organization. On same sense it was also hypothesized that either future performance measures do have any impact due to IC components. Results corroborated that future performance is impacted by structural capital. This results emphasize the role of knowledge conversion in system of the organization.

4.4 Analysis of Bangladesh

This subsection will discuss and tabulate all the results regarding Indian sample to infer role of IC and its components on firm current & future performance and value.

4.4.1 Descriptive Statistics

Table 4.51 provides the descriptive stats of Indian data for whole time period. HCE and RCE shows pattern different from other two countries, as their mean and standard deviations are on higher side. One issue of the Bangladesh data is unbalanced panel, as investment in relational capital in some instances is limited to one or two years than whole time period of study. Figure 4.3 provides year-wise pictorial description of IC components.

TABLE 4.51: Descriptive Statistics (Bangladesh)

	Mean	Std. Deviation	Min	Max	Skewness	Kurtosis
Age	3.18	0.98	0.69	7.61	2.53	13.55
Lev	1.68	1.80	0.50	3.35	1.09	1.52
Size	3.29	0.71	1.72	5.13	0.36	2.73
ROA	0.08	0.11	-0.25	0.68	2.09	9.81
ROE	0.16	0.38	-0.83	2.05	-5.93	8.81
HCE	6.39	14.37	-2.23	18.94	6.55	52.40
RCE	0.29	3.84	-4.55	1.53	1.34	13.60
SCE	0.68	0.51	-0.06	1.44	6.93	4.02
CEE	0.43	0.54	-2.61	4.53	2.05	8.60
MR	0.13	0.25	-0.60	1.98	4.00	23.53
RG	0.16	0.58	-0.79	0.85	0.08	1.17
MBR	2.82	5.65	0.76	6.20	6.64	5.88

4.4.2 Panel Unit-Root Test

To check the level of stationary for panel data variables, panel unit root test was applied. Fisher panel unit root tests were used to check the level of stationary for

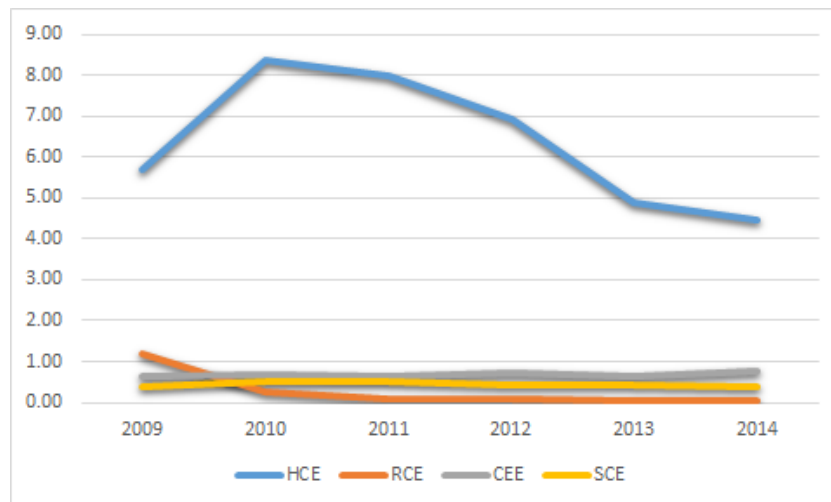


FIGURE 4.3: Yearly Mean IC Components

the data. As to apply regression it is necessary to ascertain either variables are stationary at level or not. Results of the test are shown in table 4.51.

Table 4.52 shows the result of unit root test of all variables in sample along with their significance and level of integration. Fisher ADF and PP type Unit root test was checked with trend and without trend as reported in the table. All variables are stationary at level according to PP test with and without trend. While majority of the variables are not stationary and have unit root at level according to ADF test. While keeping position of data structure of Bangladesh in view, it is ascertained that data do not have any serious issue of unit root. Data of Bangladeshi firms are highly unbalanced because of non-availability of concerned information in published financial reports. Due to such nature of data, the results of PP and ADF unit root tests are opposing each other.

To choose which panel data model will be statistically sound for such data, redundant fixed effect and Hausman test was used. Table 4.53 describe in detail with est stats.

As redundant fixed effect cross section F and chi-square is significant which employs that Fixed effect model is preferable than pooled regression model. Then Hausman test was applied to ascertain either fixed effect model is significantly better than random effect model. Null hypothesis of Hausman test is that random effect is preferable while result clearly depicts that null hypothesis was rejected

TABLE 4.52: Panel Unit Root Test (Ban)

	Fisher-ADF		Fisher-PP	
	With Trend	Without Trend	With Trend	Without Trend
	Chi-Square	Chi-Square	Chi-Square	Chi-Square
ROA	131.19 (0.358)	152.89 (0.052)	224.18* (0.000)	217.51* (0.000)
ROE	127.96 (0.435)	168.53* (0.007)	215.47* (0.000)	210.45* (0.000)
MR	176.47* (0.002)	208.49* (0.000)	318.80* (0.000)	274.39* (0.000)
RG	104.57 (0.918)	166.14* (0.009)	191.70* (0.001)	215.67* (0.000)
MBR	136.66 (0.243)	174.58* (0.003)	223.85* (0.000)	203.80* (0.000)
HCE	161.79* (0.017)	133.78 (0.268)	262.70* (0.000)	189.20* (0.000)
SCE	142.81 (0.145)	162.14* (0.017)	277.78* (0.000)	214.77* (0.000)
RCE	150.89 (0.065)	192.05* (0.000)	228.22* (0.000)	242.47* (0.000)
CEE	172.95* (0.004)	145.63* (0.111)	302.55* (0.000)	176.57* (0.002)
Age	1160.50* (0.000)	1136.80* (0.000)	1160.50* (0.001)	1130.13* (0.000)
Size	153.84* (0.046)	136.89 (0.239)	251.51* (0.000)	209.75* (0.000)
Lev	195.22* (0.000)	183.38* (0.000)	321.60* (0.000)	208.34* (0.000)

significantly which ultimately assure that fixed effect model is preferable than random effect model.

TABLE 4.53: Fixed vs Random effect model (Ban)

Redundant Fixed Effect Test			Hausman Test		
	statistics	Prob.		statistics	Prob.
Cross section F	12.16	0.000	Cross section random	31.70	0.000
Cross Section Chi-square	403.49	0.000			

4.4.3 Diagnostics Tests

4.4.3.1 Wald Heteroskedasticity Test for Panels

Due to use of fixed effect model, modified Wald test for group-wise heteroscedasticity test was applied on each model to check the level of heteroskedasticity. The null hypothesis of this test is; square of residual is same across the panels. If the test stat is significant then we can reject the null hypothesis and conclude that there is group level heteroskedastic issue and standard OLS estimate for a panel will be biased in such case. Table 4.54 shows the result of hetero issue, and it can be safely and confidently corroborated that there is group wise heteroskedastic issue, panels are not homoscedastic and for this panel data standard fixed effect regression will be biased and inconsistent. Equations 3.1-3.4 and 3.10 were tested.

