

T.C.
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SOSYAL BİLİMLER ENSTİTÜSÜ
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MUHASEBE-FİNANSMAN (İNGİLİZCE) BİLİM DALI

**INTELLECTUAL CAPITAL AND ITS IMPACT ON
FINANCIAL PERFORMANCE OF FIRMS LISTED IN
BORSA ISTANBUL**

Doktora Tezi

SEDEAQ NASSAR

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Danışman: PROF. DR. EMİN AVCI

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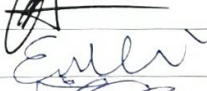
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ÖZET

Maddi olmayan varlıklar, fiziksel ve finansal sermayenin yansira örgütsel faaliyetleri destekleyen doğası nedeniyle, “Entelektüel Sermaye” (intellectual capital-IC) olarak da değerlendirilmekte ve bilinmektedir. IC’ye ilişkin çeşitli tanımlamalar bulunmaktadır. Bunların çoğu IC’yi bilgi-bazlı ekonomi bağlamında tanımlamaktadır. IC’nin ölçülmesinde çeşitli yöntemler kullanılmakta olup, bunların en yaygın olanı IC Katma Değer Katsayısı (VAIC) ile öne çıkan Pulic’s yöntemidir.

Bu tez, IC ve üç IC bileşeninin (İnsan Sermayesi Etkinliği (HCE), Yapısal Sermaye Etkinliği (SCE) ve Kullanılan Sermaye Etkinliği (CEE)) şirket performansı üzerindeki etkisini incelemektedir. Bu amaçla, Borsa İstanbul’da 2004-2015 yılları arasında işlem gören finans sektörü dışındaki şirketler üzerine analizler yapılmıştır.

Şirketlerde performans üç farklı kategoriye ayrılmıştır: piyasa, finansal ve üretkenlik performansı. Piyasa performansı fiyat kazanç oranı (FKO) ve piyasa değeri-defter Değeri (PD); finansal performans aktif karlılığı oranı (AKO), öz kaynak karlılığı oranı (ÖKO) ve hisse başına kar (HBK); üretkenlik performansı ise aktif devir hızı (ADH) oranları kullanılarak ölçülmüştür. Çalışmada panel veri analizi kullanılmıştır.

Bulgular, HCE’nin kriz öncesi ve sonrası üretkenlik performansı ve finansal performansına olumlu etkisine işaret etmektedir. SCE’nin kriz öncesinde FKO üzerinde olumlu etkiye sahip olurken, kriz sonrasında AKO ve ÖKO üzerinde aynı etkiye sahip olduğu görülmüştür. CEE’nin ise kriz öncesinde PD ve FKO’ye olumlu etkiye sahip olduğu görülmüşken, üretkenlik performansına (ADH) olumsuz etkiye sahip olduğu tespit edilmiştir. CEE kriz sonrasında ise, piyasa, üretkenlik (ADH) ve finansal (AKO ve ÖKO) performanslara olumlu etkilere sahip olduğu görülmüştür. HEC, SEC ve CEE üçlüsünden oluşan VAIC’ın kriz öncesinde piyasa (MB) ve finansal (AKO ve ÖKO) performanslara olumlu etkiye sahip olduğu görülmüştür. Buna ilaveten VAIC’nin kriz sonrasında üretkenlik performansı (ADH) ve finansal performansın tüm faktörleri üzerinde önemli bir olumlu etkiye sahip olduğu görülmüştür.

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ABSTRACT

Intangible assets are known and considered as intellectual capital (IC) because of their supporting nature to organizational activities along with physical and financial capital. There are several definitions of intellectual capital. Most of these definitions define IC in the context of the knowledge-based economy. Among the several methods to measure IC, the most popular measure in this context is Pulic's method, which is known as the value added intellectual coefficient (VAIC).

This thesis examines the impact of IC and its three components (human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE)) on corporate performance. The analysis is carried on non-financial companies listed on Borsa Istanbul for the period starting from 2004 till 2015.

Corporate financial performance is classified into three different categories; market, financial, and productivity performances. Market performance is proxied using Price-Earnings ratio (PE) and Market to Book ratio (MB); financial performance is proxied using Return on Assets (ROA), Return on Equity (ROE), and Earning Per Share (EPS) ratios; while productivity performance is proxied using Assets Turnover (ATO) ratio. The study uses Panel Data analysis to fulfill its objectives.

The findings indicate that HCE has a significant positive impact on productivity and financial performance before and after the crisis. SCE has a significant positive impact on market performance (PE) before the crisis and the same impact on financial performance (ROA and ROE) after the crisis. Regarding CEE, it has a significant positive relationship with market performance (MB and PE) and a significant negative relationship with productivity performance (ATO) before the crisis. After the crisis, it has a significant positive influence on productivity performance (ATO) and has a significant positive impact on financial performance (ROA and ROE). VAIC, which represents the three different components; HCE, SCE, and CEE, has a significant positive impact on market performance (MB) and financial performance (ROA and ROE) before the crisis. In addition, it has a significant positive impact on productivity performance (ATO) and all financial performance factors after the crisis.

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ABBREVIATIONS

HC	Human Capital
HCE	Human Capital Efficiency
SC	Structural Capital
SCE	Structural Capital Efficiency
CE	Capital Employed
CEE	Capital Employed Efficiency
OC	Organizational Capital
CC	Customer Capital
PC	Physical Capital
RC	Relational Capital
IC	Intellectual Capital
ICE	Intellectual Capital Efficiency
VA	Value Added
VAIC	Value Added Intellectual Coefficient
EVA	Economic Value-Added
MCM	Market Capitalization Methods
DICM	Direct Intellectual Capital Methods
SCM	Scorecard Methods
IAS	International Accounting Standards
AICPA	American Institute of Certified Public Accountants
OECD	Organization for Economic Co-operation and Development
CICA	Canadian Institute of Chartered Accountants
CPRI	Canadian Performance Reporting Initiative
CPA	Certified Public Accountants
AICPA	American Institute of Certified Public Accountants
ROA	Return on Assets
ROE	Return on Equity
EPS	Earnings per Share
ATO	Assets Turnover
MB	Market to Book value
PE	Price-Earnings ratio
FAGE	Firm Age
FSIZE	Firm Size
FLEV	Firm Leverage
FCR	Firm Current Ratio

INTRODUCTION

Intellectual capital (IC) has become the main issue in firms' knowledge management and value creation throughout the last two decades (Zeghal and Maaloul, 2010). In a knowledge-based economy era, organizations face ultra-competition related to the surrounding environment, mobility, increasing complexity, and globalization. Consequently, to avoid these challenges, organizations should pay more attention in developing its potentials and inner skills. This can be accomplished with the fundamentals of managing knowledge assets and intellectual capital that could be used by organizations to achieve preferable performance in the business world (Bontis, 2001; Cariola et al., 2007). Nowadays, intellectual capital and knowledge management are considered as a sustainable strategy to approach and to maintain the competitive position of organizations. This trend has led to the emergence of several studies dealing with intellectual capital and its elements from several aspects; such as, the history of recognition of intellectual capital and its use, the definition and components of intellectual capital, the importance of intellectual capital in creating value, innovation and maintaining competitive advantage, and its different methods of measurement (Bismuth and Tojo, 2008; Haghshenas and Barzegar, 2014).

According to the Organization for Economic Co-operation and Development (OECD), several organizations are nowadays investing in employee skills through training, research and development, customer and supplier relations, technology, and information systems (OECD, 2008). These investments, which are known as intellectual capital, are increasing day by day at the expense of physical and financial capital. This shift in investment structure trends is attributable to the emergence of the knowledge-based economy (Stewart, 2002; Zeghal and Maaloul, 2010).

Many researchers have defined intellectual capital in the context of the knowledge-based economy¹, and how intellectual capital contributes in maximizing value creation efficiency. Knowledge can be described as information in context, alongside with the realization of how to use it (Mayo, 2001, p. 35). According to this definition, knowledge management is defined as the company's ability to manage and control the intellectual capital (Martensson, 2000). Intellectual Capital according to Sullivan (1999),

¹knowledge-based economy is a result from a complete recognition of the role of knowledge and technology in economic growth.

is the knowledge that can be converted into profit by exploiting the non-financial and non-physical resources of the company. In general, IC can be defined as *“the group of knowledge assets that are attributed to an organization and most significantly contribute to an improved competitive position of this organization by adding value to defined stakeholders”* (Sudarsanam et al., 2006, p. 293).

One can get an impression that the Intellectual Capital history belongs to the period of the eighties and nineties, but in fact, it goes way back to 1969 where the first use of Intellectual Capital as a term was by John Kenneth Galbraith as it appears in the literature (Kaya et al., 2010).

Since the introduction of the concept of intellectual capital, several methods have been developed to measure it. Hang Chan (2009a) has identified 34 measures of IC and classified it into 5 generic approaches such as; Market Capitalization Methods (MCM), Direct Intellectual Capital Methods (DICM), Scorecard Methods (SCM), Economic Value-Added Methods (EVA), and Value Added Intellectual Coefficient Method (VAIC).

One of the most important and utilized approaches for measuring intellectual capital performance is Value Added Intellectual Coefficient (VAIC) method. This method has been developed by Ante Pulic (1998, 2001, 2002 and 2004) in the Austrian Intellectual Capital Research Centre. He divided his approach "VAIC" into three elements; Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) and Capital Employed Efficiency (CEE). Many researchers (Abdulsalam et al., 2011; Iazzolino et al., 2013; Laing et al., 2010; Sledzik, 2013; Stahle et al., 2011) have used Pulic's model (VAIC) in their studies in order to investigate its influences on firm's performance in different sectors. Ulum and others have modified the VAIC model by adding a new component to measure the IC effect on financial performance in the Indonesian Banking Sector. The new added component is Relational Capital (RC) (Ulum et al., 2014).

Although the increasing recognition of the importance of IC and its effect on the future viability of companies, the study of IC's determinants on financial firms performance is still in its early stages (Swartz and Firer, 2005). A limited set of studies and researches have been conducted in dealing with this important subject. These studies give inconclusive and limited results, especially in the Turkish setting. When exploring the studies conducted in Turkey, one can find various limitations of these empirical studies. One example of the limitations found in these studies is that they used a survey

to find the relationship between IC and firm performance. Moreover, these studies was only applied on specific sectors, such as the banking and telecommunication sectors. (Aktaş, 2015; Ayvacık, 2012; Çolak, 2012; Gülcemal, 2016; Kızıl, 2009; Kocapınar, 2010; Odabaşoğlu, 2016; Özbek, 2016; Yıldız, 2010; Akpınar and Akdemir, 1999; Bozbura, 2004; Calisir et al., 2010; Ozer et al., 2015; Ozkan et al., 2016). In another manner, there is no study conducted in Turkey that compares between the periods of pre-and post-financial crisis. Our study will be the first study that is conducted in Turkey that takes into consideration all listed companies and differentiate between the pre-and post-financial crisis periods.

The continuous developments of the economy have caused significant changes in companies' activities in the global market. Therefore, intellectual resources play a key role as an effective tool to increase corporate competitiveness. This fact may cause the need to measure companies' performance by including the measurement of intangible sources use effectiveness (Jurczak, 2008a).

The broad area under which this thesis falls is in the area of Financial Performance within Intellectual Capital. The thesis will examine the three elements of intellectual capital: human capital, structural capital, and capital employed as suggested and developed by Ante Pulic (1998, 2001, 2002 and 2004), and their impact on financial performance. The study will examine the companies listed on Borsa Istanbul for the period over 2004 to 2015 and taking into consideration the differences between two periods: pre-crisis period from 2004 to 2007 and post-crisis period from 2010 to 2015.

Intellectual capital is considered as the source of competencies and capabilities which are essential for growth, human development, and quality of companies, which has been attracting an increasing amount of attention (Malhotra, 2003). Particularly, the results of these studies conducted on intellectual capital could provide a direction for companies to benchmark, aiding them to make wise decisions in respect to the effective investment of intangible assets.

The motivation behind this research is recognizing the importance of using intellectual capital approach to value creation and firm performance, which enhances the ability of Turkish companies to maximize their returns and market values, and their ability to compete internationally. The main objective of the study is to provide literature on intellectual capital management in developing countries especially in Turkey and apply or develop a model that can be used in all economic sectors and companies listed on Borsa

Istanbul, by determining an appropriate mix of human capital, structural capital, and capital employed to achieve organizational performance.

In order to evaluate the intellectual capital performance and its effect on financial performance of companies listed on Borsa Istanbul, Intellectual Capital will be measured by Value Added Intellectual Coefficient (VAIC) method which was proposed firstly by Ante Pulic (1998), while firms' performance will be measured by firms' market performance (PE and MB) ratios, firms' financial performance (ROA, ROE, and EPS) ratios, and firms' productivity performance (ATO) ratio.

The thesis entitled ***“Intellectual Capital and its impact on Financial Performance of firms listed in Borsa Istanbul”*** is structured in five chapters, setting guiding lines of the roles that IC plays in affecting the future value of the company. The chapters include relevant aspects related to the conceptual framework, theoretical aspects, and issues linked to the definitions, components, measures, and evaluation techniques of IC.

The second section of this study ***“Intellectual Capital”*** gives more details about IC, such as intellectual capital definitions, intellectual capital components (human capital, structural capital, and capital employed), information and intellectual capital, and intellectual capital and intellectual assets.

The third section ***“Intellectual Capital Measurements and Valuations”*** explains intellectual capital methods and measurements involving; Market Capitalization Methods (MCM), Direct Intellectual Capital Methods (DICM), Scorecard Methods (SCM), Economic Value-Added Method (EVA), and Value Added Intellectual Coefficient Method (VAIC). In addition, this chapter represents the perspectives of studying IC (economic perspective, accounting perspective, and finance perspective).

The fourth section ***“An Analysis of The Effect of IC On Company Performance: Application on BIST Companies”*** provides a comprehensive overview of literature regarding intellectual capital, including the researches of the field of IC and its impact on firm performance, research methodology, study hypotheses, study model, and data analysis.

The fifth section ***“Conclusion”*** represents the results of data analysis, explanation of findings and discussion, conclusion, recommendations, limitations, and suggestions for future researches.

2. INTELLECTUAL CAPITAL

This section will discuss the vary aspects related to Intellectual Capital, starting with the definitions of IC and the different components and elements of IC including; Human Capital, Structural Capital, Capital Employed and other dimensions of IC. In addition, popular measurements and valuations methods that used by several researchers since the onset of IC, and the perspective of IC which related to the field of the study such as Financial, Economic and Accounting perspectives will be explored under this section.

2.1 Intellectual Capital Definitions

The intellectual capital concept was first introduced by Jon Kenneth Galbraith in 1969 (Khalique et al., 2011). Although, there is an agreement among scholars on the importance of the intellectual capital, there is no consensus about the standard definition of it. On the other hand, intellectual capital definitions are not considerably different among the scholars (Tayles et al., 2007). Where most of the definitions essentially include the same words like; information, knowledge, experiences and skills of employees, customer and employees' loyalty and satisfaction, firm reputation, organizational systems and procedures, organizational cultures, and value creation (Brooking, 1996a; Edvinsson and Malone, 1997; Kamath, 2007; Roos and Roos, 1997; Sullivan, 1999; Yalama and Coskun, 2007).

Intellectual capital is a relatively enigmatic and new concept, it related to the intangibles and highly changeable assets of the firm. Therefore, while the intangible assets concept is more accurate and represents the set of intellectual capital components that are considered as assets, the intangible assets, and intellectual capital is often regarded to be equivalent. Therefore, in order to provide a clear definition of intellectual capital, we should start first with defining intangible assets.

Regarding IAS 38 intangible asset is defining as *“an identifiable non-monetary asset without physical substance. An asset is a resource that is controlled by the entity as a result of past events (for example, purchase or self-creation) and from which future economic benefits (inflows of cash or other assets) are expected”*(“IAS 38 — Intangible Assets,” 2016).