TABLE 4.54: Wald heteroskedasticity Test (IC Components)

Performance Measure	Chi-Square	Prob.
ROA	310	0.0000
ROE	190	0.0000
MR	140	0.0000
SG	250	0.0000
MBR	390	0.0000

As it is evident that in both models of testing for impact of VAIC and its components on performance and value of firm, hetero is major issue. Therefore panel data analysis must incorporate correction of this issue for robust results.

4.4.3.2 Wooldridge Autocorrelation Test

Before analyzing the models empirically and deducting inferences, another issue that may cause results meaningless is to check serial or autocorrelation in panel data. If there is presence of serial or autocorrelation then serially corrected standard errors required for analyzing impact of one variable over the other. Following tables enlist the results of empirical testing of equation 3.1-3.4 and 3.10.

TABLE 4.55: Wooldridge Autocorrelation Test (IC Components)

Performance Measure	F-stat	Prob.
ROA	10.52	0.0000
ROE	46.04	0.0000
MR	1.98	0.1600
SG	27.95	0.0010
MBR	52.24	0.0000

Results showed that residuals are serially correlated with each other, and in such situation standard errors will be biased which will make the significance level meaningless. Model with margin ratio as dependent variable shows no such evidence of autocorrelation, therefore during further analysis it this assertion was kept in view for accurate vindication.

4.4.3.3 Cross-section Dependence Test

As discussed earlier in start of analysis section, it is evident that contemporaneous correlation in data required correction before analysis. It is typically found in corporate panel that they are linked with each other in some or other way. It could be due to firms in sample related to one industry, or firms interlinked with each other in terms of input-output structure etc.

As Bangladesh data is highly unbalanced and Pesaran CD require a good number of observations for test stat, therefore in such situation correlation matrix was ascertained across the panel, which depicts that cross sections are correlated in general and results manifest that all models are contemporaneously correlated. [Frees](#)

(1995) and Friedman (1937) tests were used to ascertain cross section dependence in such case, and these tests affirmed the presence of cross section dependency. In such case simple pooled OLS or fixed/random effect will provide biased estimates of SE's. Due to presence of Heteroskedasticity, Autocorrelation and contemporaneous correlation (HACS) adjusted standard errors will be required for inference. As Driscoll and Kray provided a framework to test a relation in panel in presence of such big issues. Recently Vogelsang (2012) provided an in-depth analysis on Driscoll and Kraay (1998) procedure of HASCs robust SE in linear panel regression with fixed effect after relaxing the basic assumption of Driscoll method i.e. $N < T$. This study also employed panel linear regression in fixed effect with Driscoll and Kray HACS robust SE to check the relationship of intellectual capital and its components with firm performance and its value.

4.4.4 Driscoll-Kray Fixed Effect Regression with HAC Adjusted SE's

Table 4.56 provides the fixed effect panel regression results in which dependent variables are ROA and ROE. Results conclude that on both performance measures of performance, components of VAIC impact differently.

As people and experts can leave an organization but edifice of expertise and innovative ideas which strengthen an organization and aid in good value is based on structural capital Therefore results corroborated that structural capital positively impacts the firm performance i.e. ROE of firm. While relational capital and human capital too affect return on assets and equity positively but relationship is not significant. As there are two forms of assets i.e. tangible and intangible. Results corroborated that human capital efficiency and relational capital efficiency both have no impact on ROA and ROE. Just creation of intangible assets can't make a firm profitable in terms of performance. Efficient use of both tangible and intangible assets do affect the performance of an organization.

Results from ROE (performance measure) is different from ROA in a sense that structural capital impact return on equity only. All components of value added

intellectual coefficient affect the performance of firm but only impact of structural capital is significant. One of the conclusion from such analysis is that mere investment in tangible and intangible assets are not guarantee for better performance rather an optimal mix of tangible-intangible assets along with efficient use of such capital is necessary for performance enhancement.

Both performance measure are being impacted positively by physical capital as CEE is highlt significant in both cases as shown in table 4.64.

TABLE 4.56: Driscol and Kray estimation (Dep: ROA & ROE)

	Dep Var: ROA			Dep Var: ROE		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
HCE	0.26	0.84	0.44	0.29	0.6	0.58
RCE	0.47	0.23	0.83	0.21	1.3	0.25
SCE	0.77	1.81	0.13	0.29	2.16	0.08
CEE	0.96	3.18	0.02	0.76	5.77	0.00
Age	1.08	4.96	0.00	0.16	2.25	0.07
Size	1.82	6.19	0.00	-1.23	9.83	0.00
Lev	0.68	0.43	0.69	0.42	3.98	0.00
Within R-Squared	0.14			0.18		
F-Stat	135.91			591.7		
Prob. of F	0.00			0.00		

Table 4.57 shows impact of intellectual capital on other two performance measures for a firm i.e. margin ratio and revenue growth. As this measure is solely income statement based measure, it can produce different result in terms of income-expense paradigm. Empirical results affirmed that physical capital aid in enhancing revenue of firm as CEE is highly significant in case of RG. While second major influencer of enhancing the growth of firm is human capital. As human capital is indispensable for sales enhancement; ideas, knowledge, expertise which develop or enhance the life of a product/service depends on human asset. While in case of Bangladeshi market peculiarly, human capital, structural capital and physical

capital fail to significantly impact the margin ratio of firm. As margin ratio is percent of income generated through sales, only relational capital enhance the MR. It can be argued that due to relational capital, firms of Bangladeshi market can decrease its cost. As relational capital significantly impact MR but no relation with SG, so it can be corroborated that relational capital helps to reduce the cost for a firm but fail to improve sales.

TABLE 4.57: Driscoll and Kray estimation (Dep: MR & RG)

	Dep Var: MR			Dep Var: RG		
	Co-eff	t-stat	Prob.	Co-eff	t-stat	Prob.
HCE	0.34	1.11	0.32	0.34	3.30	0.02
RCE	0.012	3.77	0.01	0.03	2.47	0.05
SCE	0.89	0.55	0.61	0.09	2.06	0.09
CEE	0.26	1.72	0.15	0.12	9.23	0.00
Age	-0.22	-2.28	0.07	-1.02	-6.00	0.00
Size	0.98	2.35	0.06	0.54	2.75	0.04
Lev	-0.07	-2.14	0.09	0.08	0.07	0.95
Within R-Squared	0.10			0.10		
F-Stat	77.11			51.44		
Prob. of F	0.0001			0.0002		

Table 4.58 shows result of model 3.10 in which it was checked that either IC components affect the value of a firm. Results corroborated that in Bangladeshi corporate culture relation building through philanthropic measures and marketing/advertising are seen as negatively by the investors. As relational capital negatively impact the market value of firm. According to firm theory, there is asymmetry of information in inside and outside of the firm stakeholders. Shareholders or investors usually discount all such factors which are deemed unnecessary in their point of view. Investors consider their agents are using their capital in unnecessary issues i.e. philanthropy and market advertisement which have no value for a firm but just an expense that reduce their per share earnings. Therefore market participants discourage all such activities which reduce their earnings, this could be

reason of negative impact of RC on market value. Human capital expense and structural capital which are deemed necessary for firm development are not penalized in same way as relational capital. Market participants value structural and human capital. According to human capital theory, humans add value to the firm which ultimately enhance its market worth. It was extensively debated in extant literature that it is usually considered that physical capital enhance value of firm while in knowledge prone environment mere physical capital doesn't impact the value of firm, as shown by analysis. IC matters more in Bangladesh market as SC significance level is on higher side.

TABLE 4.58: Driscoll and Kray estimation (Dep: MBR)

	Dep Var: MBR		
	Co-eff	t-stat	Prob.
HCE	0.67	5.05	0.00
RCE	-0.08	-1.25	0.26
SCE	0.62	10.97	0.00
CEE	0.54	0.4	0.70
Age	1.32	1.44	0.21
Size	-1.87	-3.79	0.01
Lev	0.23	6.89	0.00
Within R-Squared	0.1		
F-Stat	182.36		
Prob. of F	0.00		

Keeping Driscoll and Kray limitation in view as discussed in Pakistan and Indian analysis section regarding cross section and time period requirement for such analysis and role of contemporaneous correlation, LSDV with PCSE is robust measure for generalization of findings towards policy.

4.4.5 Least Square Dummy Variable (LSDV) with Panel Corrected Standard Errors (PCSE)

According to [Bailey and Katz \(2011\)](#) longitudinal data typically displays contemporaneous correlation across units and also unit level heteroskedasticity, which

produced biased SE for inference in ordinary least square. As the diagnostics tests of Bangladeshi panel data revealed that data is heteroskedastic, serially correlated with cross-sectional dependency, therefore standard errors will be biased in case of panel linear regression analysis. Along with these diagnostics, Fixed effect likelihood test and Hausman test was applied to ascertain estimation method according to nature of data. According to F-likelihood and Hausman test Fixed effect estimation is feasible in current scenario. As it was discussed in detail in econometric methodology section that under such situation, PCSE will provide robust SE's. To incorporate fixed effect in this suggested linear panel OLS model along with dummy variables of units are added; commonly known as least square dummy variable estimation by econometricians, as per equation 4.1.

LSDV PCSE estimation method has been applied each model under consideration. Following sections will reveal the detail analysis of IC and performance link using LSDV PCSE estimation methodology.

4.4.5.1 Impact of IC on Current Performance

Four performance measures namely ROE, MR, RG and ROA were used in this study. Following portion will identify the econometric model to test along with results tabulation that shows the impact of IC on current performance measures, followed by discussion.

To check the impact of IC components and E-VAIC on ROE, equations 3.2 and 3.6 were tested using LSDV PCSE estimation technique. Table 4.59 depicts the result in detail.

First half of table apparent the result of IC components impact on ROE of firm. As R-square of model is 0.81 which manifests that 81% of the variation in ROE is due to the regressors i.e. Intellectual capital along with control variables. Wald Chi-square value is highly significant which also attests efficiency of the model used. Most influential factor on ROE is human capital, which is highly significant. As for as other intellectual capital components are concerned, the most prevailing components which affect ROE of firm is structural capital whose

TABLE 4.59: LSDV with PCSE estimation (Dep: ROE)

Dep Variable = ROE _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.684	0.092	7.43	0.00	VAIC	0.312	0.108	2.89	0.00
RCE	0.092	0.086	1.07	0.29	Age	1.280	0.119	10.76	0.00
SCE	0.803	0.17	4.72	0.00	Lev	0.391	0.024	16.29	0.00
CEE	0.302	0.426	0.71	0.48	Size	-0.618	0.055	-11.24	0.00
Age	0.627	0.119	5.27	0.00					
Lev	0.401	0.118	3.40	0.00					
Size	-0.598	0.083	-7.20	0.00					
R-Sq.	0.81					0.75			
Wald Chi-Sq.	3102.37					3596.06			
Prob.	0.000					0.000			

coefficient is more than other factors of IC. Peculiarly, physical capital fails to show any significance with ROE while relational capital i.e. IC component, also fail to show any impact on ROE. In corporate prospective, human capital theory supports this evidence i.e. human capital aids in enhancing performance of a firm. While resource based theory also states that the internal sources of firms are more important than external, by employing these capital efficiently firm can increase their performance. As HCE and SCE which are pertinent factors of IC, significantly impact the return of shareholders.

Next it was also investigated that in presence of control variables, either composite measure of E-VAIC significantly impact the return on equity. Empirical investigation revealed that E-VAIC significantly impact the performance of firm. As E-VAIC is amalgamation of all capitals according to seminal Pulic (1998) model along with Pulic (2000b) and Pulic (2004), and HC and SC heavily impacts individually, so the E-VAIC. As 75% of variability in ROE is due to E-VAIC along with control variables.

Apropos to VAIC and its components relation with performance, further it was checked on performance measure i.e. revenue growth. As revenue growth depicts that how much sales are increasing or growing in a firm. In simple terminology it is growth rate of firm. As firms main business is to expand its sales in relation

to previous period and targets are set to achieve a specific growth in normal conditions of business. The sole earnings of any firm is its sales regardless of its nature of business. Therefore, to check link of physical and intellectual capital on growth of firm is imperative to judge performance IC nexus. Equation 3.4 and 3.8 were tested to evaluate IC and RG link. Table 4.60 provides complete picture of link in econometric terms.

TABLE 4.60: LSDV with PCSE estimation (Dep: RG)

Dep Variable = RG_t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.331	0.135	2.45	0.01	VAIC	0.498	0.227	2.19	0.03
RCE	0.45	0.27	1.67	0.09	Age	0.533	0.587	0.91	0.36
SCE	0.275	1.357	0.20	0.84	Lev	0.71	1.192	0.60	0.55
CEE	0.639	0.478	1.34	0.18	Size	0.111	0.133	0.83	0.40
Age	0.219	0.659	0.33	0.74					
Lev	0.084	0.129	0.65	0.50					
Size	0.151	0.114	1.32	0.19					
R-Sq.	0.42					0.32			
Wald Chi-Sq.	154.59					32.92			
Prob.	0.000					0.003			

Human capital came out to be the only most influential factor in determining revenue growth. As revenue growth depends on humans which possess the expertise, knowledge and skills, that help to develop a good product or service which aids in sustainable development. These results are not different from the results obtained from Driscoll and Kray methodology. While the second portion of the table displayed result when composite effect of VAIC was checked on RG of firm. VAIC impacts positively but the level of significance is not as much as of ROE.

Next measure performance was taken as Margin ratio of firm which depicts that how much earnings represent the sales of the firm. If MR increases this means either sales increase or costs decrease or both which can further be investigated through RG measures. Ultimate objective of any organization is to increase the sale base along with achieving economies of scale so that cost of business and production be less than other competitors in the industry. It was ascertained the

role of IC and its components on margin ratio of firm through testing of equation 3.3 and 3.7.