Such definition points out that the intangible assets are non-physical resources being controlled and able to generate the future economic benefits of the company. Brooking (1996, p. 12) defines IC as a set of intangible assets which give the company the ability to work. In order to define IC as accurate as possible, several researchers and

specialists attempted to define IC according to various fields of expertise, like economic, accounting, management, education, development, sociology, psychology, and information technology. From an economic point of view, IC can be defined as an economic value that generated by a set of intangible parts held by the companies and represent by human capital, organizational capital and relational capital (Bontis, 2002, p. 137).

In accounting field as mentioned before, the associated term with IC is intangible assets. The intangible assets considering as controlled resources by the entity, these resources are used to achieve companies' future economic benefits regardless of its non-monetary nature (Bontis, 2002, p. 137). From management side, many researchers refer to IC as the use of knowledge in creating value for the business, Stewart (1997) in his book "Intellectual Capital" defines IC as intellectual resources of the company including; knowledge, experience and information which can use to create wealth for the company (Stewart, 1997, pp. ix–x). Bontis et al. (2000); Edvinsson and Malone (1997); García-Meca and Martínez (2005); and Sveiby (2001) clarify that IC is the knowledge that can convert to value. Roos and Roos (1997) said that IC is the total of assets do not appear in financial statements which companies can loss if employees left. In another side (Lev, 2007, p. 5) considered IC as the value of non-physical resources which can be gained by innovation, the unique design of the organizations, and human resource experiences.

From above definitions, one can say that IC is the non-monetary engine for creating or increasing companies' value, where most of the authors in their definitions focused on how companies use the knowledge (intangible resources) effectively to gain competitive advantage (or maximize the value of the firm).

With the objective of making a good comparison and comprehensive look among the modern definitions of IC, Table 2.1 provides an abstract of most of these definitions.

Table 2.1 Definitions of Intellectual Capital

Author	Definition
Edvinsson and Sullivan (1996)	IC is the knowledge can be changed into value.
Roos and Roos (1997)	IC is a set of assets do not appear in company's financial statements. Thus, companies can loss if employees left.
Edvinsson and Malone (1997)	IC is the knowledge that companies owned in addition to organizational technology and experiences, employee's skills and the relationship with customers that can maximize company's value and its competitive advantages.
Brooking (1996)	IC is a group of intangible assets which give the ability to the company to function properly.
Stewart (1997)	IC is intellectual resources of the company including; knowledge, experience, and information which can use to create wealth for the company.
Sveiby (1998)	IC is the knowledge, employee skills and experience and all knowledge resources that company has in its operating system databases, as well as philosophy and culture.
Sullivan (1999)	IC is the knowledge that can be changed into profits
Bontic et al. (2000)	IC is the term classifying and linking among all company's intangible resources.
Pulic (2000)	IC is the company's intellectual ability which presents how efficiently they used of physical capital, and intellectual potential to create value.
Kamath (2007)	IC is the use of human mind and intellect to create value.
Yalama and Coskun (2007)	IC is the hidden resources which do not appear on balance sheet, which also can be used as a competitive advantage and to maximize the future value of the company.
Zeghal and Maaloul (2010)	IC is the collective knowledge which able to use to add the value of the company.

Source: Adopted from Wang, 2008

2.2 Intellectual Capital Components

Like IC, which has defined from many aspects, the components of IC also have several dimensions. Edvinsson (1997) and Roos and Roos (1997) divided IC into two components; Human Capital and Structural Capital; and Structural Capital was further classified as Costumer Capital and Organizational Capital by Edvinsson (1997). Marr et al. (2004) followed the same classification as Edvinsson (1997) but he separated organizational capital into two elements: process capital and innovation capital; innovation capital related to company's capability and procedures to create innovation. Stewart (1997) added another dimension to intellectual capital which is customer capital where intellectual capital became involving three components human capital, structural capital, and customer capital (Stewart, 1997, p. 84). Many of famous researchers in the early phase of intellectual capital development involved; Brooking (1996), Edvinsson (1997), Stewart (1997), Roos et al. (1997), Sveiby (1998), and Bontis (1996,1999) agreed that intellectual capital is mainly based on three components namely human capital, customer capital, and structural capital (Khaliq, Shaari, Abdul, and Isa, 2011). Some other researchers such as; Edvinsson and Malone (1997), Andriessen and Stem (2004),

Youndt et al. (2004) stated that intellectual capital concept includes various components such as organizational capital, social capital, and relational capital. Based on Value Added Intellectual Coefficient "VAIC™" method, which has been developed by Ante Pulic (1998, 2000 and 2002) and presented firstly in Austrian Intellectual Capital Research Centre, Pulic has been divided his approach "VAIC" into three basic components; Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE) (Pulic, 2000). Ulum et al. (2014) modified Pulic's model by adding a new dimension to VAIC method. This new dimension is the relational capital where they classified IC into four components; Human Capital, Structural Capital, Capital Employed and Relational Capital (Ulum et al., 2014). For comparison and comprehensive look among the contemporary classifications of IC, table 2.2 explore the most divisions of IC components.

Table 2. 2 Review of IC components

Scholars	Year	Components
Bontis	1996, 1999	Human Capital, Structural Capital, Relational Capital
Brooking	1996	Human Capital, Structural Capital, Customer Capital
Roos and Roos	1997	Human Capital, Structural Capital
Roos et al.	1997	Human Capital, Structural Capital, Customer Capital
Stewart	1997	Human Capital, Structural Capital, Customer Capital
Edvinsson and Malone	1997	Human Capital, Structural Capital, and Structural Capital divided into Costumer Capital and Organizational Capital
Sveiby	1998	Personnel Competence, Internal Structure, External Structure
Pulic	2000	Human Capital, Structural Capital, Capital Employed
Andriessen and Stem	2004	Human resources, Organizational resources, Relational resources
Youndt et al.	2004	Human Capital, Organizational Capital, Social Capital
Laing et al.	2010	Human Capital, Structural Capital, Capital Employed
Ulum et al.	2014	Human Capital, Structural Capital, Relational Capital and Capital Employed

Source: Adopted from Wang, 2008.

Based on the above review of the classification of IC components, one can see that IC comprises of three main categories; Human Capital (HC), Structural Capital (SC), and Capital Employed (CE). This study depends on the previous classification of IC components exactly what mentioned in Pulic's model "VAIC" which is a very widely acceptable method and used by several researchers. VAIC method is considered as one of the most appropriate methods to measure IC performance (Abdulsalam et al., 2011;

Chen Goh, 2005; Chen et al., 2005; Hang Chan, 2009; Joshi et al., 2010; Kamath, 2007; Mavridis, 2004; Mavridis and Kyrmizoglou, 2005; Yalama and Coskun, 2007).

Based on the above interpretation for various use of IC classifications, this study classifies IC into three elements Human Capital (HC), Structural Capital (SC) and Capital Employed (CE). The following part presents the definitions of these elements and their sub-categories.

2.2.1 Human Capital (HC)

Human capital searches individual decisions related to the investments that enhanced productivity, skills and knowledge, career choices, and other characteristics based on work such as salaries and wages, and hours of work (Gimeno et al., 1997). Human capital poses the individual knowledge tool of the organization which can be represented by its employees (Mention and Bontis, 2013). So whether HC is in any form, it considers as the most important source of intellectual capital creation in the organizations (Roos and Roos, 1997; Shaari et al., 2011).

HC is considered as the most significant factor of the organization and the main source of innovation and strategic competitiveness (Bozbura, 2004). HC is the widely-used concept and the most important component of IC, where all researchers refer to HC as the main element when classifying IC. HC involves employees' qualifications embraces knowledge, talents, skills, education, experiences and competencies that company can lose if they decide to leave the company (Cheng et al., 2010; Edvinsson and Malone, 1997; Kim et al., 2011; Lock Lee and Guthrie, 2010; Roos and Roos, 1997). Bontis et al. (2000) noted that employees create IC through their intellectual agility, attitudes, and competencies. Intellectual agility related to innovativeness and make a solution of organizational problems; attitude based on the behavioral aspects of the employee's functions while competencies cover skills, training, and education. Therefore, HC consisting of the competence, skills, experience, and intellectual abilities of the individual employees, which are not reflected in the financial statements (Chang, 2010; Edvinsson and Malone, 1997; Meihami et al., 2013; Muhammad and Ismail, 2009; Sullivan, 1999).

Moreover, many others point out that HC is considered as one of the most important intangible resource of the company. Ahonen (2000) confirms that HC is, in fact, the only creative intangible and, therefore, the main component of IC (Marr, 2012, p. 96).

According to Pulic, HC is not only a set of characteristics (capability, skills, etc.) held by employees, but the amount of capital invested in knowledge workers (wages, salaries, training, etc.). He points out that HC in the company is represented by the expenditures for employees as accounting concept, like expenditures for employees, that means the employees are treated as investment not as cost because they invest their skills and their knowledge which can be valued through firm's activities at the market and reflected in value added creation (Pulic, 2000, 2004, 2008).

For performance considerations, companies should treat the employees as an asset, instead of as a cost where HC is a valuable element. Crook et al. (2011) indicate that investment in HC can create a significant outputs performance, for both employees and companies. Whereas, HC is the main motivation for competitive advantage, reaching effective performance, and creating value for the company (Chen et al., 2005).

2.2.2 Structural Capital (SC)

The second factor of the IC is the structural capital. Companies need new ideas, which are created through human capital. Moreover, in order to have the ability to popularize these ideas throughout the company, they should learn their potential. Converting human capital into structural capital is a critical distance for a market capitalization of IC (Edvinsson and Malone, 1997, p. 35).

Structural capital refers to the organization's potential to face internal and external challenges (Cabrita and Vaz, 2005). Structural capital, in contrast to *Human Capital*, is the intellectual asset which is independent of individuals; hence, structural capital remains after employees leave the company (Chen et al., 2005; Sydler et al., 2014). Structural capital is considered as the non-human stock of knowledge, which is consisting of information technology, trademarks, patents, and plans, as represented by its databases, software, hardware, laboratories, and organizational structures (Al-Zoubi, 2013; Chen et al., 2005; Moradi et al., 2013).

Bontis (1998) pointed out that SC transacts with the organizational mechanisms and structures which can assist the employees in their pursuits to achieve optimum business and intellectual performance. In other words, SC means the organizational know-how that concentrates on converting HC into IC. In this regard, SC is a significant link to measure IC at any level of the organization (Bontis, 1998). According to Roos et al. (1997) SC is considered as a non-thinking asset, which is comprised of all things that remain after employees leave the company, such as; customer profiles, databases,

trademark, manuals, and organizational structure (Roos et al., 1997). Edvinsson and Malone (1997) state that SC is the knowledge in the company, which does not relate to human capital, and covers contact elements, patents, and databases. While, Sullivan (1999) defines SC as the tools like computer software, marketing strategies, work procedures, information systems, and company know-how which companies provide to support their HC.

In conclusion, we can say that SC includes processes, systems, structures, brands, intellectual property, and other intangibles that are owned by the firm but do not appear on its balance sheet (Bounfour, 2003; Brooking, 1996a; Stewart, 1997).

2.2.3 Capital Employed (CE)

Capital Employed is the tangible assets part of capital which contains both physical and financial assets; the physical part is represented by fixed assets and raw materials, while the financial part includes other existing assets after employees leave the company (Basso et al., 2010). Therefore, CE can be defined as total capital that exploited in a firm's current and fixed assets (physical and financial) which appear in funding side, it equals to long-term liabilities (loan capital) plus stockholders' funds (equity capital) (Muhammad and Ismail, 2009).

2.3 Information and Intellectual Capital

Intellectual capital can be defined as intellectual resources of the company including; knowledge, experience, and information which can use to create wealth for the company (Stewart, 1997, p. 59). In this new era, wealth is the most important products of knowledge. Where knowledge and information are not only a scientific knowledge but also advice, communication, service, a technology that have become the essential raw materials of the new economy (Stewart, 1997, p. 12). As a result of the information age, knowledge nowadays is more significant than ever before where it has become one of the most important elements of business activity in what is known as the knowledge-based economy or economic revolution (Stewart, 1997, p. 24).

The relationship between the information and the knowledge has been extensively discussed, especially in last few years with the advent of knowledge management as one of the managerial practices (Marr, 2005, p. 129). According to Sewdass (2005), there is a strong relationship between information and knowledge where good information considers as a primary condition for knowledge management. While information is a message which gives the receiver the ability to change the way to perceive something and

also to have an influence on his behavior and decisions. Knowledge is the information that can give appropriate meaning (Davenport and Prusak, 1998, p. 20).

Information revolution and exponential growth of information led to a recognition of the new economy known as knowledge-based economy and the dominance of networked society (internet based companies), hence concentrated attention on the value of managing knowledge in the organizations. This means that a growing number of organizations will abandon their tangible and physical assets phased out in favor of intellectual capital asset (Al-Ali, 2003, p. 20; Wall et al., 2004, p. 14). According to Stewart (1997) growing up the economy of the intangibles considered as a new information age economy, where the knowledge and information are the basic sources of wealth instead of physical labor and natural resources. Organizations based on material assets are incapable of realizing further levels of the economy, and therefore they are unable to achieve competitive advantage by using tangible assets alone (Lev, 2007, p. 7). according to Itami and Roehl (2009), intangible assets are considered as the key source of companies that seek for competitive advantage.

Information revolution has helped to emphasize the role and importance of intellectual capital as a core asset of institutions (Serrat, 2011). Starovic and Marr (2003) stated that intellectual capital is very significant to both organizations and society. Nowadays, it can be considered as the main source of competitive advantage among companies and for stimulating innovation that drives to wealth generation and value creation. From this perspective, intellectual capital is the growing group of tools, approaches, and methods necessarily focused on that companies can increase their profits, create value and maximize their return on knowledge assets (Serrat, 2011). According to Edvinsson and Malone (1997) the knowledge, information, and experience are creating value for the firm.

In order to convey the information regarding intangible assets -which is part of intellectual capital- to users, companies should be in a position to report its intellectual capital assets (Alcaniz et al., 2011). As García-Ayuso (2003) companies are required to provide information and share knowledge with their various users and stakeholders, and in order to provide information about intellectual capital assets, companies have to find a new way to view their financial information and to redesign their reporting systems. In addition, the capital market is asking for more information that characterized by reliability regarding knowledge assets in the companies, such as experience, managerial qualities, innovation skills, strategic direction, integrity, and risk factors. these resources are the

key factors of value creation, where most of them are considered as intangible assets or intellectual capital of the company (García-Meca, 2005).

According to Alcaniz et al. (2011) the lack of reliable information regarding intangibles, there is a possibility that decision makers and investors will waste investment opportunities; because they can think that the investment of intangibles may impair of company's performance and will reduce its value. Many researchers such as Eccles and Mavrinac (1995), Amir and Lev (1996), and Lev and Zarowin (1999) have pointed out that there is an absence of the relevancy of accounting information which let the investors and the managers without suitable information for making investment decisions. They suggested making the financial information of the company more convenient for investors. Therefore, the financial reporting should involve on information regarding of intangibles. At least, this means that companies should prepare a descriptive report of intangibles as a supplement to financial statements to reflect the true market value of intangibles (Fijalkowska, 2008). Whereas, Mouritsen et al. (2004) agree with the reflection problem of information regarding of intellectual capital in company's annual reports, Derun (2013) states that although the large number of studies about intellectual capital, the problem that remains unresolved is the reflection of intellectual capital in the balance sheet.

The pioneer organization, which started to work on the subject of the reflection of intellectual capital on financial statements, was the American Institute of Certified Public Accountants (AICPA)². The first step was taken in 1991 by creating the Committee on Financial Reporting. Then reports was prepared in 1994 and 2001, which concluded that information contained in the financial statements does not meet the needs of investors, and therefore requires the addition of complementary information in the notes of financial statements regarding intangibles (Derun, 2013; Lev, 2007). Beattie and Thomson (2010) stated that the disclosures on information regarding intellectual capital within financial statements are still largely existed as voluntary activity in many countries.