TABLE 4.61: LSDV with PCSE estimation(Dep: MR)

Dep Variable = MR_t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.132	0.065	2.03	0.04	VAIC	0.641	1.28	0.50	0.62
RCE	0.072	0.098	0.73	0.46	Age	-1.17	0.61	-1.92	0.05
SCE	0.748	0.478	1.56	0.12	Lev	-0.034	0.296	-0.11	0.91
CEE	0.339	0.416	0.81	0.42	Size	-0.164	1.02	-0.16	0.87
Age	-1.265	0.653	-1.94	0.05					
Lev	-0.062	0.255	-0.24	0.81					
Size	-0.599	0.832	-0.72	0.47					
R-Sq	0.601					0.584			
Wald Chi-Sq	315.4					176.16			
Prob.	0.00					0.003			

Table 4.61 shows the result of IC as whole and its components' effect on margin ratio. Result is not different from other performance measure (RG) in a sense that human capital is the major contributor in affecting MR as in RG case. As margin ratio is specifically income statement based ratio, which shows that how much income is generated from turnover of a firm. As RG and MR both are being affected by human capital, therefore it can be corroborated that firms in Bangladesh corporate arena increase their sales and achieve economies of scale exceptionally through employment of efficient human capital i.e. knowledge, skills, expertise, know how etc.

In last performance measure i.e. ROA was taken to verify IC influence on it. Equation 3.1 and 3.5 were used for empirical analysis using LSDV PCSE methodology. Table 4.62 reports the result of following models.

4.4.5.2 Value and IC Nexus

Earlier role of IC and its components in determining performance of the firm was ascertained, the second phase of this study also tried to justify the role of IC and its components on value of firm. As it was hypothesized that market value more

TABLE 4.62: LSDV with PCSE estimation(Dep: ROA)

Dep Variable = ROA _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.966	0.261	3.70	0.00	VAIC	0.093	0.021	4.43	0.00
RCE	0.428	0.434	0.99	0.32	Age	0.089	0.053	1.68	0.06
SCE	0.016	0.008	2.00	0.04	Lev	0.021	0.011	1.91	0.05
CEE	0.988	0.786	1.26	0.21	Size	-0.158	0.053	-2.98	0.00
Age	0.093	0.055	1.69	0.09					
Lev	0.021	0.01	2.10	0.04					
Size	-0.153	0.051	-3.00	0.00					
R-Sq.	0.699					0.697			
Wald Chi-Sq.	1879.7					452.4			
Prob.	0					0			

than book value is due to all those invisible assets which are not part of books but market value these assets and price it. As it is evident from literature that appointment of directors, CFO's and board as whole impact the market value of firm with news infusion but not book value, [Fox and Opong \(1999\)](#) and [Bhana \(2016\)](#) affirm this postulation. Therefore empirically this study tried to explore this nexus to vindicate or deplore this bond. Equations 3.9 and 3.10 were tested to identify this nexus empirically.

TABLE 4.63: LSDV with PCSE estimation(Dep: MBR)

Dep Variable = MBR _t									
	Co-eff	PCSE	z	P>z		Co-eff	PCSE	z	P>z
HCE	0.874	0.813	1.08	0.28	VAIC	0.115	0.111	1.04	0.29
RCE	0.094	0.406	0.23	0.82	Age	2.52	1.64	1.54	0.12
SCE	0.558	0.207	2.70	0.00	Lev	0.362	0.217	1.67	0.09
CEE	0.291	0.155	1.88	0.05	Size	0.966	0.853	1.13	0.26
Age	2.983	1.796	1.66	0.09					
Lev	0.168	0.229	0.73	0.46					
Size	1.356	0.856	1.58	0.11					
R-Sq	0.78					0.721			
Wald Chi-Sq	2780.63					60.34			
Prob.	0.000					0.000			

As market to book ratio is used as proxy for market value, value of MBR greater than 1 depicts that market value of firm is more than book value of firm. Results in table 4.63 corroborated that human capital efficiency i.e. proxy for human capital failed to impact the value of firm significantly. While structural capital is more valuable in determining the market value of firm. Physical capital too, influence the value of firm but this influence is significant at 90% level. Other component of IC i.e. RC show positive link with market value but fail to impact significantly. As in Driscoll and Kray methodology, relational capital negatively impacted the market value of firm. Relational capital comprises of investment in philanthropic and marketing related actions, so market can price it differently. In emerging markets such expenses which are deemed unnecessary may be priced negatively by investors while in developed markets these investments add value in the firm. As only structural capital affect the market value of firm while other capitals failed to influence it. It can be justified through E-VAIC impact, as composite measure of IC also have no impact on market value.

It can be wrapped up that in Bangladesh stock market, investors value innovation or tacit knowledge, which distinguish a firm from others, rather preference for humans which can come and go, but systems made by these humans remain with the firm, for rest of life.

4.4.5.3 Future Performance

Next a new dimension was also checked that either intellectual capital affect the future performance of the firm. As intellectual capital is considered an invisible asset, and according to definition of long term asset which is named as 'non-current asset' by IAS-16, its benefits are spread over more than one period (a financial year) in which it was installed. Therefore on same grounds it was hypothesized that IC which can be enlisted in 'non-current' asset definition of IAS-16, do have an effect on future performance of firm because of their benefits spread over more than one period. Its impact may belittle but not vaporize as diffused in case of tangible assets. First ROE and ROA were taken as performance measure and equations 3.15 and 3.16 were tested.

Capital employed proxy of physical capital is no doubt the significant factor for any firm to perform better in competitive market. Extant literature also documented that physical capital is important and crucial factor which aids in future performance.

Results manifested that the sole influential factor which affects positively the future performance of a firm is SC. As in both cases of performance measure ROA and ROE, structural capital is significant, while other IC components fail to ascertain their impact for future. To ascertain role of IC on future growth of firm and margin, following models were estimate;

TABLE 4.64: LSDV with PCSE estimation(Dep: ROA_{t+1} & ROE_{t+1})

Dep Var:	ROA _{t+1}				ROE _{t+1}				
	Co-eff	PCSE	z	P>z	Co-eff	PCSE	z	P>z	
HCE	0.033	0.037	0.89	0.36	HCE	0.116	0.421	0.28	0.78
RCE	0.03	0.065	0.46	0.65	RCE	0.026	0.017	1.53	0.11
SCE	0.13	0.049	2.65	0.00	SCE	0.164	0.049	3.35	0.00
CEE	0.051	0.088	0.58	0.56	CEE	0.231	0.406	0.57	0.57
Age	0.079	0.096	0.82	0.41	Age	0.503	0.805	0.62	0.53
Lev	0.036	0.028	1.29	0.19	Lev	-0.322	2.11	-0.15	0.88
Size	-0.09	0.05	-1.80	0.06	Size	0.084	0.531	0.16	0.88
R-Sq.	0.744				0.347				
Wald Chi-Sq.	8142.69				3689.77				
Prob.	0.000				0.000				

In case of income statement related performance measure for a firm, physical, human and relational capital fail to impact future growth and margin of firm as it is evident from results. While SCE is significant in case of margin ratio while significance level in case of revenue growth is lower than that of MR. It can be argued that SC if not impacts the current performance than surely it impact the future performance of firm. As SC comprise of processes, research and development which are not developed abruptly but takes time, so the case with its impact.

When IC and its components were regressed against the future MR and RG, results are not different from ROE and ROA performance measure. Structural capital which includes investment in all processes, mechanisms, innovations, R&D

TABLE 4.65: LSDV with PCSE estimation(Dep: MR_{t+1} & RG_{t+1})

Dep Var:	RG _{t+1}				MR _{t+1}				
	Co-eff	PCSE	z	P>z	Co-eff	PCSE	z	P>z	
HCE	0.165	0.246	0.67	0.50	HCE	0.386	0.991	0.39	0.70
RCE	0.016	0.027	0.59	0.53	RCE	0.025	0.13	0.19	0.85
SCE	0.286	0.149	1.92	0.05	SCE	0.993	0.435	2.28	0.01
CEE	0.698	6.98	0.10	0.92	CEE	0.298	0.654	0.46	0.65
Age	0.182	0.713	0.26	0.80	Age	-1.091	0.364	-3.00	0.00
Lev	-0.091	0.14	-0.65	0.52	Lev	0.0141	0.476	0.03	0.98
Size	-0.179	0.124	-1.44	0.15	Size	0.0242	0.104	0.23	0.82
R-Sq.	0.375					0.709			
Wald Chi-Sq.	75.89					108.33			
Prob.	0.000					0.000			

is the most influential factor which aids in enhancing future performance of the firm. While all other factors may help to enhance one period performance of firm while SC effects last more than one period.

Therefore it can be concluded that SC, component of IC, is the most important factor for enhancing the future performance of the firm. As discussed in earlier sections that SC fail to affect current performance of firms which is due to time required by organization to convert tacit knowledge of individuals in to explicit one. And that explicit knowledge become a part of structural capital. Therefore, it is evident from analysis that SC impacts future performance of firm.

4.4.6 Robustness Check

To check either the measure used for intellectual capital (VAIC components) impact the true performance of the firm. [Joorbonyan et al. \(2015\)](#) methodology was followed in case of Bangladesh firms' analysis to empirically investigate components of intellectual capital effect on economic performance of the firm, which represents the true shareholders value. As economic value added (EVA) accounts for the cost of capital providers and depicts true economic profit of a firm. Therefore, it has been ascertained empirically that either VAIC components impact

positively to the true economic profit of firm or not. Equation 3.19 was tested to empirically evaluate the role of IC components, with true economic value of firm. All diagnostics test were applied on Bangladesh sample as described in previous sections to ascertain either residuals are non spherical in nature.

TABLE 4.66: Diagnostic Tests (EVA)

Modified Wald Test		Wooldridge Autocorrelation Test		Pesaran CD test	
Chi-Square	6700*	F-stat	184.00*	Stat	9.50
Prob.	0.0000	Prob.	0.0000	Prob.	0.001

*Significance at 99%

Data have issues of heteroskedasticity, serial correlation and contemporaneous correlation, mere fixed effect regression without correcting for stated econometric issues, standard errors will be spherical. As stated earlier this study incorporated two way fixed effect estimation and LSDV along with PCSE estimators. In panel data literature there are cases when both effect of time and cross section need to be fixed because they are significantly impacting the results. Results from both estimation techniques are given below in table 4.67 and 4.68, following with discussion.

TABLE 4.67: Two-way Fixed effect model with PCSE (EVA)

Dep Var: EVA				
	Co-eff	PCSE	z	P>z
HCE	1.85	0.22	8.63	0.00
SCE	0.86	0.21	4.24	0.00
RCE	0.72	0.18	4.04	0.00
CEE	0.97	0.05	20.13	0.00
Size	0.14	0.15	0.83	0.88
LEV	-0.20	0.13	-1.60	0.11
R-Sq.	0.86			
Wald Chi-sq.	5065.86			
Prob.	0.000			

In two-way fixed effect estimation with panel corrected standard error estimation, Pulic framework of VAIC components are significantly and positively impacting the true value of firm. 86% of variation in EVA is attributed to VAIC components in presence of control variables i.e. size and leverage. All components of IC are positively affecting EVA of firm. As the major component which affect EVA is physical capital as one unit change in CEE brings 0.97 unit change in EVA of firm.

Capital employed is no doubt a decisive factor in value addition for firm. Two control variables namely size and leverage were used to correctly identify the relation of economic value added with intellectual capital components. Both factors are have no significant impact for Bangladesh.

TABLE 4.68: Least Square Dummy Variables with PCSE (EVA)

Dep Var: EVA				
	Co-eff	PCSE	z	P>z
HCE	1.75	0.24	7.44	0.00
SCE	0.79	0.21	3.84	0.00
RCE	0.73	0.18	4.07	0.00
CEE	0.97	0.04	22.47	0.00
Size	0.43	0.24	1.81	0.07
LEV	-0.41	0.94	-0.44	0.66
R-Sq.	0.85			
Wald Chi-sq.	1495.81			
Prob.	0.000			

Secondly, LSDV with panel corrected standard error estimation technique was used to check fixed effect within panels effect after controlling for cross section effect only. These results are not so different from the two-way fixed effect estimation. Whole results are different if compared to Pak and Ind results in terms of RCE. As RCE came out to be significant factor in Bangladesh context.

4.4.7 Epilogue

From Bangladesh perspective, it was checked that either intellectual capital and its components individually along with physical capital affect the performance of firms. Human capital and structural capital positively and highly affect performance of a firm. One major aspect which came out through empirical evidence is knowledge conversion process. As in all performance measure cases, structural capital positively impacts the performance, which alludes its role in determining performance. It can be conceived that organizations conversion cycle of knowledge - from tacit to explicit takes place in same period in Bangladesh market.

As humans capital enter in organization in two forms i.e. tacit and explicit. Organizations are duty bound to convert expediently that tacit knowledge in to explicit knowledge, so that structural capital widens with passage of time, which furnish growth and profitability for an organization not just in one period but in future period too. It is evident from the analysis that HC and SC both effect positively current performance of firm. While RC and CE failed to affect significantly.

Secondly it was hypothesized that highest IC efficiency affect positively the market value of firm. Empirical analysis accepted this hypothesis, that in case of Bangladesh SCE and CEE positively and significantly affect the market value. In other words, it can be asserted that efficient SC and physical capital enhance the value of market. Peculiarly from other two countries analysis, this analysis came out to be different. In other two country analysis i.e. Pakistan and India etc. human capital came out to be decisive factor in market which enhance its worth in market. But here in Bangladeshi corporate analysis firms with good SC are priced more in market than other factors of IC.