The use of like reports of the reflection of information on intellectual capital in notes to the financial statements of the company has many advantages. From direction, it gives the company's management the ability to recognize the potential of its intellectual capital which can dramatically improve the company's financial position. Moreover, these

² AICPA, the world's largest member association representing the accounting profession sets ethical standards, auditing standards and develops the CPA Exam.

reports can rise the confidence of creditors and investors and decrease the risk regarding providing loans and investing. Furthermore, it will enhance the awareness of shareholders, and therefore minimize the potential for illegal actions such insider trading of information related to intellectual capital by the competitors or stakeholders (Derun, 2013; García-Meca, 2005).

Intellectual capital is a significant key to value creation in today's economies and organizations. Nowadays, traditional financial statements are not sufficient to provide relevant and reliable information for managers, stakeholders, and investors to understand the potentiality of intellectual resources – which are mostly intangibles - in creating value in the future. Therefore, the suggestion of designing intellectual capital statements will help to reduce the gap by providing information regarding intellectual resources and how it can create future value (Mouritsen et al., 2004).

2.4 Intellectual Capital and Intellectual Assets

At the end of the eighties and nineties, with the advent of what is known as knowledge management, more attention has been given to some different notions related to knowledge management such as Intellectual Capital, Intellectual Assets, Knowledge Assets, and Intangible Assets. Although many researchers differed in the use of these notions or they used it interchangeably. They all agreed that these concepts in the total lead to creating value and competitive advantage of an organization (Bontis et al., 2000; Kujansivu and Lönnqvist, 2007; Lev, 2001; Roos et al., 1997).

For instance, Sudarsanam et al. (2006) pointed out that intellectual capital is a set of intangibles or knowledge assets, and also, they believe that knowledge assets and intellectual assets can give the same meaning. Many others illustrated that intellectual capital involves intangible assets, e.g., information, knowledge, human skills, social value, loyalty, faith, ethics, customer satisfaction, procedures, policies, intellectual and industrial property, etc. (Bontis, 1998b; Brooking, 1996a; Edvinsson and Malone, 1997; Ismail, 2009; Sveiby, 1997).

Claver-Cortes et al. (2007) use intangible assets as synonyms of the intellectual capital where they stated that knowledge management depends on intangibles which in turn form the intellectual capital of the business. Galabova and Ahonen (2011) believe that if knowledge resources used to create the value for the organization, then it can be considered as intellectual capital which is the collection of human capital, structural capital, and relational capital.

According to Brooking (1996), intellectual capital is a concept refers to the set of intangible assets, intellectual property, human capital, which enable the organization to function. Koçoğlu et al. (2009) illustrated that intellectual capital concept is often considered as equivalent to intangible assets. Moreover, the OECD always refers to intellectual capital synonymous as intellectual assets of which locating according to OECD as a subset of intangible assets of the organization. Bismuth and Tojo (2008) said that intellectual assets refer to intangible assets which involve R&D, software, and human capital. Sveiby (1997, p. 12) classified intangible assets into three categories: external structure involved; brands, supplier and customer relations, internal structure includes; management, manual systems, legal structure, attitudes, software and R&D, and competence of employees consist of education, skills, and experience. In addition, Khalique et al. (2011) refers that intellectual capital is generally based on human capital, structural capital, customer capital, technological capital, social capital, and spiritual capital.

Whereas, Bontis (2002, p. 293) defined intellectual assets as the knowledge of employees who have high competence, normally very hard to recruit, not easy to replace, and who can add value to an organization. McConnachie (1997) considers intellectual assets, which include trademarks, patents, know-how, and trade secrets, as the knowledge that is the key factor of wealth creation of an organization. However, intellectual assets can be defined as recordable intangible assets of the company, involving assets like company name, company's goodwill and reputation, company's brands, trade secrets, as well as business processes and know-how (Huggins and Weir, 2012).

Some authors like (Abeysekera, 2003; Majdalany and Manassian, 2012; McConnachie, 1997; Sudarsanam et al., 2005; Talukdar, 2008) pointed out that the notion of intellectual capital is regarded as the same concept of intellectual assets. Peppard and Rylander (2001) debated that intellectual assets give a framework and how they incorporate each other in value creation. Mavridis and Kyrmizoglou (2005) stated that intangible assets have the possibility to create value for the firm. Sullivan (1999) used the concept of intellectual assets for intangible assets that can be recorded and commercialized, where he classified intangible assets as structure capital, customer and relational capital, operational procedures and methods, managerial tools, and the way of acting business (Andriessen, 2004, p. 23).

However, Lev (2001) uses the term of intellectual assets in the same sense of intellectual property and intangible assets. According to Stewart (1997) intellectual

property is considered as one part of intellectual capital, where intellectual capital is define based on knowledge, information, employee skills and experiences, and intellectual property which can be used to create wealth (Stewart, 1997, p. 12).

According to the previous discussion, it can conduct that the terms such as intellectual capital, intellectual assets, knowledge assets, intangible assets, and intellectual property are used interchangeably.



3. INTELLECTUAL CAPITAL MEASUREMENTS AND VALUATIONS

According to the definition of intellectual capital, there is no globally accepted measurement of IC (Chan, 2009; Ramirez et al., 2007; Zeghal and Maaloul, 2010). The differences of conceptual, cognitive and philosophical theories of IC concept guide to the lack of a totally accepted measure of IC performance (Swartz and Firer, 2005). According to Nazari and Herremans (2007), the participation of researchers from different fields like economics, accounting, finance, human resources, psychology, and strategy has resulted in the diversity of IC measurement. Moreover, the complex nature of the division of intellectual capital as tangible and intangible (physical and non-physical) assets, in addition to the huge number of variables related to individuals and the organization itself gives another reason of the measurement problem of IC (Kannan and Aulbur, 2004).

Many researchers, including Andriessen (2004); Chen Goh (2005a); Edvinsson and Malone (1997); Pulic (2004); Stewart (1997) are strongly leaning towards physical and financial resources to measure IC. They claim that current traditional accounting measurements do not give a real image when measuring IC performance. In addition, the use of conventional measures could lead investors to take inadequate economic decisions. According to Kamath (2007), the neglecting of IC could be a great threat for the firms in the long-term, because of the rising of the importance of IC as the significant source of firm's competitive advantage and value creation.

The failure of conventional approaches to measures IC performance encourage researchers to conduct new studies assist in finding new methods fit with measuring IC performance which is resulted in produces many methods and models of measuring IC. Sveiby (2010) explored and identified 42 of methods for measuring and evaluating IC, classifying them into four categories: “(1) component-by-component and nonmonetary, (2) component-by-component and monetary, (3) organizational level and nonmonetary, and (4) organizational level and monetary”.

Another classification of IC measurements, created by Pew Tan et al. (2007), grouping IC methods under two categories: (1) methods that do not use a monetary valuation of IC, such as; Intangible Asset Monitor approach, the balanced scorecard, and the IC-Index, and (2) methods that use a monetary value on IC, such as; the calculated intangible value, economic value-added, market capitalization, and value added intellectual coefficient (VAIC).

According to Luthy (1998), all methods can be grouped into four main approaches: (1) Direct Intellectual Capital Methods (DICM); (2) Market Capitalization Methods (MCM); (3) Return on Assets Methods (ROA); and (4) Scorecard Methods (SCM). While according to Hang Chan, (2009b), IC measurement methods can be classified into five categories: (1) Market Capitalization Methods (MCM); (2) Direct Intellectual Capital Methods (DICM); (3) Scorecard Methods (SCM); (4) Economic Value-Added Methods (EVA); and (5) Value Added Intellectual Coefficient Method (VAIC).

Andriessen (2004) in his book *“Making Sense of Intellectual Capital Designing a Method for the Valuation of Intangibles”* reported 25 methods for measurements and valuations of intangibles. Table 3.1 clarifies a summary of the IC measurements and valuation methods based on Ulum’s study.

Table 3.1 IC measurements and valuation methods

No.	Name of Method	Inventor/Pioneer and Year of Publication
1	Balanced Scorecard	Kaplan and Norton (1992)
2	Intellectual Capital Audit	Brooking (1996)
3	Holistic Value Approach	Roos, Roos, Dragonetti, and Edvinsson (1997)
4	Intellectual Capital Index	Roos (1997)
5	Intangible Asset Monitor	Sveiby (1997)
6	Market-To-Book Ratio	Stewart (1997)
7	Skandia Navigator	Edvinsson and Malone (1997)
8	Calculated Intangible Value	Luthy (1997, 1998)
9	Value-Added Intellectual Coefficient (VAIC)	Pulic (1998)
10	Sullivan’s Work	Sullivan (1998, 2000)
11	Intangibles Scoreboard	Lev (1999)
12	Intellectual Capital Benchmarking System	Viedma (1999, 2001)
13	Inclusive Value Methodology	M’Pherson and Pike (2001)
14	Intellectual Capital Statements	Mouritsen (2001)
15	Citation-Weighted Patent	Hall, Jaffe, and Trajtenberg (2001)
16	iValuing Factor	Standfield (2001)
17	Intellectual Capital Dynamic Value	Bounfour (2002)
18	Value Chain Scoreboard/Value Chain Blueprint	Lev (2001, 2003)
19	Extended VAIC	Nazari and Herremans (2007)
20	iB-VAIC	Ulum (2013)
21	M-VAIC	Ulum, Ghazali and Purwanto (2014)

Source: Adopted from Ulum et al., 2014

For the purpose of this study, Chan (2009) classification of IC approaches will be followed. Such classification is Market Capitalization Methods (MCM), Direct Intellectual Capital Methods (DICM), Scorecard Methods (SCM), Economic Value-Added Methods (EVA) and Value Added Intellectual Coefficient Method (VAIC).

3.1 Market Capitalization Methods (MCM)

Market Capitalization Methods determine the value of intangible assets and intellectual capital by deducting stockholders' equity of the company from its market capitalization (Chan, 2009; Jurczak, 2008b; Luthy, 1998; Sveiby, 2010). The only advantage of these methods that they are easy to use and understand by all level of the company and to its external stakeholders but also these methods have many criticized. The weakness of these methods is that it depends on firm's market value which is normally volatile and could be vulnerable to speculation in capital markets. Moreover, they are criticized as they only provide a set of information about IC without classifying it to its components. Therefore, it does not assist managers to understand how does IC can affect firm performance (Luthy, 1998). On the positive side, The MCM methods have a degree of strictness in that they depend on financial data which, although not ideal, are auditable. Also, these methods attempt true valuations and may show useful in many cases since they can provide significant comparisons among companies within the same sector (Jurczak, 2008b).

The MCM approach includes methods such as Tobin's q, Investor Assigned Market Value (IAMV), Market-to-Book Value.

3.1.1 Tobin's Q

Tobin's q method is helping for investment decisions; James Tobin the economist who won Nobel prize has been developed "q" measurement stands for the ratio of firm's stock market value divided by the replacement cost of its assets (Luthy, 1998). The replacement cost refers to the value that firms are paying to replace their assets at the present time, depending on its current value (Choo and Bontis, 2002, p. 624; Stewart, 1997, p. 225). According to Sveiby (2001) if the result of q is greater than 1 and at the same time greater than the average of the market, then the firm has the ability to make profits more than the average. The cause of this profit is that the intellectual capital which is owned by the company provides an advantage in comparison with competitors (Luthy, 1998). The results and variations of "q" may use as an indicator of the effectiveness of the use of intellectual capital.

3.1.2 Investor Assigned Market Value (IAMV)

Investor Assigned Market Value (IAMV) method is created by Standfield (1998), where he differentiates the true value of a company from its share market value through the following equation:

$$(3.1) \quad TV = TC + RIC + ICE + SCA$$

Where; TV is the company's true value, TC is Tangible Capital, RIC is Realized intellectual capital, ICE is Intellectual capital erosion, and SCA is Sustainable Competitive Advantage. (Owais and Ali, 2012; Sveiby, 2010).

3.1.3 Market to Book Value

The Market to Book value method, presented by Stewart (1997), assumes that company's value (tangible assets + intangible assets) is equal to its market value. This means that the difference between the market value and the book value refers to the value of the IC of the company. Market to Book ratio is considered an acceptable measurement and an easy way to calculate the intellectual capital value of a company by calculating the gap between the book value of its assets and its market value at a certain point of time (Luthy, 1998; Stewart, 1997).

If the outcome of the ratio is greater than one, this refers that the company has intellectual capital which does not appear in its financial statements. While if the ratio is less than one that means the intellectual liabilities of the company is greater than the value of the intellectual assets (Abeysekera, 2003b). However, this method of valuation of intellectual capital has some limitations; the clearest defect is that this method evaluates IC as one asset without any attempt to separate the elements that could comprise it. In addition, the value of intangible and tangible assets is not necessarily reflecting the market value of the company (Lev, 2001a, p. 57).

3.2 Direct Intellectual Capital Methods (DICM)

The DICM evaluate the monetary value of intangible assets and IC by determining its different components. Where they could be evaluated directly, either aggregated or individually (Sveiby, 2001). The DICM has been prepared to be more comprehensive and allow the possibility to create a more holistic picture of a company's health than financial measurements. The methods are more elaborate and can be easily used at any level of the company (Jurczak, 2008b). DICMs might be more accurate and faster in the case of measuring IC than MCM methods with respect to resources. Moreover, they may be very beneficial for non-profit organizations, government units and also for social and environmental purposes, since their methodology does not depend on financial terms. Their disadvantage is that they cannot be linked easily to financial outcomes (Jurczak, 2008b).

The DICM at component level involved many methods such as; Technology Broker, Citation Weighted Patents, The Value Explorer, Total Value Creation, and Intellectual Asset Valuation.

3.2.1 Technology Broker

Technology Broker is a practical contribution represented by Annie Brooking (1996) to measure the monetary value of IC as specified by an IC audit. The value of a company's IC is evaluated based on a diagnostic analysis through the answering of twenty questions, these questions are considered as the IC audit indicators. According to Brooking, IC is divided into four major categories that represent the combinations of IC: Human-centered assets, Market assets, Intellectual property assets, and Infrastructure assets (Bontis, 2001; Ratnatunga, 2002). Human-centered assets are the set of employees experiences, innovation and creativity, leadership and decision making; these assets do not own by the company, where the company can lose these assets when employee leave it (Archer et al., 1998). Market assets are the assets which grant the company the power in the marketplace like as customers, company's name and brand name, collaboration agreements, distribution channels, and franchise and licensing agreements (Archer et al., 1998; Bontis, 2001). Intellectual property assets are the set of assets that are protected by the law such as copyright, trademarks, trade secrets, patents, and design rights. Infrastructure assets are the assets that enable the company to function, including methodologies, technologies, processes, corporate culture, financial structure, communication, and information systems (Andriessen, 2004, p. 307; Brooking, 1996b; Marr, 2005, p. 59). Every component of these categories of IC is investigated by some of the particular audit questionnaires to specify how much this assets' category is contributing to IC (Bontis, 2001). The idea of this analysis indicate that the less a firm can answer in a positive manner to the twenty questions, the more it needs to concentrate on strengthening its IC (Ratnatunga, 2002).

3.2.2 Citation Weighted Patents

Intellectual asset management at the Dow Chemical Company has been developed a Citation weighted patents method as an economic indicator to manage its intellectual assets by implementing a six-step process. These steps include; identifying the role of knowledge in the organization, understanding how the use of knowledge assets enhance company's competitive advantage, identifying how much the company have as knowledge assets, assessing knowledge assets' value for the purpose of keeping,

developing, abandoning, or selling them, investing in the areas where gaps are found, and compiling the new knowledge assets portfolio (Bontis, 2001; Joia, 2007, p. 60; Muller, 2004; Nazari, 2015; Vaz et al., 2015).

Citation weighted patents has been proactive in using patents as a proxy for measuring IC practically. According to that and based on the patents, they calculated a technology factor developed by the company. Where it can measure intellectual capital and its performance based on the influence of research and development efforts on a set of indices, such as; R&D expense per sales dollar, income per R&D expense, number of patents, and cost of patents to sales turnover, that describe the firm's patents (Hall et al., 2001).

3.2.3 The Value Explorer (PROBE)

The Value Explorer methodology was developed by the Knowledge Advisory Services (KAS) team of KPMG The Netherlands in 1998. This method focuses on identifying and financially assessing intangible resources. It identifies the importance of IC on the notion that IC is one of the core competencies of organizations. The Value Explorer gives an idea about the future prospects of intangible assets by taking into consideration cases such as competitiveness, value added for customers, endurance power, the potentiality of accepting new opportunities, and powerfulness. The Value Explorer method is considered as an accounting methodology calculating and allocating value to five groups of intangible assets; skills and tacit knowledge, technology and explicit knowledge, assets and gifts, functions and management processes and norms, and social values (Andriesson, 2005; Demartini and Paoloni, 2013; Jurczak, 2008; Malhotra, 2003; Marr, 2005, p. 218; Nazari, 2015; Radianto, 2011; Vaz et al., 2015).

3.2.4 Total Value Creation (TVC)

Total Value Creation method (TVC) has been developed and proposed by the Canadian Institute of Chartered Accountants (CICA) in 1995 as an integral part of the broader Canadian Performance Reporting Initiative (CPRI), which focuses on intellectual capital management. TVC is an attempt to measure value creation by using the discounted cash flows to show how events impact planned activities (Bontis, 2001; Malhotra, 2003; Muller, 2004). TVC approach is based upon four aspects to report on the company's value creation capabilities: First, the company's strategy for realizing and creating value. Second, total value creation includes financial value streams as well as non-financial value streams. Third, the focus must be on the company's capacity to create expected

value streams (the company's capacity involves on infrastructure, networks, and capabilities). Fourth, the financial and non-financial flows report for shareholders (Al-Ali, 2003, p. 59). TVC could measure and improve value creation by a company that would, in the end, benefit stakeholders (Nazari, 2015).

3.2.5 Intellectual Asset Valuation

Sullivan's method (2000) is used for representing intellectual capital. According to this method, intellectual capital is categorized into three components; Intellectual assets, Human resources, and Intellectual property. Intellectual assets consist of tangible knowledge, brands, design, technology, and creative works; human resources consider as the most important subject in the firm, representing by staff intellects, experiences, and skills; Intellectual property is a type of intellectual asset which is protectable legally supportable and traceable (Morgan et al., 2010; Muller, 2004; Nazari, 2015; Sullivan Jr & Sullivan Sr, 2000).

3.3 Scorecard Methods (SCM)

The scorecard methods (SCM) distinguish among the various components of IC. They are similar to the DIC methods, but they do not allocate any cash value to the IC components (Chan, 2009; Sveiby, 2010). SCM methods provide various means to form an overall picture of a company's health more than financial metrics, and they can be easier to apply than other methods at any level of the company (Jurczak, 2008b). These methods are very useful not only for business units, but also for nonprofit organizations, government agencies, and for social and environmental purposes (Lev, 2001). According to the lack of the qualitative nature as well as the standardization of SC methods, many argue that it is highly subjective, and it is difficult to make comparisons among companies. The indicators and the meanings of the resource determinations can differ between each company and each purpose, which makes comparisons so difficult (Chan, 2009; Sveiby, 2010). SC methods include Balanced Scorecard method, Skandia Navigator, Intangible Asset Monitor, Intellectual Capital Index (IC Index).

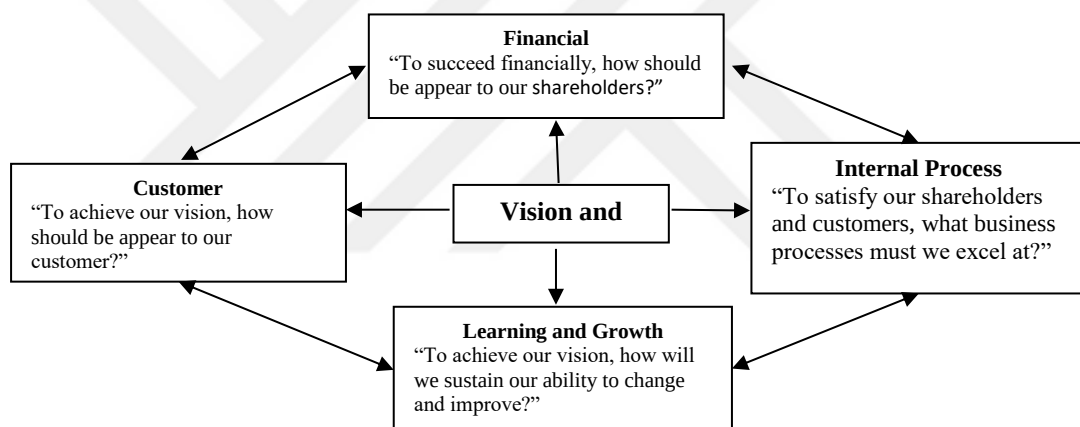
3.3.1 Balanced Scorecard (BSC)

The Balanced scorecard has been developed by Kaplan and Norton (1992, 1996) as a tool of organizational performance management. The balanced scorecard is defined as a management and a strategic planning system used to harmonize business activities to achieve the vision statement of an organization (Kaplan, 2008). The main reason for creating and developing BSC method was because of the fact that there was a trend to the

importance of invisible assets instead of tangible assets (Kaplan and Norton, 1996a, p. 36).

To have a successful Balanced Scorecard path, the organization first should know and understand the mission statement and strategic plan/vision of the organization. Then it should determine the financial position of the organization, the current structure and operating system of the organization, the employees' skills and experiences and the level of customer satisfaction (Bose and Thomas, 2007). The BSC model provides managers with useful information related to creating value by means of four perspectives: financial performance perspective, customer perceptions perspective, internal processes perspective, and learning and growth perspective (Souissi and Itoh, 2006). The following figure 3.1 shows what areas may be considered for improvement (the areas are not comprehensive and often applies to a specific company):

Figure 3.7 The Balance Scorecard Perspectives



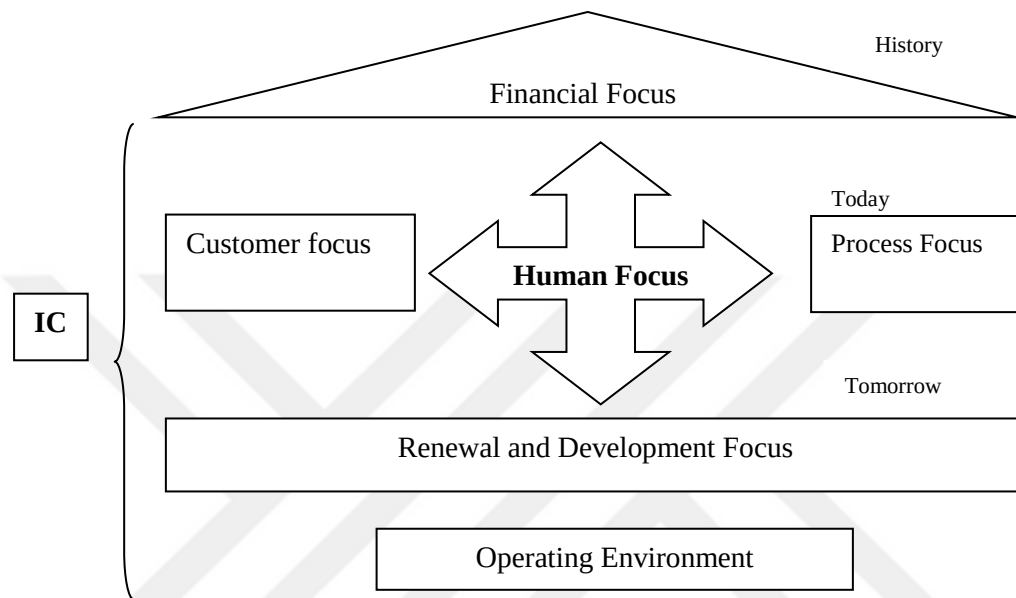
Source: Kaplan and Norton (1996, p. 76)

3.3.2 Skandia Navigator (SN)

Skandia is a Swedish insurance company which is considered the first big company to have made a real cohesive effort in measuring knowledge assets (Bontis, 1998a). Skandia navigator is one of the non-financial measures of IC. According to Skandia's model, IC is comprised of the sum of the hidden elements of human and structural capital (Edvinsson and Malone, 1997, p. 11). The SN method is similar to the balanced scorecard in terms of that SN links IC to the strategies of the company (Hunter et al., 2005). Skandia navigator was created and developed by Leif Edvinsson and a team of experts in 1994 where he was a corporate director at the Skandia company (Edvinsson and Malone, 1997). The model describes the existence of intangible assets as well tangible

assets, and the conversions of these assets accordance to strategic goals of the company. In other words, the model provides managers with financial and non-financial as well the information on value creation process (Marr and Spender, 2004). The Skandia Navigator model depends upon about 30 indicators of performance divided into five areas or focus, as shown in figure 3.2.

Figure 3.8 the Skandia Navigator



Source: Edvinsson and Malone (1997, p. 18)

Edvinsson says that navigator can be “viewed as a house. The financial focus is the roof. The customer focus and process focus are the walls. The human focus is the soul of the house. The renewal and development focus are the platform. With such a metaphor, renewal and development become the critical bottom line for sustainability.” (Edvinsson and Malone, 1997, p. 50).

The Skandia Navigator, similar to other non-financial methods, has disadvantages. SN is restricting the comparisons over time and among companies. Moreover, this model has been developed specifically for one company which is Skandia, but it could be used in any company for measuring the intellectual capital value (Hunter et al., 2005).

3.3.3 Intangible Asset Monitor

The Intangible Assets Monitor is a model created by Sveiby (1997) for measuring intangible assets, which is a simple format that shows many of the relevant indicators.

These indicators are selected by management based on the strategic goals of the company. They help in measuring four fields (growth, innovation, efficiency and stability) of value creation from intangible assets, as shown in figure 3.3 (Sveiby, 1997, p. 164).

Figure 3.9 Intangible Asset Monitor

	Intangible Asset Monitor			
	Market Value			
	Tangible Assets	Intangible Assets		
		External Structure	Internal Structure	Individual Competence
Growth				
Innovation				
Efficiency				
Stability				

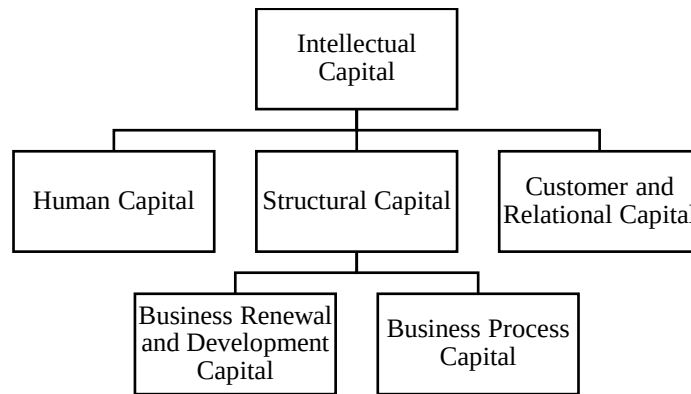
Source: (<http://www.sveiby.com/articles/CompanyMonitor.html>)

Sveiby divides the invisible assets in the balance sheet into three aspects of intangible assets; external structure, internal structure, and individual competence. The format is mostly appropriate for companies to have large intangible assets, like Knowledge Organizations (Sveiby, 2001).

3.3.4 Intellectual Capital Index (IC INDEX)

Intellectual capital index method has been created by Roos and Roos (1997), and it considers as the “second generation” practices of measuring IC. The model integrates all different individual indicators into one index. The indicators as shown in figure 3.4 are divided into three categories; Human capital, Structural capital, and Customer and Relational capital. Each category is weighted according to its importance (van den Berg, 2007, p. 20). The model is similar to the Balanced Scorecard from where the IC Index is also relevant to the company's strategy. The IC-Index can measure at a certain time and also can review over several years (Jurczak, 2008b).

Figure 3.10 IC-Index categories



Source: van den Berg (2007, p. 20)

The main disadvantage of IC-Index measurement is that it lacks inclusiveness within the industry. That means it is not possible to compare its results with other organizations. Also, as the author asserts this measure is not likely to be published, because of the direct relation to the organization's strategy, which impedes further development by not allow it to public criticism (Bontis, 2001).

3.4 Economic Value-Added Method (EVA)

Economic Value Added (EVA) was proposed by Stewart (1990, 1991) as a comprehensive measure of a company's performance. It uses multiple variables, such as; financial planning and capital budgeting, shareholder communication and performance measurement, goal setting and incentive compensation, to calculate and measure the value added to the company (Bontis et al., 1999). EVA is a useful method for measuring firms' performances which provide a good path for the analysts to investigate and evaluate the financial performance of the companies (Iazzolino et al., 2013).

According to Bontis et al. (1999) one can define EVA as the residual income after deducting the sum of operating expenses, taxes, and capital charges from net sales. Whereas, capital charges can be calculated by multiplying the total capital invested with the weighted average cost of capital (Bontis et al., 1999). The equation of EVA is given below:

$$\text{EVA} = \text{Net sales} - \text{operating expenses} - \text{taxes} - \text{capital charges}$$

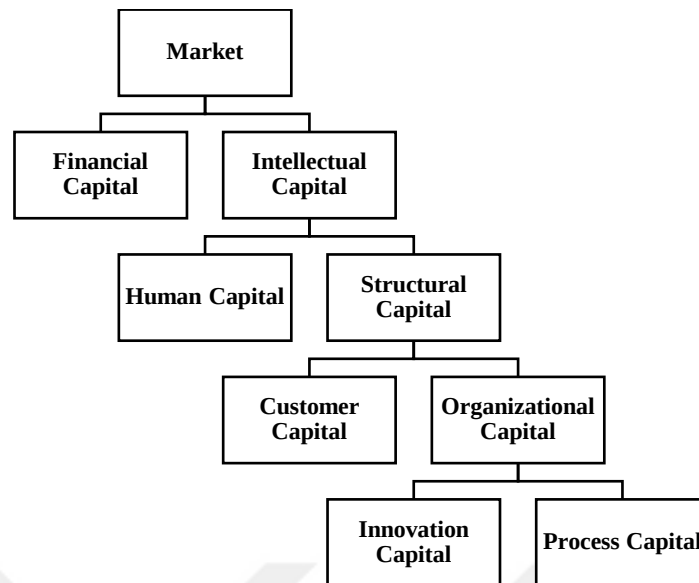
The main advantage of EVA is determining economic profit by considering all the costs including the cost of equity capital, which can be ignored in accounting. In the opposite side, there are many disadvantages of EVA as follow (Ray, 2012; Shil, 2009):

1. EVA has a short-term perspective. However, large companies look for long term measures because of their investments nature.
2. The true amount of EVA cannot be measured objectively specially for long term investments because companies could not measure future return, but they can only estimate.
3. The inflation and other factors may limit periodic EVA, in the case of estimating the value added to shareholders.
4. EVA suffers from the periodizing problem, where could show negative value even if the company expects to gain profit in the long term, because companies may have many undepreciated assets in their balance sheet.

3.5 Value Added Intellectual Coefficient Method (VAIC)

The value added intellectual coefficient (VAIC), which is the main interest of this study, measures the intellectual capital performance of a company. The VAIC methodology is a widely used method created and developed by professor Ante Pulic (1998-2000) with his colleagues at the Austrian intellectual capital research Centre (AICRS) (Abdulsalam et al., 2011; Chen Goh, 2005a). The main objective of Pulic's work is to create a performance measure for knowledge-based organizations. Pulic, like many other authors, says that, in modern economies, the main competitive strategy is to investments in knowledge to create value (Pulic, 1998, 2000, 2004). VAIC is the first approach bases the analysis of IC performance upon financial indicators extracted from company's financial statements (Stahle et al., 2011). The VAIC model allocated clear economic values such as value added (VA), human capital (HC), structural capital (SC) and capital employed (CE) and based on this basis produces an unequivocal index of Value Added Intellectual Coefficient (VAIC) (Iazzolino and Laise, 2013). Pulic designed his model VAIC based on the Skandia Navigator scheme given in figure 3.5 (Edvinsson and Malone, 1997, p. 52).