Due to long term nature of intangible assets, it was hypothesized that IC and its components do affect future performance of firm. In case of bangladesh all hypothesis of future performance were rejected except for SCE, according to which only efficient SC affect the performance measures of firm. Pragmatically, intellectual capital's life is uncertain as learning-relearning is a continuous process. Structural

capital with passage of time improves, while human capital rejuvenates. empirically it can be asserted from the results that all components of IC are time bound except SC, which affects beyond time in future.

4.5 Cross-Country Comparison

As all econometric tests are applied on each country separately, so to know the real relationship, between IC and performance at one end and IC-Value at other, without any apparent econometric issue. It is also imperative to check that which IC factor(s) affect current and future performance & what differences these economies have with respect to IC-Performance link.

Table 4.69 presents the result of equation 3.1, in which it was ascertained that how effect of performance measure i.e. ROA is affected by components of IC. For all countries of South Asia in sample, it can be concluded that human capital is the major contributing element from all IC components that significantly. While second major component according to Pulic's VAIC model i.e. SC significantly affect Pakistan's and Bangladesh's corporate sector. It can be asserted that in both these countries, corporate sector is not only satisfying stakeholders i.e. HC but also shareholders (SC) according to main argument of [Iazzolino et al. \(2014\)](#).

The importance of physical capital (CE) could not be ignored, but in modern times of IT revolution, there is a need for an efficient use of available physical capital rather building it inefficiently to make heavy books of accounts. just in case of Bangladesh, physical capital (CEE) failed to affect significantly, but in all three countries role of CEE is positive which manifests that efficient utilization of physical resources enhance the current performance. With respect to the new factor in VAIC model i.e. RC [according to [Nimtrakoon \(2015\)](#) and comprehensive measurement of that factor in study]failed to affect Indian and Bangladesh's financial performance. As VAIC model is an efficient parameter, therefore it can be argued that efficient utilization of RC, which is creation of value for business by investing in customer and social capital, is only in Pakistan where it affect the performance positively.

TABLE 4.69: Cross-Country Comparison (Dep:ROA)

	Dep Var: ROA _t		
	Pak	Ind	Ban
HCE	1.87*	2.70*	3.70*
RCE	2.36*	1.02	0.99
SCE	2.69*	1.15	2.00*
CEE	2.95*	3.74*	1.26
Age	0.13	-3.16	1.69
Size	-1.69	1.98*	-3.00
Lev	-0.30	-4.14	2.10
R-Sq	0.63	0.87	0.70

*Significance at 95% confidence level

The one of the main aim of the study is to empirically evaluate role of IC on future performance. As it has been described in earlier sections that IC is an intangible asset whose useful value is more than a financial year, therefore it was hypothesized that IC components affect the future performance of the firm. Results of equation 3.15 for all countries are shown in table 4.70. Limited literature of IC-future performance link asserted that for an organization it took time to convert efficient HC (tacit knowledge) in explicit knowledge (SC). Following the gist of Pulic's VAIC model, organizations aim is to create value to satisfy its main stakeholder (HC) which in turn create SC that rests with the organization for life time.

For Pakistan, SC not only affect current performance but future performance too. But in case of Bangladesh, SC is highly significant in affecting future performance of the organization. As organizations progress, humans come and go but SC build continuously, which is manifestation of the fact that tacit knowledge of humans convert with time into explicit knowledge for Bangladesh corporate sector. While physical capital (CEE) is highly significant in affecting future performance of Indian corporate sector. In all three countries of South Asia, results are mixed and interesting in a sense to gauge the importance of IC investment for future betterment.

TABLE 4.70: Cross-Country Comparison (Dep:ROA_{t+1})

	Dep Var:ROA _{t+1}		
	Pak	Ind	Ban
HCE	1.54	0.53	0.89
RCE	0.32	0.21	0.46
SCE	2.09*	1.79	2.65*
CEE	1.99*	6.90*	0.58
Age	0.84	1.76	0.82
Size	0.99	1.03	-1.08
Lev	1.15	-1.67	1.29
R-Sq	0.67	0.87	0.74

*Significance at 95% confidence level

For Indian corporate sector, IC affect current performance but role of physical capital is one and only factor of enhancing performance. While for Bangladesh corporate sector where due to high and cheap availability of knowledge workers as compared to other countries in sample, it can be corroborated that conversion of tacit into explicit knowledge takes time. While for Pakistan, the conversion process starts in the same period and flow forward in subsequent years.

According to [Stewart \(1997\)](#) IC is one of the invisible asset for a firm that is the main cause of difference between BV and MV. Table 4.71 enlist the results of equation 3.10 for all countries in sample. As the proxy used to gauge this phenomenon is market to book ratio. Therefore, any positive and significant effect of IC components mean that market value enhances due to that factor.

Results are mixed in all three countries, effect of HC is positive and significant in Pakistan and Indian market, which corroborates that market value of firm in these countries enhances due to HC. While for Bangladesh, role of SC only is significant and positive. Therefore, it can be concluded that Bangladesh's market value the processes, systems, popularity, copyrights etc more than any HC or RC. While role of efficient knowledge workers are very important for Pakistani and Indian market

to which literature supported.

TABLE 4.71: Cross-Country Comparison (Dep:MBR)

	Dep Var: MBR _t		
	Pak	Ind	Ban
HCE	2.67*	2.40*	1.08
RCE	0.29	2.05*	0.23
SCE	0.99	0.30	2.70*
CEE	2.18*	3.58*	1.88*
Age	2.09*	-0.58	1.66
Size	2.70*	2.42*	1.58
Lev	0.29	0.43	0.73
R-Sq	0.58	0.63	0.78

*Significance at 95% confidence level

As in case of IC-future performance link for India, physical capital came out highly significant which emphasize the importance of physical capital in enhancing future performance. On same grounds, role of physical capital in Indian market is highly significant, which manifest that investors look for physical assets and their utilization to create value in firm. For Pakistan and India too, role of physical capital is significant and positive.

4.6 Use of Panel in Cross-Country Analysis

As discussed earlier that this study has selected three emerging economies of South Asia i.e. Pakistan, India and Bangladesh based on their economic significance according to World bank 2018 report, BBVA 2015 research report and [Shobhit \(2018\)](#). While in all these countries structure of corporate arena and reporting is according to their local laws and regulations.

According to International Financial Reporting Standards (Accounting Standard Setting Body) reports, India do not follow IFRS while Pakistan completely adopted

it in 2015. While in Bangladesh there is selective adoption of International standards (IFRS, 2016). Based on these reports, it can be concluded that there is no uniformity in reporting practices across the selected countries.

According to [Miller \(1996\)](#) there are number of studies which employed cross-country regression by assuming that all these countries are on same level of growth, structurally equal with respect to production technologies and institutional pattern, while such studies are potentially flawed. [Maddala and Wu \(2000\)](#) discussed such analysis issue with respect to [Frankel and Rose \(1996\)](#) and [Trueblood \(1991\)](#) where the researcher has gone into cleaning up the basic data while making the grounds for all countries same, so that empirical results can be generalized. On same pattern as discussed earlier, [Maddala and Wu \(1999\)](#) and [Maddala \(1999\)](#) empirically justified in their studies that there are multiple flaws in treatment of all countries as "equal" while using cross-country panel regression.