Figure 3.11 Skandia Market Value Scheme



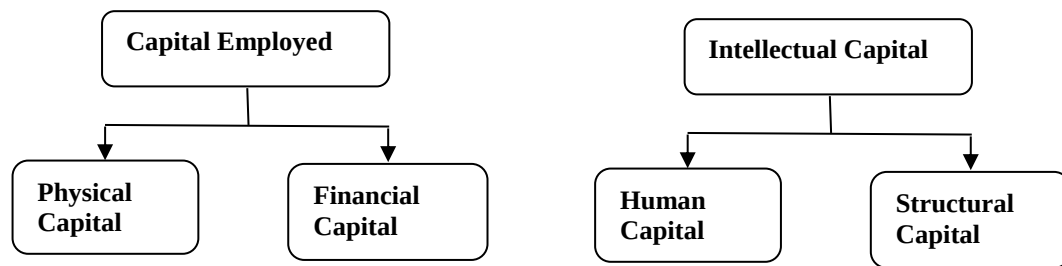
Source: Edvinsson and Malone (1997, p. 52)

The main goal of this model is to provide information about how to create efficient value from tangible and intangible assets of an organization. VAIC model is a measurement tool for measuring the intellectual capital performance of the company. This method is comparatively easy to use and apply because its calculation depends on the financial statement accounts (balance sheet and profit and loss statement) (Abdulsalam et al., 2011, 2011; Kamath, 2007; Ulu et al., 2014; Yalama and Coskun, 2007).

Pulic (2004) refers to two keys of resources that can be used to create value added in the company: capital employed and IC. IC include the sum of both human and structural capital. Value added is calculated by deducting the input from the output of a firm. Output refers to the sales revenue, while input refers to all expenses that company carried to obtaining revenue (Pulic, 2004, 2008). Figure 3.6 clarify the division of two key resources that suggested by Pulic to create VAIC.

The expression Human Capital (HC) according to Pulic is the amount of capital invested in employees to improve their knowledge (wages, salaries, training, etc.), and not as in the Skandia Navigator, which considers Human Capital (HC) as a collection of characteristics that employees owned (capability, skills, etc.) (Iazzolino and Laise, 2013).

Figure 3.12 Pulic's VAIC components



Source: Andriessen (2004)

The term of Structural capital also differs in meaning between Pulic and Skandia Navigator, where Structural capital as Skandia Navigator is comprised of all intangible assets types such as patents, brands, organizational structure, and process, etc. Whereas, according to Pulic, SC is the residual value after deducting the investment amount in human capital (HC) from value added (VA) and Capital Employed is consist of both Physical and Financial capital (Iazzolino and Laise, 2013).

VAIC is based on several assumptions as follow,

1. The creation value added of the company is built on the use of financial, physical, and intellectual capital. IC alone cannot create any value because of value creation process is the sum of both financial and physical capital and IC, where IC is a dependent variable of financial and physical capital (Pulic, 2004; Stahle et al., 2011).
2. The overall efficiency of the company is related to its added value creation. Therefore, VAIC is the total of intellectual capital efficiency (ICE) which include both human capital efficiency (HCE) and structural capital efficiency (SCE), and capital employed efficiency (CEE). Thus, the greater the VAIC, the best is the efficiency level, the good performance indicator of the company, and vice versa (Chen Goh, 2005a).
3. the most significant component of IC is HC because of the nature of knowledge that employees carry where without this knowledge the other components of IC cannot function (Sledzik, 2013).
4. Given the importance of HC as the main component of value creation, the expenditures for the employees should not be treated as an expense any more it should be treated as an investment (Sledzik, 2006).

3.6 Perspectives on Intellectual Capital

Perspectives on Intellectual Capital works as an aid to reduce the gap in understanding and helps in grasping the essence of IC. It also makes knowledge transfer across multiple-disciplines easier. Many interdisciplinary areas deal with the concept of IC such as; information systems, strategy, human resource management, marketing, operations management, economics, accounting, and finance. It also presents viewpoints on IC from the perspectives of epistemology, knowledge management, and public policy.

There are three main perspectives of IC, which are economic, accounting, and finance perspectives. These perspectives will be explored and discussed in the following sections of this study.

3.6.1 Economics Perspective

It is known that during the industrial revolution, where many countries experienced rapid developments, many of the economic concepts have been fundamentally changed. Among the concepts that have changed are the division of labour, the market expansion and greater production which was the inevitable result of the large increase in the number of companies. At that time companies were depend on tangible assets, such as buildings, lands, and machines, which were used to create value in combined with manual labour (Alcaniz et al., 2011).

In today's world, tangible assets are less important than what it was in the past. The new economy is characterized as a service-based economy, where knowledge-based industries replace the capital-intensive industries. This has led to an increased need for skilled and educated labour forces. Moreover, the traditional financial measurements failed to evaluate the performance of those companies increasingly depending on intangible resources (Miller et al., 1999). Knowledge in the new economy has become the prominent economic resource and the most important capital instead of physical and financial capital (April, 2002; Demediuk, 2002; O'Donnell et al., 2003).

The massive growth of knowledge and information in the new economy concentrates on the necessity of managing and benefiting from knowledge-based assets in the organizations (Hamzah and Ismail, 2008). Stewart (2002) in his book *"The wealth of knowledge"* refers to three pillars of the new economy; first pillar that knowledge has become what we buy, what we sell and what we do. Second pillar that knowledge-based assets became more significant to organizations. The third one that to clarify the knowledge-based assets, we need to create a new management techniques, new strategies

and new technologies (Stewart, 2002, p. 5). The knowledge which considers as an integral part of individuals and organizations has been titled as "intellectual capital" (Demediuk, 2002; Stewart, 1997; Sullivan, 1999).

In a knowledge-based economy, which is the new economy, or known as a knowledge economy, value creation of businesses tends to be related to intangible assets rather than tangible assets (Ismail, 2009). According to Al-Ali (2003), in like economy - knowledge economy- companies' resources and capital consists of 80% of intangible resources and only 20% of companies' capital based on tangible resources. This high percentage of intangible capital refers to the importance of intellectual capital as a key component of companies' capital and resources (Al-Ali, 2003, p. 23).

In short, in the new economies, we can see the clear shift from an industrial economy, which based on tangible resources, to a knowledge-based economy, where intellectual capital is the crucial resource and the key factor of competitive advantage of the organizations.

3.6.2 Accounting Perspective

From an accounting perspective, the term "intangible assets" is mostly used to refer to the term "intellectual capital", which refers to non-physical resources and value drivers in companies that represent claims to future benefits (Abeysekera, 2008, p. 16; Marr, 2005, p. 42). Knowledge and information comprise the biggest part of the businesses' intangible value creation process. Nonetheless, the accounting discipline is facing a huge challenge on how to measure and report this knowledge (Seetharaman et al., 2002, p. 132). Therefore, in order to stay relevant in the knowledge-based economy, the accounting profession needs to put more effort to solve this challenge. This challenge comes from the fact that knowledge and information are intangible and nonphysical in nature. The traditional accounting approach, which is designed for businesses operating in the industrial economy, is still focused on financial and physical assets and mostly ignores IC assets (Zeghal and Maaloul, 2010). Interestingly, even IFRS (International Financial Reporting Standards) and IAS (International Accounting Standards), including the most recent modifications by IASB, do not participate in redefining many of the principles, concepts and valuation measures of IC assets (Zeghal and Maaloul, 2010)³. There is still a relative lack of accounting recognition of intellectual capital and its

³ The accounting regulation of IC assets can be found in IFRS 3 (business combinations), IAS 36 (impairment of assets) and IAS 38 (intangible assets).

increasing role in value creation process, which means that financial statements are not entirely beneficial or useful for shareholders and other users (Canibano et al., 2000). Moreover, according to Derun (2013), there are many problems in the accounting of intangible assets that is internally generated, where IAS 38 “Intangible Assets” does not recognize internally generated goodwill as an asset (Derun, 2013).

Several studies, conducted through the resource-based theory approach, tried to discuss the problem of accounting for IC assets. The initial studies began with identifying, representing, and classifying IC components (Edvinsson, 1997; Guthrie et al., 2004; Zeghal and Maaloul, 2010). Other studies were concerned in IC practices and reporting in annual reports of the companies (Abdolmohammadi, 2005; Liao et al., 2013; Williams, 2001). Some other studies also argued the problem of IC measurement which is not recorded in financial statements (Chen et al., 2004; Pulic, 1998; Stewart, 1997). Finally, some of the studies have investigated the relationship between the decision-making context and IC, especially in terms of the usefulness of IC to shareholders and other users in the capital market (Casta et al., 2005; Lev, 2007; Liu and Wong, 2009). Huang and Wang (2008) pointed out that, in order to measure the accurate value of the firm, both IC and financial capital should be included in financial statements. Lev ‘s definition of IC has the closest link to accounting than any other discipline. This link between IC and accounting has made it easier for more researches and debates to discuss the treatment of IC in a company's financial statements, in order to improve the usefulness of annual reporting. The recognition of IC as an asset in the financial statements would reduce the gap between market and book value of the firm as reported in its financial statements. This recognition can lead to a more credible representation of the value of the firm (Lev et al., 2005).

Therefore, despite the large number of publications exploring IC, there is still existing unsolved problems in defining IC from an accounting and economical perspective. These problems revolve around the lack of reflection of IC and its components in the balance sheet to provide useful information to users. Nowadays, the traditional financial balance sheets are increasingly seen as insufficient in reflecting the true value of the company’s due to their negligence of intangible resources, in particularly human capital. Thereby, the issues of determining the substance and the structure of IC, as well as its implications on the accounting system, needs to be further studied (Derun, 2013; Watson et al., 2005).

Edvinsson see that, there are four important new roles for accounting IC. (1) Developing an accounting information system to manage and monitor IC. (2) To work on reporting standards for IC that would be generally accepted, containing measurements, benchmarks, indexes, and policies. (3) Auditing and certifying IC. (4) Advise investors on patterns and systems for management and value creation of IC (Seetharaman et al., 2002).

3.6.3 Finance Perspective

In knowledge-based economies, where companies moved from industrial and manufacturing activities toward services-based activities, IC had become a key component of the total capital of companies. Relative to the other factors of company's capital, like monetary and physical capital, IC is seemed difficult to define, manage, measure and value in the traditional manner (Hamzah and Ismail, 2008; Lev et al., 2005; Wall et al., 2004, p. 3). However, because of IC crucial importance to a company's capabilities to create value and make its competitive advantage, more serious attempts need to be made to set and prove clear definitions, measures and valuation principles (Stahle et al., 2011; Sudarsanam et al., 2003).

Krugman (2000) says that in the past, companies invested mainly in tangible assets for production, such as machines, buildings, and materials. Therefore, the value of the company was to some extent related to its physical capital value. However, these days, companies are increasingly investing in IC (Krugman, 2000). Although the widespread recognition of the new knowledge-based economy and that the world is now in an information and technology age, nevertheless a huge number of studies, there is still no general acceptable methodology of measuring IC (Wall et al., 2004, p. 3).

Pulic (2000) argued that the current accounting system cannot meet the needs of modern companies because the core of modern companies is not the cost any more but is the value creation. He mentioned that if a company wants to maximize its profits by its given resources, management should know how effectively create value in the company. therefore the information provided by the main economic function is critical for successful management of IC (Iazzolino and Laise, 2013; Pulic, 2000).

To assess IC, as well as, the need to appropriate evaluation methods, we also need suitable financial and accounting information, where traditional financial standards do not fully and accurately convey a company's financial statements, especially in regard to human capital. One of the problems in companies that depend highly on skilled workers

is to measure their productivity. To solve this problem according to Pulic, he suggested the VAIC model which completely depends on accounting information extracted from a company's financial statements (Iazzolino and Laise, 2013). And in order to build his measure (VAIC) of Value Creation, He first created the Value-Added Income Statement as shown in table 3.2.

Table 3.2 the Value-Added Income Statement

Sales	OUT
- Costs	IN
= Value Added	VA
- Salary and wages	HC
= Structural Capital (Ebitda)	SC
- Amortization and Depreciation	A+D
= Operating Profit	P

Source: Pulic (2008); Iazzolino and Laise (2013).

4 AN ANALYSIS OF THE EFFECT OF IC ON COMPANY PERFORMANCE: APPLICATION ON BIST COMPANIES

Intellectual capital management should not be considered as a means to an end in itself but should be the main part of the function of value creation, which is the prime purpose of the organization. Intellectual capital management literature concentrates on two different, but integrated, topics of interest. One topic is external and is concerned with measuring and reporting intangible resources to stakeholders. The interest here is to clarify the strengths of the organization through setting out different approaches to evaluate the organizational knowledge. Although these approaches are helpful regarding accounting and external reporting purposes, they do not provide managers with an overall sight of the organizations' knowledge resources (Brooking, 1996b; Edvinsson and Malone, 1997; Kaplan and Norton, 1996b; Roos et al., 1997; Sveiby, 2001). The other topic is internal and is related to the management and development of knowledge. The interest here is concerned with improving the value of the organization, customers, and human resources of the company, making it an 'incubator' of intellectual capital (Andriessen, 2004; Bontis, 2001; Stewart, 1997).

The theme of intellectual capital (IC) has obtained more attention in theoretical and practical researches due to the rise of knowledge-based economies, which manifested by the replacement of the traditional production based economy (Rastogi, 2000). OECD attributes the increase interest in knowledge economies as a business and research topic due to the raised importance of IC. This debate has been strengthened by Guthrie 2001 who indicated four arguments which confirm the importance of IC (James Guthrie, 2001):

- The uprising in the information technology and the information society
- The growing importance of knowledge and knowledge-based economy
- The changing patterns of interrelationship and personal activities and the network society
- The principal determinant of competitiveness is the emergence of creativity and innovation

Petty and Guthrie stated that the modern organizations rely increasingly on information and knowledge economy which creates what is known as knowledge-based intangibles (Petty and Guthrie, 2000). Edvinsson supports this in the context of his answer

to a question, how can we be sure that intellectual capital is important and will become increasingly important in the future? He answered: “*We now live in the intangible economy. Knowledge economics is the new reality. Minds matter*”(Edvinsson, 2006, p. 18).

The high importance of IC has shown itself in a much-concerted manner, where both the U.S. stock inspection and the Swedish accounting Board recommended the companies to disclose their IC in the supplement of the annual report. The Danish government proposed a new law which constitutes that companies are obliged to report their intellectual capital (Ngwenya, 2013). In addition, Edvinsson stated that the fact remains that companies' value added nowadays comes from its intellectual or knowledge assets. Another argument is that the IC does not apply solely to one company, but it can apply universally to all companies, communities, and societies (Edvinsson, 2000).

The increasing importance of IC has attracted many researchers to study the effect of IC on firm performance which is identified as a significant research area (Swartz and Firer, 2005). Pulic refers to the importance of IC efficiency as an adequate indicator of value creation of the company (Pulic, 2004). Wang and Chang argues that IC is the basic engine of long-term corporate value and the creation of competitive advantage (Wang and Chang, 2005). Subramaniam and Youndt stated that, IC enhances business innovation capability, increases company performance, and positively affects firm capability and knowledge transfer (Subramaniam and Youndt, 2005). IC, rather than physical and financial capital, has become the main factor in firm value creation and strengthening its competitive advantage (Wang, 2011; Zeghal and Maaloul, 2010). However, despite its importance, the study of IC and its effect on firm performance is still in its beginnings (El-Bannany, 2008; Swartz and Firer, 2005).

4.1 Literature Review

The empirical researches conducted on intellectual capital started by a pioneering study conducted by Ante Pulic in 1998. Pulic created a new method (VAIC) using accounting tools to measure IC and financial performance. It widely opened the way for researchers from around the world to measure IC's efficiency for the banking sector and other economic sectors (Abdulsalam et al., 2011). To understand the essential and crucial role of IC in organizations' success and survival, previous empirical researches should be mentioned and analyzed.

The pilot research of IC conducted by Bontis (1998a) shed light on the development of some terms and measurement models relating IC and its effect on firm performance. This study showed a significant positive impact of IC on firm performance.

Luthy (1998) presented an operational definition of IC and a framework for classifying and identifying the various elements of intellectual capital. Moreover, the paper explored several methods measuring IC and its components, as well as, measurements of organizational levels.

Bontis et al. (2000) evaluated the inter-relationship among the components of intellectual capital (Human capital, Structural capital, and Customer capital) and how can these elements affect the financial performance of service and non-service companies of Malaysia. The results showed that there is a high positive association between HC and CC regardless of industry type. Moreover, the findings showed that the relationship between HC and SC is varying based on the industry sector. Furthermore, the relationship between CC and SC is homogeneous in the industry sector, and the relationship between SC and firm performance is positive regardless of industry.

Firer and Williams (2003) studied the relationship between IC and traditional measures of firm performance. They considered that IC components are human, physical, and structural capital, where profitability, productivity and market valuation are considered as the traditional measures of corporate performance. The sample of their study was collected from 75 listed companies in South Africa Stock Exchange. By using correlation test and linear multiple regression analysis they found that physical capital plays the most important role in firm performance.

Riahi-Belkaoui (2003) conducted a study on US multinational companies to examine the relationship between IC and firm performance according to resource-based⁴ and stakeholder views. The study determines IC for one given year (1991) and then examines the effect of IC on firm performance over the period of five years from (1992-1996). The results showed a positive support of resource based and stakeholder view on financial firm performance. Moreover, the findings indicated a significant positive association between IC and financial firm performance.

Li and Wu (2004) explored the relationship between IC and firm performance by applying the VAIC method on 73 Chinese public companies over the period 2001-2003.

⁴ The resource-based view states that companies could achieve a competitive advantage by managing strategic assets

They found a significant positive association of HC and SC on firm performance. However, SC is more important in affecting firm performance than HC.

Mavridis and Kyrmizoglou (2005) discussed which components of IC have effect on bank performance in Greek banking sector. The seventeen biggest banks in Greek have been analyzed over the period 1996-1999 using predictive (regression) analysis. The results showed a significant positive relationship between physical capital (CA) and value added (VA) based performance. The same results were achieved for human capital (HC) but with higher magnitude.

Cabrita and Vaz (2005) conducted their study on the Portuguese banking sector. It aimed to examine the relationship between IC and its components and bank performance. The results indicate a significant and positive relation between IC and banks performance. In addition, the study found that value creation exists when IC elements interact, which means the more interacting among IC elements, the more value is created. These results are completely compatible with the findings of a study conducted by Cabrita and Bontis (2008). They found that Portuguese banks which have more interaction among IC components have more value creation. Moreover, this study suggested that considering human capital as an important part of IC helps banks to understand how much employees can create value.

Chen et al. (2005) conducted a study on Taiwanese listed companies aimed to examine the relationship between IC (represented by VAIC and its components) and financial performance and market value. Using a regression model, the study pointed out that the IC of the firm has a significant influence on financial performance and market value of the firm.

Peng et al. (2007) investigated the association between IC and performance indicators in companies listed in Taiwanese healthcare sector. Thirty healthcare managers were questioned to find out how IC and its components can affect companies' performance. The results showed that while all IC components positively influence the performance of healthcare companies, HC plays an important role in raising its performance.

Kamath (2007) examined the impact of IC on organizational performance in the Indian banking sector over the period 2000-2004. The study used VAIC method to examine the IC and its components of Indian banks and their impact on performance by using a simple regression. The results showed a significant relation between independent (IC and its components) and dependent variables (Bank performance). Furthermore,

foreign banks showed the perfect use of HC to create value, while public banks rely on CE to achieve good performance. In addition, Kamath in 2008 conducted a study in the Indian pharmaceutical industry to investigate the relationship between IC and its components (HC, SC, and physical capital; measured by VAIC method) and firm performance (measured by profitability, productivity, and market valuation). The top 25 companies of the Indian pharmaceutical industry for the period of 1996-2006 were evaluated by applying correlation and multiple regression analyses. The findings indicated that all components of IC have influences on firm performance, especially HC, which showed the major influence on firm's profitability and productivity.

Cohen and Kaimenakis (2007) clarified the association among IC elements and indicated the effect of these elements of financial performance of service SMEs in Greece. The study tool was a questionnaire distributed on managers of SMEs in the service sector in Greece. The results showed a positive impact of IC components on SMEs performance. The results vary when compared with results extracted from large companies' surveys.

El-Bannany (2008) studied the period over 1999-2005 for the UK banking sector to point out Intellectual Capital performance determinants. Using a multiple regression analysis, the results showed that bank profitability and bank risk are significant. They also indicated that independent variables such as bank efficiency, barriers to entry, investment in IT system, and investment efficiency in intellectual capital all have positive influence on intellectual capital performance.

Hang Chan (2009b) revealed the impact of IC, as measured by Pulic's model (VAIC), on firm's financial performance, as measured by MB, ROA, ROE, and ATO. The study was conducted on all the companies included in Hang Seng Index listed on Hong Kong stock exchange over the period 2001-2005. The results of the regression analysis showed high indication of the relationship between VAIC and all financial performance measures of the firms. Moreover, the findings pointed out that physical capital still plays an important role in promoting profitability, productivity, and market valuation of the firm.

Shih et al. (2010) determined the correlation between knowledge creation and Intellectual capital in Taiwan's banking sector. The main purpose was to find the relationship between the different elements of IC and knowledge creation. The results indicated a positive and direct impact on knowledge creation and HC, and the main knowledge creators were connectivism and cognitivism. In addition, the HC performance showed a significant effect on CC and SC.

Yu et al. (2010) examined the influence of IC performance on organizational performance of companies listed on Hong Kong Stock Exchange over the period 2005-2008. VAIC method was utilized to measure IC performance, whereas four accounting ratios were used to measure organizational performance represented by MB, ROA, ROE and ATO. The results extracted from the regression analysis showed that, generally, there is no relation between VAIC and all financial indicators. However, IC components like CEE was the main factor in anticipating firm financial performance. Moreover, SCE has a positive impact on MB and ROE. Furthermore, HCE has a negative effect on firm financial performance. This means that companies listed on Hong Kong Stock Exchange still take physical and financial assets as a key resource in guiding firm success.

Yanfei et al. (2010) investigated the relationship among business culture, IC, and firm performance of randomly selected companies in China. They collected about 198 questionnaires distributed on Chinese enterprises. The results showed a significant positive impact of business culture on IC. They also showed a strong relationship between IC and firm performance, where all IC components (HC, SC, and RC) have a positive effect on firm performance. In terms of the relationship among business culture, IC, and firm performance, the findings indicated that IC plays an important role in the association between business culture and firm performance.

Zeghal and Maaloul (2010) examined the influence of IC on firms' economic, financial, and stock market performance of 300 UK companies. They divided these companies into three different sectors (High-tech, services, and traditional). The study used VAIC method to measure IC. Linear multiple regression analysis and correlation was used to find the relationship between IC and firm's financial performance. The results indicated that there is a significant positive relation between IC and economic and financial performance. Whereas, IC has a significant relation with stock market performance only in the High-tech sector. In addition, findings showed that while CE has a negative relation with economic performance, it still plays an important role in financial and stock market performance.

Sharabati et al. (2010) conducted a study in Jordan, aimed to investigate the relationship between IC and its elements (HC, SC, and RC) and firm performance. The study sample included 132 top and middle level managers of Pharmaceutical Manufacturers. The questionnaire results showed a positive impact of IC and its components on organizational performance, although SC showed the lowest influence on organizational performance in Jordanian Pharmaceutical Manufacturers.

Bin Ahmad and Mushraf (2011) examined the relationship between IC and firm performance in the Iraqi industrial companies. They used a quantitative survey distributed among 191 managers. They found a significant positive relation between IC and its components (human capital, relational capital, structural capital, and customer capital) and firm performance.

Wang (2011) evaluated the relationship between IC and its components (HC, SC, and CE) and firm performance measurements (ROA, PBR, and ATO) for the period of 2001-2008 in Taiwanese listed companies. The VAIC method was applied to measure IC performance and the OLS test was applied to analyze the relationship between elements of IC and factors of firm performance. The findings indicated that while there is a significant relation between HC and CE with firm performance, there is no influence of SC on firm performance.

Khalique et al. (2011) examined the relationship between IC components and firm performance of pharmaceutical firms registered in Pakistan Pharmaceutical Association in 2010. They used a structured questionnaire to collect the data, and they successfully collected 80 questionnaires from 150 distributed. They found a positive relationship between IC components and firm performance.

Molodchik and Bykova (2011) study 350 Russian industrial companies over the period of 2005-2007. They aimed to discuss the association between VAIC and its components (HC, SC, and physical capital) and business performance (measured by sales growth, productivity, and profitability). The results indicated that there is a positive relationship between IC and its components and business performance.

Radianito (2011) investigated the performance of IC in the Indonesian banking sector by comparing between 2007, as pre-crisis year, and 2009, as post-crisis year. Using VAIC model and multiple regression tests, the study's results indicated that IC positively affected bank performance as measured by ROA, with no regard to the period whether pre-or post-crisis.

Rehman et al. (2012) examined the impact of IC performance on the financial performance of the Pakistani banking sector over the year 2010. By using the VAIC model, they found that all components of IC (HCE, SCE, and CEE) have significant positive impact on financial performance (ROE and ROA), especially HCE, which represents 70 to 80% of value creation capabilities. In addition, this study showed a significant positive relationship between VAE and ROE and EPS.

El-Bannany (2012) explored the impact of global financial crisis on Intellectual Capital performance of the banking sector in UAE. Using multiple regression analysis over the period for 6 years between 2004-2010, the findings showed a significant impact of Global Financial Crisis on the Concentration ratio, measuring market structure and IC performance. In addition, the results indicated that independent variables (investment in IT systems, bank size, barriers to entry, bank profitability, bank risk, bank age, and bank listing age) are important and positively affecting IC performance.

Mondal and Ghosh (2012) studied empirically the relationship between IC and its components (HC, SC, and PC) and financial performance (represented by ROA and ROE, as measures of profitability, and ATO, as a measure of productivity). The paper applied Pulic's (2000a, b) VAIC method on 65 Indian banks for 10 years over the period 1999-2008. The study highlighted the importance of IC in firm profitability and productivity, and concluded that HC has a major significant impact on banks financial performance.

Hassanzadeh et al. (2012) studied 49 active companies selected from five indexes in Tehran Stock Exchange for the period of 2005-2009. The study examined the impact of IC using VAIC model on firm's financial performance (ROE, ROA, MB, Growth revenues, and Create Shareholder's value). The findings showed a negative relationship between IC and MB and ROE ratios, whereas, indicated a positive effect of ICE (HCE and CEE) on ROA. In addition, they pointed out a positive influence of SCE on Growth revenue but an insignificant relationship between CEE and Create shareholder's value. Mosavi et al. (2012) also investigated the relationship between IC and firm success in Iranian companies listed on Tehran Stock Exchange for the period over 2006-2010. The firm success was measured by financial performance (ROA, ROE, and GR) and market value (MB). Using the VAIC method and different regression models, the study indicated that the only positive relationship was between HCE and financial performance (ROE) and MB, where the other components of IC had no relationship with financial performance and market value.

Guo et al. (2012) measured the impact of IC on the performance of biotech firms listed in the US stock market over the period 1994-2005. The results indicated that there is a positive association between patents and R&D expenditure. They also showed that HCE positively affects technology innovations and financial performance.

Zehri et al. (2012) evaluated the influence of IC on firm performance using data collected from 25 non-financial firms listed on Tunisia Stock Exchange for the period of 2009-2011. They measured IC and its components (HC, SC, and CE) using the VAIC

model, while firm performance by economic, financial, and market capitalization performance. The results showed a significant positive relation between IC components and economic and financial performance of the firms, whereas, they found no significant relation between IC and stock market performance.

Kim et al. (2012) explored the inter-relationship among IC components (HC, OC, and CC) and its association with organizational performance in top-upscale hotels in Seoul, Korea. The findings indicated that HC influences both OC and CC, whereas, OC affects CC. In addition, the study found that IC components, except HC, have a direct positive impact on business performance.

Abdulai et al. (2012) examined the relationship between IC and firm performance in software companies working in West Africa. 83 software companies were surveyed by employing the PLS (Partial Least Square) model. The findings indicated a significant association between IC components and firm performance.

Mehralian et al. (2012) estimated the association between IC components (HC, SC, and PC) and the performance of pharmaceutical firms listed on pharma sector in the Iranian Stock Exchange (ISE) for the period of 2004-2009. Analyses, such as; correlation, artificial neural network (ANNs), and multiple regression models were applied to find the relationship between IC components (measured by VAIC model) and firm performance (measured by profitability, productivity, and market valuation). The results showed various associations between IC components and firm performance indicators. Although the findings indicated an impact of IC components on firm profitability, it could not find any influence of IC on productivity and market valuation. In addition, the results indicated that PC plays an important role in firm profitability.

Komnenic and Pokrajčić (2012) examined the impact of IC on the performance of a company. In addition, they clarified which of the IC components could be the driver of organizational success. The study was conducted on 37 multinational companies working in Serbia for the period of 2006-2008. They applied the VAIC model as a measure of IC components (independent variables), while the dependent variables (company performance) was represented through profitability and productivity. They used regression test to examine the association between IC and its components (HC, SC, and CE), and traditional performance measurements (ROA, ROE, and ATO) ratios. The findings indicated that there is a positive impact of HC on all three performance factors. In addition, they found a significant relationship between SC and ROE. Whereas there is no relation between HC and both ROA and ATO. These results are mostly supported by

the findings of Janošević et al. (2013) study, which was conducted on 100 Serbian companies except banks and insurance companies for the year 2010. They found a significant impact of HC and SC on ROE and ROA, whereas CE affects ROE only. The findings of the two previous studies are not compatible with the study of Dženopoljac et al. (2016), which was applied on 13,989 Serbian information communication technology (ICT) companies over the period of 2009-2013. They did not find a significant impact of IC components on firm financial performance except for CEE, which has a positive impact on financial performance, especially when using leverage and firm size as control variables.

Joshi et al. (2013) evaluated the association amongst IC components and the effect of IC and various components of financial performance of banks in the Australian Financial Sector. They used Pulic's model (VAIC) to determine the relationship among IC constituents and ROA to measure bank financial performance for the period of 2006-2008. The findings of multiple regression models showed a significant positive relation between IC and ROA. Moreover, they found that HCE plays a more important role in all Australian national banks than SCE and CEE. In addition, there is no effect of bank size, total assets, employees number, and shareholders' equity on IC performance. These findings are completely compatible with the results of the study conducted in Australia over the period of 2005-2007 by Joshi et al. (2010). The study depicted a significant relation between HC and value creation efficiency of the banks. In addition, it did not show an impact of CE and SC on value creation efficiency of Australian banks. Moreover, different results are shown when studying the impact of IC and its elements on performance of Australian listed companies over the period 2004-2008. These differences have been shown in the study conducted by Clarke et al. (2011), where it indicated that there is a positive effect of IC on firm performance, with CE more than HC. This means that Australian listed companies depend on physical and financial capital in driving their performance more than human capital. However, the previous findings by Clarke et al. (2011) is entirely incompatible with the results of Laing et al. (2010). They conducted a study on Service Companies' performance represented in hotel companies listed on the Australian Stock Exchange over the period 2004-2007. They found a significant association between HCE and ROA. In addition, they found a negative relation between CEE with ROA. This indicates that hotel companies depend on their staff contributions more than physical and financial capital.

Gigante (2013) measured IC performance in 64 banks from selected European countries over the period 2004-2007. The study examined the relationship between value creation efficiency, market valuation, and financial performance of the banks. In addition, it measured the impact of IC performance on bank profitability by using the VAIC model. The results pointed out that there is a positive relationship between IC performance and profitability, mostly in Finland. Whereas the results showed that German banks have the lowest level of IC efficiency.

Mehri et al. (2013) tested the effect of IC components (HCE, SCE, and CEE) on companies' performance (profitability, market valuation, and productivity). The study was applied on some sectors listed on Bursa Malaysia over the period 2006-2010. The results found a significant positive effect of VAIC on ROA, ROE, MB, and ATO, in general. Whereas it found diverse results for the different components of IC (HCE, SCE, and CEE).