As this study consists of hundred corporations from each country of South Asia, therefore there is panel at country level too and cross-country analysis can be possible through nested structure. According to [Antweiler \(2001\)](#) there is basic econometric problem in nested structure and involve a trade-off which hamper the generalization of analysis. For example, in the model of this study which comprises of corporations from multiple sectors, two specific effects can be analyzed in cross-country analysis i.e. country specific and firm/sector specific. But for such analysis the sectors in all countries must be same so to get sector specific effect. If a researcher uses country specific effect then firm/sector specific effect must forgo and vice versa.

For corporate level data as this study employed, availability of data is the major problem which has been discussed in limitation of this study. Due to data unavailability, use of panel data methods with cross-country data is not feasible because of model uncertainty, while lacking robustness also posed serious implications for policy and theoretical implications ([Rogoff, 1996](#)). With small and unbalanced sample cross-country regression, policy implications and recommendations will be flawed with no statistical meaning ([Sala-i Martin et al., 2004](#)). [Ray and Rivera-Batiz \(2002\)](#) empirically investigated sample bias in cross-country data analysis

through panel data and confirmed that statistical significance change drastically while removing the bias.

Based on the discussion above, it can be concluded that using panel data methods with cross-country data is only econometrically sound when data structure of all countries is on same ground. While for corporate level data where sectors of countries are not same, cross-country panel data analysis will be misleading and with no practical implications. For corporate level countries data, where the level of corporate structures is significantly different, panel analysis in such scenario is spurious. While, it is more meaningful, statistically and for practical implications too, to provide country specific effects along with the major components which effected corporation's performance with respect to IC. Hence, this study employed country analysis with respect to IC-Performance and IC-Value link to explore the country specific dynamics. While previous section discuss cross country differences with respect to IC-performance link.

Chapter 5

Conclusion and Recommendations

The purpose of this study was two-fold i.e. to explore the linkage of intellectual capital with firm's current and future performance and to examine the impact of intellectual capital on value of the firm. Six year's data (2009-2014), employed for empirical analysis, has been extracted from the published financial statements of hundred firms each from three developing South Asian economies i.e. Bangladesh, India and Pakistan. By employing Panel data methodology after corrected for basic OLS issues, empirical investigation was carried out separately on each country of South Asian economy in sample. Due to generalization issue in Panel data cross-country analysis with corporate level data and structural corporate difference across countries, analysis was employed on each country individually.

Intellectual capital was decomposed in to human, structural and relational capital according to well established literature and measured in accounting terms using famous [Pulic \(2000b\)](#) framework of Value Added Intellectual Capital (VAICTM). While literature of IC calculation ignored the complete aspect of RC, this study used comprehensive measure of RC i.e. customer capital and social capital. Four factors were representing the performance measure for a firm in current study i.e. return on asset (ROA), return on equity (ROE), margin ratio (MR) and sales growth rate (RG). Additionally few control variables were added including size of firm, leverage and age of a firm etc. to make the analysis more meaningful.

Extant literature on panel data documented some inherent data issues including contemporaneous correlation, heteroskedasticity, serial correlation etc. Before empirically investigating the main aim of this study, diagnostics test were applied. Diagnostics reveal that data comprise of econometric issues to which commonly referred as HAC. To choose best econometric technique for testing of this study's hypothesis empirically, framework of [Moundigbaye et al. \(2018\)](#) and [Reed and Ye \(2011\)](#) was employed. According to their guidelines, Panel Corrected Standard error with fixed effect estimation was employed for empirical testing.

Three questions were empirically answered through this study. First, it was hypothesized that IC and its components significantly affect performance of firm. From empirical analysis it is evident that for all South Asian economies in sample, the major component of IC that positively and significantly affect the profitability of the firm is 'human capital' while other components of IC do matter but differently in different economy. Except Bangladesh, in other two countries corporate sector, physical factor do affect the current performance positively. Which manifests that, in Bangladesh corporate sector importance of physical capital is not more than or equal to that of intangible capital for performance enhancement.

Secondly, it was hypothesized that IC like other long term assets definition, not only affect current performance but its effect last beyond one financial year. The main point to ponder after empirical analysis is that IC not only impact the current performance of the firm but also future performance, which testify the crux of IC theory i.e. organizations take time to convert its tacit knowledge in explicit one. In case of Pakistan and Bangladesh, SC not only affect future performance but also current performance. While for India this pattern is solely for future performance.

In last, one hypothesis was to testify the assertion of pioneer studies on IC that market-book value difference is due to IC. The empirical investigation confirmed the relation that IC do impact the market value of a firm. As it is determined fact in plethora of studies that change of human capital in firm impacts the market value at once with news infusion, but no such change can be seen on book value of firm. This scenario depicts that market and book value difference is due to some invisible assets which lacks recognition on financial position of firm due to

lacuna of reporting standards. Therefore this assertion invigorated to explore the nexus of value of firm and IC. Empirical results corroborated that human capital and structural capital are the decisive factors that impacts the market value and creates a huge gap between market and book value.

In case of Bangladesh, Structural Capital along with physical capital affect the market value of firm. As described earlier that SC affect current and future performance of Bangladesh corporate sector, on same sense it is corroborated that market values SC more than any other component of IC in Bangladesh corporate sector. While in Pakistan the impact of human capital is more than physical capital which signify the role of efficient human resource.

It was imperative to check that either IC components add value in residual worth of firm. For robustness, this dissertation explored the importance of IC components in creation of real value for firm i.e. EVA. Following the seminal work of]Joorbonyan et al. (2015) results corroborated that Pulic (2008) model strongly add in economic value of firm which depicts the real maximization in wealth for the shareholders.

5.1 Implications of Study

There are two perspective of implications of current study i.e. theoretical implication and policy or practice implication.

5.1.1 Theoretical Implication

This study contributed to two theoretical perspective of intellectual capital i.e. resource based view of firm and human capital theory, both are linked and considered the fundamental element of human resource development which aids in development of competitive edge for a firm. As Wright et al. (2001) rightly identified that resource based view of firm has been used by different researcher in further theory development or rationale for empirical evidence. Proponents of resource based view argue that internal resources of firm including the human resource are

more meaningful for competitive edge than external resources. Results of the current study employ that human capital is driving force for profitable operation in a firm. Further analysis affirmed the theoretical perspective on internal resource view i.e. HC, SC and RC which are internally generated intangible assets aids the performance of a firm.

5.1.2 Policy Implication

In modern times of knowledge management and market or classic liberalization; human capital (HC) worth's more than any tangible asset because HC is considered the basic pillar for generation of further assets in an economy. Human development is considered the most effective factor in nation development to which United nations in its program sustainable development goals (SDG-2030) emphasized eminently in seventeen goals. Similarly for apex tier of a firm, human capital development and better efficiency of HC must be the priority for better financial performance of firm. It can be concluded that an awareness must be aroused across the firms that building physical capital can no more provide competitive edge to a firm in such border-less and knowledge based economies. Rather, focus of every firm must be alignment of intellectual capital with physical capital and a better fit of IC components which can aid in not current performance of firm but also in future.

One of the major findings of the study is the role of HC and SC in enhancement of firm performance with respect to dynamic theory of IC. Strategist, apex bodies in corporations, whose main aim is to maximize the wealth of shareholders, can satisfy shareholders by efficiently utilizing internal resource i.e. HC which helps in creation of value for an organization. Once that value is created then SC emerges with passage of time which in turn enhance not only current but future performance of the organization.

At macro level governments must identify, develop and formulate policies for enhancement of human capital in an economy so to strengthen economic performance. There is a need for promotion of knowledge culture across the region, so

that tacit knowledge can be converted in to explicit knowledge which further develops IC for better economic results. Once this culture is promoted then foreign direct investment will flow to such economies i.e. South Asia where potential of growth still exists.

5.2 Limitations and Future Directions

Due to different limitations and constraints, it is not easy for a researcher to incorporate each and every prospect related to the subject matter. But the idea generates further thought provoking areas related to subject for further exploration and investigation. On same lines, this study also have few limitations which provides avenue for further investigation of this area. As research on IC is at foundational stage, therefore in depth analysis and exploration of this area need significant attention from academia and managerial side, both. This study incorporates proxy of IC on the basis of the available financial data by employing well known model VAIC. As VAIC is an input measure, and input-output relation could not be measured at minute level due to non-availability of data. Secondly this study employed that aspect of relational capital component of IC that could be measured through available financial data. Thirdly, it was a cumbersome matter to gauge IC data from published financial statements from three emerging economies of South Asia. While collecting data, those sectors are added in sample who have reported all related matters of IC in financial statements, therefore due to data restriction, empirical evidence was limited to few sectors and firms in a market. Hence, this study is limited in time span. This limits the analysis to multiple sectors across countries, so cross-country regression was not analyzed. With limited data and time span, dynamic relation among the variables of interest was not statistically possible, therefore static relationship was studied.

These limitations provide avenue for further research on the issue. Therefore further studies should check IC-Performance relation in which a comprehensive measure of relational capital must be accounted for to better judge the comprehensive IC impact on financial performance of firm. Secondly, a linkage of components of

IC needs to be checked to develop a comprehensive index for IC, that can be used for cross country or cross-company analysis. With composite IC index at firm level, which is statistically uniform across firms, can help to run cross-country regressions and whole regions impact can be analyzed. Thirdly, impact of IC on services sector performance and especially performance of banks must be checked because financial sector requires an efficient employment of human capital for being a profitable entity in industry. Specifically, the dynamic relation can be checked with long time span across region by taking any specific sector i.e. information technology to check human capital impact on performance of corporate sector.

In totality, accounting standards association must develop a mechanism for reporting and valuation of intellectual capital of a firm so a uniform measure can be developed for future researchers. All stakeholders can better judge then, the real value of firm, as currently a vast difference in market and book value is reported due to non-inclusion of this hidden capital in analysis portion. With uniform reporting standard, the comparison across country will come up as more significant.

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Appendix I

Calculus of VAIC

The main idea of Pulic (1998), Pulic (2004) and Pulic (2008) concept of VAIC is, based on Skandia Navigator, to measure the productivity of knowledge workers and value creation by using Value added income statement. Value added income statement is

Sales	OUT
(cost)	IN
Value Added	VA
(Employees cost)	HC
EBITDA	SC
(Amortization and Depreciation)	D
Profit	P

The fundamental equation of Pulic value accounting is:

$$VA = HC + SC \dots\dots (1)$$

Dividing both sides by VA, gives

$$1 = HC/VA + SC/VA \dots (2)$$

As according to Pulic's VAIC,

$$HCE = VA/HC \text{ and}$$

$$SCE = SC/VA$$

Rearranging (2),

$$SCE = 1 - (1/HCE) \dots (3)$$

From (3) and Pulic's Value Added Income Statement Framework, three conditions are possible as;

-
- (i) if productivity of knowledge workers is less than 1 ($HCE < 1$) then $VA < HC$, which means that wages/salaries can't be covered and SCE will be negative. Under such situation, firm will be unable to satisfy shareholders and stakeholders,
- (ii) if productivity is exactly 1 ($HCE=1$), then according to (3), SCE will be zero, which means that VA will be sufficient to pay wages/salaries and shareholders wealth will not be increased,
- (iii) and only a firm can add in worth of shareholders, if $HCE > 1$, in such case $SCE > 0$.

Appendix II

Davidson and Mackinnon (1993) Test of Exogeneity

According to resource-based view of firm and human capital theory, firms exploit their internal resources first to get sustainable advantage. But limited literature on intellectual capital and performance linkage also checked causality from performance towards intellectual capital i.e. good performance leads to investment in intellectual capital. Therefore, to check the endogeneity issue in the model of the study, tests has been applied.

For endogeneity in system most common test used is Durbin Wu Hausman test [Durbin (1954), Wu (1973) and Hausman (1978)], commonly known as DWH test. But literature corroborated that DWH has some shortcomings. DWH, among other things, depends on assuming, that instruments used are valid, which is rare in practice (Guo et al., 2016). The primary purpose of DWH test is to ascertain the presence of endogeneity by comparing ordinary least square (OLS) estimate with two stage least square (TSLS). According to Alfò and Aitkin (2006) two preconditions for DWH test are; (i) instruments are strongly associated with endogenous variable, (ii) instruments are known with certainty to be exogenous.

To cater these issues, Davidson et al. (1993) proposed test of exogeneity which is similar to DWH test but it accommodates unbalanced panel data and also no strict condition of valid instrument presence in system. Davidson-Mackinnon test of exogeneity look for consistency of panel data fixed effect model. Null hypothesis of this test states that ordinary least square (OLS) estimator would yield consistent estimates. Rejection of null hypothesis ascertain the presence of endogeneity in system (Guerriero and Sen, 2012) and use of fixed effect regression would yield

spurious results with no meaning (Wooldridge, 2000). User written Stata program by Baum and Stillman (2003) for Davidson and Macknnon test of exogeneity was used to check the endogeneity issue in all three countries by using equations 3.1 and 3.10.

TABLE 5.1: Exogeneity Test (Eq-3.1)

Country	Statistics	Prob.
Pakistan	0.126	0.722
India	0.117	0.732
Bangladesh	2.52	0.113

TABLE 5.2: Exogeneity Test (Eq-3.10)

Country	Statistics	Prob.
Pakistan	1.340	0.249
India	1.371	0.243
Bangladesh	2.80	0.096

Results revealed that for all countries and both models null hypothesis can not be rejected at 95 percent level of confidence interval. Therefore, it can be concluded that in both model 1 and 2, intellectual capital (VAIC) is not endogenous variable but exogenous. According to Baum and Stillman (2003) if null hypothesis is accepted then any endogeneity in regressor(s) would not have any disastrous affect on OLS estimates.