Mention and Bontis (2013) investigated the relationship between IC and its components (HC, SC, and RC) and banks performance. The study was conducted on the banking sector within both Luxembourg and Belgium. The results showed that HC affects bank performance directly and indirectly, whereas SC and RC both have insignificant positive impact on bank performance.

Sumedrea (2013) examined how much IC structure is affecting firm performance during the crisis period in Romanian companies listed on BSE. Based on VAIC method, the findings indicated that in the crisis period HC and SC play a major role in companies' development, while financial capital is an important factor affecting firm profitability.

Fathi et al. (2013) examined the relationship between IC and its components (HC, SC, and CE) and financial firm performance represented by (ROE, ROA, and GR) of 49 Iranian listed companies in Tehran stock exchange for the period of 2001-2010. Different regression models were used to examine this relationship. The results showed a significant positive association between SC and all measures of financial performance (ROE, ROA, and GR). In addition, findings indicated a significant positive relation between (CE and HC) and (ROE and ROA). Whereas, the results could not find a significant relation between (CE and HC) and (GR). These results are fully compatible with Pouraghajan et al. (2013) study conducted in Tehran stock exchange for the period of 2006-2010. The study investigated the influence of IC on market value and firm's financial performance. They used the same variables to measure financial performance in addition to MB ratio for measuring market value. In addition to the previously mentioned

results, the findings showed a significant positive relationship between IC and market value measured by MB ratio.

Vishnu and Kumar Gupta (2014) tried to create a new model to investigate the relationship between IC and firm performance. Based on the VAIC method presented by Pulic (2004), they modified it by adding a new dimension which is Relational Capital (RC). The modified model was applied on 22 large pharmaceutical firms in India for the period of 2005-2011. The findings indicated that there is a significant positive association between IC and performance indicators. Thus the extended variable (RC) does not show any impact or any significant association with performance factors.

Holienka and Pilková (2014) investigated the impact of IC and its elements on firm performance before and after the crisis on SMEs in 10 different sectors in Slovakia. The study uses VAIC to measure IC and its components and ROA to measure SMEs performance. It uses a panel data consisting of the years 2008 (pre-crisis year) and 2011 (post-crisis year). The results showed an increase in IC performance in the post-crisis period. Furthermore, the results indicated that although IC, in general, have a significant impact on firm performance, its components showed different results regarding the crisis and sectors.

Muhammad and Ismail (2014) examined the ICE and its influence on performance in the Malaysian financial sectors. The results pointed out that the banking sector is depending on intellectual capital more than the brokerage and insurance sector companies. In addition, they indicated that IC has a significant positive relationship with firm performance (ROA). Moreover, the study pointed out that Malaysian financial sectors rely on financial and physical capital more than IC in creating market value. These results are fully consistent with Chen Goh (2005a) study which found that Malaysian banks that have good financial performance (measured by traditional economic measures), have low intellectual financial coefficients.

Berzkalne and Zelgalve (2014) investigated the impact of IC on firm value. They applied the VAIC model on 64 Baltic listed companies (Latvia, Lithuania, and Estonia) between the periods from 2005 to 2011. They found mixed results concerning the relationship between VAIC and firm value, where they found that firm value slightly rises with the increase in VAIC in both Latvia and Lithuania. Whereas this result is not applicable in Estonia.

Al-Musali and Ismail (2014) conducted a study on listed banks on Saudi Arabia Stock Exchange over the period of 2008-2010. The study investigates IC performance by

using the VAIC model and examines the influence of IC and its components on financial performance. In addition, the study investigated whether any of the IC components could be considered as a driver of bank success. The findings pointed out that although the IC performance in Saudi banks is low, it has a positive influence on the financial performance. Moreover, they found that HC can be considered as the main driver of bank success more than the other IC components.

In Turkey, the study conducted by Bozbura (2004) investigated the association between IC and its elements and market value of companies listed on Istanbul Stock Exchange. Using a survey, the study targeted 280 companies listed on Istanbul Stock Exchange. The results showed a positive relationship between HC and MB ratio. They also indicated that there is a good correlation between SC and both HC and RC.

Yalama and Coskun (2007) measured the relationship between IC performance and profitability of Turkish banks listed on Istanbul Stock Exchange (ISE) over the period 1995-2004. The study used the VAIC approach to measure IC performance and used Data Envelopment Test to measure the effect of IC on profitability. The study found that there is a positive impact of IC performance on banks profitability. Moreover, Kayali et al. (2007) examined the effect of IC on firm valuation of technology companies listed on Istanbul Stock Exchange (ISE) using correlation and multiple regression analysis. They found that technology companies listed on Istanbul Stock Exchange do not assume any regard to the importance of IC use. Another empirical study conducted in Turkey by Calisir et al. (2010) investigated the performance of IC and its components (HC, SC, and CE) in Turkish private banks for the period of 2002-2006 by applying the VAIC method. The results showed that AK Bank has the highest VAIC for all years except 2002, and it has the highest HCE and SCE for all years. While having the lowest degree of HCE, SCE, and VAIC, ADA Bank has the highest score of CEE for all the years.

Calisir et al. (2010) examined the efficiency of IC and investigated the effect of IC and its components on firm performance in Turkish Information Technology and Communication (ITC) companies quoted on Istanbul Stock Exchange over the period of 2005-2007. The findings indicated that HCE has the highest score in all companies for all years and has the highest impact on firm performance. CEE has a significant effect on both productivity and ROE.

Aras et al. (2011) tried to find a link between corporate social responsibility (CSR) and Value added intellectual coefficient (VAIC) by examining manufacturing companies

listed on ISE over the period of 2007-2008. The findings showed that there is no relationship between CSR and VAIC.

Ozkan et al. (2016) examined the relationship between IC performance and bank financial performance in 44 banks working in Turkey over the period of 2005-2014. They used VAIC method to measure IC and its components (HC, SC, and CE) and ROA ratio to represent financial performance. The results indicated that HCE affects IC performance, while CEE and HCE have a positive impact on bank financial performance. In addition, the findings showed that the highest score of VAIC was for development and investment banks.

The previous review of IC literature has shown several IC studies conducted recently to investigate its relationship with organizational financial performance, and one can clearly set that VAIC is a popular model which can be used as a measurement of IC and its components. This argument can be proved from the widespread use of VAIC method around the world in various economic sectors, such as; banking, industrial, pharmaceutical, wholesale and retail, and hospitality sectors, etc. In addition, it can be conducted in different countries.

From the above discussion of literature, it is clear that a limited number of researches were conducted in Turkey to explore the relationship between intellectual capital and firm financial performance, as compared with international studies.

The studies conducted in Turkey, which were mentioned above, did not focus on all listed companies. They focused more on the banking sector leaving out many other sectors listed on the Borsa Istanbul. Moreover, none of these studies take into consideration the crisis period and its expected effect on companies' financial performance. This gap will be discussed in the present study.

4.2 Research Methodology

This section provides an explanation of the process of gathering data regarding the sample of the study. It also defines the study variables and develops the study's hypotheses. In addition, it describes the different measurements and analyses used to investigate the relation between the study variables.

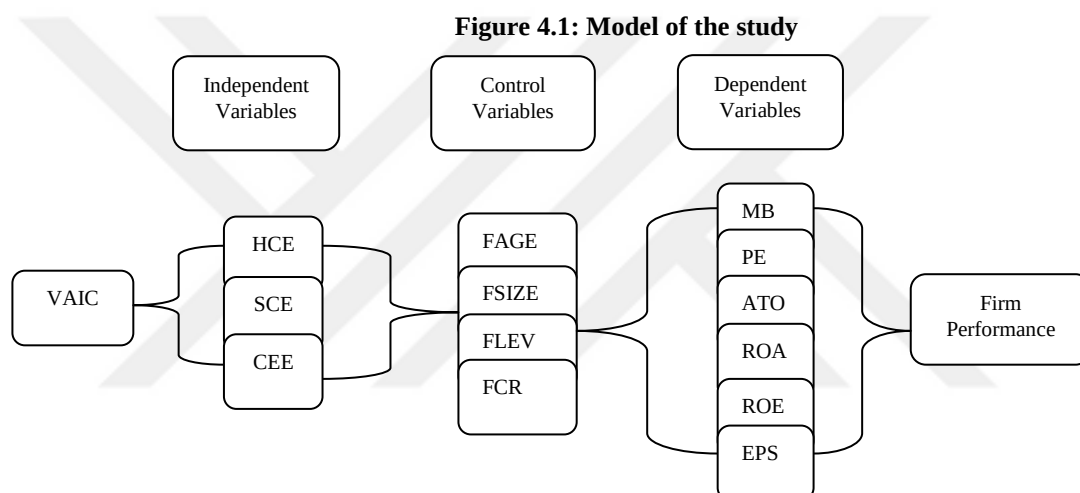
. There are three main research hypotheses derived from the study objectives. These hypotheses are listed as follows:

H1: *There is a significant positive relationship between Value Added Intellectual Capital (VAIC) and its components (HCE, SCE, and CEE) and firms' market performance (MB and PE) before and after the crisis.*

H2: *There is a significant positive relationship between Value Added Intellectual Capital (VAIC) and its components (HCE, SCE, and CEE) and firms' productivity performance (ATO) before and after the crisis.*

H3: *There is a significant positive relationship between Value Added Intellectual Capital (VAIC) and its components (HCE, SCE, and CEE) and firms' financial performance (ROA, ROE, EPS) before and after the crisis.*

The following figure 4.1 shows the model of the study.



Source: deducted by the author.

4.2.1 Sample Selection

The sample consists of 143 companies listed on Borsa Istanbul. Out of these companies, 105 are manufacturing, while the remaining are distributed over several sectors. The number of companies under each sector is given by table 4.1. Although, the number of companies traded in Borsa Istanbul is higher than 143, several companies are excluded from the data set because of missing data, limited number of companies in the sector and discontinuous listing.

Table 4.1 Sample of the study divided into sectors.

Name of Sector	NO. of Companies
Manufacturing Industry	105
Technology Sector	12
Wholesale and retail trade, hotels, and restaurants	14
Other companies	12
Total	143

Since the objective of this study is to measure the impact of IC on firm performance pre-and post the financial crisis, the study divides the research period (2004-2015) into two parts; first part refers to the pre-crisis period over 2004-2007, and second part refers to the post-crisis period over 2010-2015.

Financial data related to the study's variables are gathered from several sources (i) Finnet Analysis Expert database (main source) (ii) Companies annual reports, which are available and collected from company's websites and Borsa Istanbul's website.

4.2.2 Variables

In order to investigate the relation between IC and firm performance, IC measures are used as independent variables, while firm performance measures are used as dependent variables. In addition, several control variables are also incorporated into the analysis.

Independent variables of this study are represented by IC and its components (HC, SC, and CE). To measure IC and its components, this study applies the VAIC method which was created and developed by Pulic (1998, 2002, 2004).

According to Pulic (2004), companies can create value added by two key resources: Intellectual Capital and Capital Employed. Intellectual Capital is classified into two components; Human and Structural Capital. Whereas, Capital Employed represents both Physical and Financial Capital (Andriessen, 2004, p. 382; Pulic, 2004). Therefore, one can say that the VAIC consists of the total sum of intellectual capital efficiency (ICE) and capital employed efficiency (CEE). Hence, it can be expressed as follows (Molodchik and Bykova, 2011).

$$(4.1) \quad VAIC = ICE + CEE$$

Where; VAIC is, the Value Added Intellectual Coefficient, ICE is the intellectual capital efficiency, and CEE is the capital employed efficiency.

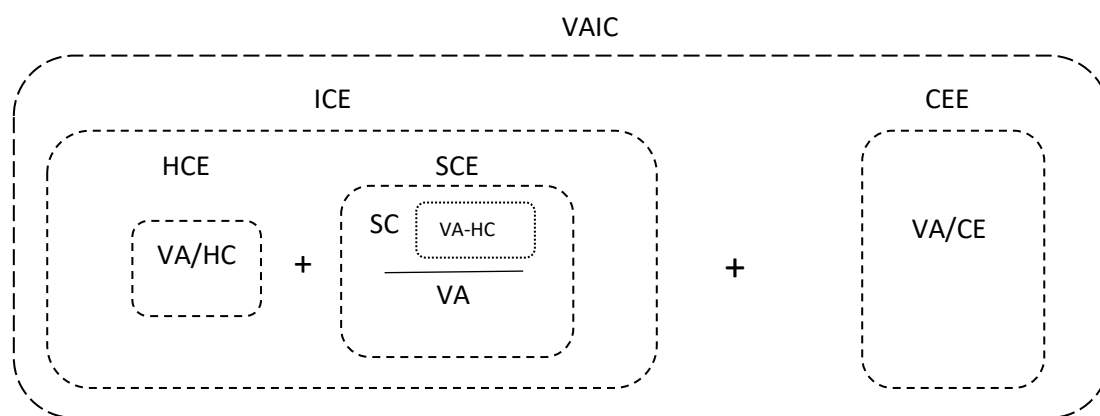
The larger the value of the VAIC, the higher the value added will be, which means, the better efficiency of all its resources (Śledzik, 2012).

ICE is calculated as the summation of human capital efficiency (HCE) and structural capital efficiency (SCE) (Pulic, 2000).

$$(4.2) \quad ICE = HCE + SCE$$

Where; ICE is the Intellectual capital efficiency, HCE is the Human capital efficiency, and SCE is the Structural capital efficiency. Figure 4.2 presents the basic components and calculation of VAIC.

Figure 4.2: VAIC formula Abbreviations



Source: Adopted from Pulic (2000)

The VAIC method is based on five basic steps. These steps are as follows (Pulic, 2000).

The first step: calculate the value added (VA) of the company

The VA of the company can be calculated as the difference between a company's output and input.

$$(4.3) \quad VA = OUTPUT - INPUT$$

Where; VA is, the value added of the company, OUTPUT refers to the revenue that represents the overall income of the company from all products and services sold on the market. INPUT refers to all expenses of resources consumed within the company except employee expenses. The employee expenses, including salaries and wages, training, and development, should be subtracted from total expenses as they cannot be considered as costs anymore and should be regarded as investments (Pulic, 1998, 2000, 2004).

Value added can also be calculated from existing information in annual reports as follows, Pulic (2004):

$$(4.4) \quad VA = OP + EC + D + A$$

Where; VA is, the value added of the company, OP is operating profit, EC is employee costs (normally, it can be found as notes of other operating expenses in the income statements), D is depreciation, and A is amortization.

The second step: calculate the human capital efficiency (HCE)

The HCE can be calculated by dividing the value added over human capital.

$$(4.5) \quad HCE = VA \div HC$$

Where; HCE refers to the Value-Added efficiency of human capital, which means how much a monetary unit invested in the employees can add value. VA is value added of the company and HC is human capital that refers to all employee expenses and other compensations that a company incurred on them for salaries and wages, training, and development. Therefore, the rate of HCE refers to how much one unit invested in HC can create value for the company. According to Pulic (2004), employee expenses are considered as the HC indicator. As mentioned above, these costs are no longer part of a company's inputs. This means all expenses related to employees will be treated as an investment, not as an expense. Moreover, employee expenses must no longer be an element of the profit and loss statement, but on the contrary, it should be considered and recognized on the balance sheet as an asset.

The third step: calculate the structural capital efficiency (SCE)

The SCE can be calculated by dividing structural capital (SC) over value added (VA). SC equal human capital (HC) deducted from value added (VA) (Pulic, 2004).

$$(4.6) \quad SCE = VA / (1 / SC) = SC \div VA$$

$$(4.7) \quad SC = VA - HC$$

Where SCE means structural capital efficiency, VA is the value added of the company, SC is structural capital, and HC is human capital.

According to Pulic (2000), the efficiency of the Structural Capital and the Human Capital is calculated in a different manner because they are reciprocal; where the lesser the share of human capital participating in the created Value Added is, the higher is the share of the Structural Capital and vice versa.

The fourth step: calculate the capital employed efficiency (CEE)

The CEE can be calculated by dividing the sum of value added (VA) over capital employed (CE).

$$(4.8) \quad CEE = VA \div CE$$

Where CEE is the capital employed efficiency of the company, VA is the value added of the company, and CE is capital employed of the company; which is the physical and financial capital of the company (i.e. book value of net assets) (Pulic, 2004).

CEE refers to how much one monetary unit invested in capital employed can add value to the company. According to Pulic (1998), if one unit of CE produced returns higher than any other company, that means the company has a better use of its CE.

Finally, in order to enable the comparison between overall efficiency value creations, all three efficiency indicators (HCE, SCE, and CEE) need to be gathered.

$$(4.9) \quad VAIC = HCE + SCE + CEE$$

Where VAIC is value added intellectual coefficient, HCE is human capital efficiency, SCE is structural capital efficiency, and CEE is capital employed efficiency.

The dependent variables of the study are divided into three key components: Firms' Market Performance, Firms' Financial Performance and Firms' Productivity performance. Market performance measured by Price-Earnings ratio (PE) and Market to Book value (MB), financial performance benchmarks include Return on Assets (ROA), Return on Equity (ROE), and Earning per Share (EPS), and productivity performance is represented by Assets Turnover (ATO).

Market performance's relationship with IC has been examined through the utilization of the VAIC method by many researchers. Some of them (Bozbura, 2004; Chen et al., 2005; Jafari, 2013; Mavridis, 2004; Mavridis and Kyrmizoglou, 2005; Pulic, 2000) found total or partial positive relationships between IC and firm's market performance. Some other (Dženopoljac et al., 2016; Firer and Williams, 2003; Maditinos et al., 2011; Mehralian et al., 2012; Tan et al., 2007) did not find any relation between IC and market performance. The results of this study will support or deny the findings of previous studies in terms of the existence of a relationship between IC and firm's market performance, or

lack thereof. In order to measure the effect of IC on market performance, two benchmark ratios are selected: market to book (MB) ratio and price-earnings (PE) ratio.

The MB ratio is calculated by dividing Market capitalization of the company's shares over Book value of the shareholder's capital

$$(4.10) \quad MB = \frac{\text{Market Capitalization}}{\text{Book Value}}$$

The PE ratio is calculated by dividing Market Value per Share over Earnings per Share

$$(4.11) \quad PE = \frac{\text{Market Value per share}}{\text{Earning per share}}$$

Productivity performance's relationship with IC has been examined through the utilization of the VAIC method by a limited number of researchers. Some of them (Chen et al., 2005; Mavridis and Kyrmizoglou, 2005; Kamath, 2008) found a positive relationships between IC and firm's productivity performance. Some other (Dženopoljac et al., 2016; Clarke et al., 2011; Mehralian et al., 2012; Bontis et al., 2015) did not find any relation between IC and productivity performance. The results of this study will support or deny the findings of previous studies in terms of the existence of a relationship between IC and firm's productivity performance, or lack thereof. The Asset Turnover (ATO) ratio will be utilized for this purpose.

Asset Turnover Ratio is calculated by dividing total revenue by total book value of assets.

$$(4.12) \quad ATO = \frac{\text{Total Revenue}}{\text{Total Book Value}}$$

Financial performance's relationship with IC has been also examined through the utilization of the VAIC method by many researchers. Some of them (Bozbura, 2004; Chen et al., 2005; Jafari, 2013; Mavridis, 2004; Mavridis and Kyrmizoglou, 2005; Pulic, 2000) found total or partial positive relationships between IC and firm's financial performance. Some other (Dženopoljac et al., 2016; Firer and Williams, 2003; Maditinos et al., 2011; Mehralian et al., 2012; Tan et al., 2007) did not find any relation between IC and financial performance. The results of this study will support or deny the findings of previous studies in terms of the existence of a relationship between IC and firm's financial performance,

or lack thereof. Three ratios will be utilized to analyze the effect of IC on financial performance. These ratios are return on assets (ROA), return on equity (ROE), and earnings per share (EPS).

Return on Assets ratio is one of the traditional accounting ratios used to evaluate firm's profitability. It can be calculated by dividing firm's net income over total assets of the firm.

$$(4.13) \quad ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

Return on Equity ratio measures firm profitability by showing how much profit a firm creates from shareholder's investments.

$$(4.14) \quad ROE = \frac{\text{Net Income}}{\text{Total Equity}}$$

Earnings per share is one of the indicators of a firm's profitability. It is the value of income earned in a financial period for each of the outstanding shares. It can be calculated as follows:

$$(4.15) \quad EPS = \frac{(\text{Net Income} - \text{Preferred Dividends})}{\text{Average Outstanding Shares}}$$

This study uses an empirical approach to examine the impact of IC and its components on firm performance. For this purpose, the study uses four control variables have been included to isolate the impact of intellectual capital. These variables are firm age (FAGE), firm size (FSIZE), firm leverage (FLEV), and current ratio (FCR).

Firm age represents the age of the company from its establishment time. Most researches use firm age as an independent variable in order to find its relationship with intellectual capital disclosure (Ferchichi and Paturel, 2013).

Firm size is represented as the natural log of total market capitalization. Several studies used firm size as a control variable (Boujelbene and Affes, 2013; Firer and Williams, 2003; Hatane and sany, 2014; Joshi et al., 2013; Kamath, 2015; Pasaribu et al., 2012; Swartz and Firer, 2005; Yu et al., 2010).

Financial leverage of the firm is measured by dividing total debt by book value of total assets. This factor is used also as a control variable by many previous studies

(Boujelbene and Affes, 2013; Firer and Williams, 2003; Hatane and sany, 2014; Joshi et al., 2013; Kamath, 2015; Pasaribu et al., 2012; Swartz and Firer, 2005; Yu et al., 2010).

The current ratio of the firm is calculated by dividing current assets by current liabilities. This factor is used in this study as a control variable since the intellectual capital literature did not mention the use of this factor before.

Table 4.2 Summary of all variables used in the study

Variables	Abbreviation	Equation
Independent Variables		
Human Capital Efficiency	HCE	VA/HC
Structural Capital Efficiency	SCE	SC/VA
Capital Employed Efficiency	CEE	VA/CE (CE = Total Assets – Intangible Assets)
Value Added Intellectual Coefficient	VAIC	HCE+SCE+CEE
Dependent Variables		
Market to Book value	MB	Market Capitalization/Book Value
Price-Earnings ratio	PE	Market value per share/Earning per share
Assets Turn Over	ATO	Total Revenue/Total Book Value
Return on Assets	ROA	Net Income/Total Assets
Return on Equity	ROE	Net Income/Total Equity
Earnings per Share	EPS	(Net Income-Preferred Dividends) / (Average Outstanding Shares)
Control Variables		
Firm Age	FAGE	Age of the company from its establishment time
Firm Size	FSIZE	Log of firm's total assets
Firm Leverage	FLEV	Total debt / Total assets
Firm Current Ratio	FCR	Current assets/ Current Liabilities

4.2.3 Study Model

To achieve the objectives of the study, a general regression model was used as follows:

$$(4.16) \quad Y_{it} = \beta + \beta_1 X_{it} + \beta_2 C_{it} + \varepsilon$$

Where Y_{it} represents the dependent variables (MB, PE, ATO, ROA, ROE, and EPS), X_{it} represents the independent variables (HCE, SCE, CEE, and VAIC), and C_{it} represents the control variables (FAGE, FSIZE, FLEV, and FCR).

This general regression model was applied 23 different times to examine the relationship between IC and its components and market, financial, and productivity performance. The following table 4.3 summarizes the different models used. Model 1 examines the relation between IC components and firm performance, while Model 2 examines the relation between VAIC and firm performance. Such model can be written as follows:

$$(4.17) \quad \text{Model 1 } Y_{it} = \beta + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 C_{it} + \varepsilon$$

$$(4.18) \quad \text{Model 2 } Y_{it} = \beta + \beta_1 VAIC + \beta_2 C_{it} + \varepsilon$$

The relation between variables were analyzed firstly by the use of the pooled OLS regression. Then to examine the appropriateness of the OLS method of analysis, the panel diagnostics test was applied.

This diagnostic test helps to choose whether the pooled OLS or the fixed or random models are more appropriate for the data. In order to decide which method of analysis to be used in each analysis, the panel diagnosis tests handle Hausman test, Breusch-Pagan test and F tests. Table 4.4 summarizes the analyses methods used for each dependent variable and model.



Table 4.3 Summary of regression models

Relationship	Model	Y_{it}	X_{it}	C_{it}
IC and market performance	Model 1 (IC Components as independent variables)	MB	HCE SCE CEE	FAGE FSIZE FLEV FCR
		PE	HCE SCE CEE	FAGE FSIZE FLEV FCR
	Model 2 (VAIC as independent variable)	MB	VAIC	FAGE FSIZE FLEV FCR
		PE	VAIC	FAGE FSIZE FLEV FCR
IC and productivity performance	Model 1 (IC Components as independent variables)	ATO	HCE SCE CEE	FAGE FSIZE FLEV FCR
	Model 2 (VAIC as independent variable)	ATO	VAIC	FAGE FSIZE FLEV FCR
IC and financial performance	Model 1 (IC Components as independent variables)	ROA	HCE SCE CEE	FAGE FSIZE FLEV FCR
		ROE	HCE SCE CEE	FAGE FSIZE FLEV FCR
		EPS	HCE SCE CEE	FAGE FSIZE FLEV FCR
	Model 2 (VAIC as independent variable)	ROA	VAIC	FAGE FSIZE FLEV FCR
		ROE	VAIC	FAGE FSIZE FLEV FCR
		EPS	VAIC	FAGE FSIZE FLEV FCR

Table 4.4 Panel diagnostic results

	IC components						VAIC					
	MB	PE	ATO	ROA	ROE	EPS	MB	PE	ATO	ROA	ROE	EPS
All companies with dummy variables*	Random	Fixed	Fixed	Random	Random	Random	Random	Fixed	Fixed	Fixed	Fixed	Random
All companies pre-crisis period	Random	OLS	Fixed	Fixed	Fixed	Random	Random	OLS	Fixed	Fixed	Fixed	Fixed
All companies post-crisis period	Random	Random	Fixed	Fixed	Random	Random	Random	Random	Fixed	Fixed	Fixed	Random
Manufacturing companies with dummy variables**	Random	Fixed	Fixed	Random	Random	Random	Random	Fixed	Fixed	Random	Random	Random
Manufacturing companies pre-crisis period	Random	OLS	Fixed	Fixed	Fixed	Random	Random	OLS	Fixed	Fixed	Fixed	Fixed
Manufacturing companies post-crisis period	Random	Fixed	Fixed	Fixed	Fixed	Random	Random	Random	Fixed	Fixed	Fixed	Random

* All companies with dummy variables include all observations, assigning a dummy variable for the period of the crisis (2008-2009)

** Manufacturing companies with dummy variables include all observations for the manufacturing sector, assigning a dummy variable for the period of the crisis (2008-2009)

4.3 Data Analysis

To achieve the study's objectives for measuring the relationship between intellectual capital and firm performance, the study uses a mixture of panel data methods including pooled ordinary least squared, fixed and random effect models. (As mentioned earlier in table 4.4). The analysis aims to (i) explore the crisis effect on IC performance, (ii) investigate the impact of IC on firm performance before and after crisis. The analysis was applied using the Gretl program.

4.3.1 Descriptive Statistics

Descriptive statistics of variables are presented in table 4.5. Table 4.5 shows that the VAIC and its components namely HCE, SCE, and CEE have a respective mean value of 7.14, 6.27, 0.76, and 0.12 respectively. According to this result, one can say that HC is the most effective component in the issue of value creation than SCE and CEE for the study period.

The market performance variables (MB and PE ratios) have a respective mean value of 1.91 and 10.18 respectively. The productivity performance variable (ATO) shows a mean value of 1.10. Regarding financial performance ratios (ROA, ROE, and EPS), they show a mean value of 0.04, 8.12, and 0.76 respectively. The standard deviation for the independent variables is the highest in HCE, while for the dependent variables, PE and ROE ratios show the highest values.

Table 4.5 Summary statistics of all study variables

Variable	No. of obs.	Mean	Std. Dev.	C.V.	Minimum	Maximum	Skewness	Ex. kurtosis
HCE	143	6.27	4.86	0.78	0.00	44.71	3.06	14.78
SCE	143	0.76	0.45	0.59	-5.61	9.37	2.52	145.77
CEE	143	0.12	0.58	4.95	-6.03	4.16	-2.11	23.29
VAIC	143	7.14	5.07	0.71	-5.54	45.86	2.75	12.95
MB	143	1.91	2.44	1.28	0.00	33.45	5.87	48.79
PE	143	10.18	10.93	1.07	0.00	68.82	1.71	3.84
ATO	143	1.10	0.81	0.74	0.00	6.55	2.48	9.42
ROA	143	0.04	0.09	2.10	-0.59	0.58	-0.09	5.16
ROE	143	8.12	17.52	2.16	-79.58	80.22	-0.43	2.66
EPS	143	0.76	2.18	2.88	-11.01	32.38	5.59	55.64
FAGE	143	35.60	13.71	0.39	0.00	82.00	-0.13	-0.11
FSIZE	143	19.40	1.83	0.09	12.04	24.47	-0.24	0.91
FLEV	143	1.36	2.10	1.54	0.02	49.98	9.43	176.64
FCR	143	2.46	3.23	1.31	0.03	70.59	9.48	151.54

HCE is human capital efficiency, SCE is structural capital efficiency, CEE is capital employed efficiency, MB is market to book ratio, PE is price-earnings ratio, ATO is assets turnover, ROA is return on assets, ROE is return on equity, EPS is earnings per share, FAGE is firm age, FSIZE is firm size, FLEV is firm leverage, FCR is firm current ratio

4.3.2 Correlation Analysis

Correlation analysis was performed to realize the nature of the relationships between the independent variables (HCE, SCE, CEE, and VAIC), dependent variables (MB, PE, ATO, ROA, ROE, and EPS), and control variables (FAGE, FSIZE, FLEV, and FCR). The results are shown in Table 4.6.

Table 4.6 shows that HCE has a significant relationship with other components of IC; SCE, CEE, and VAIC at 0.05 level. In addition, HCE has a significant positive association with all dependent variables of sample companies except MB where it has a significant negative relation. Furthermore, the results show that HCE has a significant positive relation with three control variables (FAGE, FSIZE, and FCR), while it has a significant negative relation with FLEV.

SCE has a significant relationship with other components of IC; HCE, CEE, and VAIC at 0.05 level. Therefore, SCE has a significant association with all dependent variables PE, ATO, ROA, ROE, and EPS ratios of the study's dependent variables except MB where it has a significant negative relation. Moreover, the results show that SCE has a significant positive relation with two control variables (FAGE and FSIZE, while it has a significant negative relation with FLEV and FCR.

CEE has a significant relationship with other components of IC; HCE, SCE, and VAIC at 0.05 level. In addition, it has a significant positive relation all variables of sample companies except ATO where it has a significant negative relation.

VAIC has a significant relationship with other components of IC; HCE, SCE, and CEE at 0.05 level. In addition, it has a significant positive relation with all variables of sample companies except MB and FLEV where it has a significant negative relation.

Table 4.6 Correlation coefficients between variables

	HCE	SCE	CEE	VAIC	MB	PE	ATO	ROA	ROE	EPS	FAGE	FSIZE	FLEV	FCR
HCE	1	0.2632	0.0601	0.9895	-0.0304	0.0451	0.0133	0.403	0.3365	0.2109	0.0207	0.1166	-0.0885	0.0369
SCE		1	0.0402	0.3459	-0.0295	0.0622	0.0573	0.2141	0.1922	0.0846	0.0151	0.1322	-0.0035	-0.0746
CEE			1	0.176	0.0603	0.0546	-0.0578	0.0684	0.0179	0.0368	0.1217	0.0057	0.0571	0.0092
VAIC				1	-0.0249	0.0551	0.0111	0.4134	0.3419	0.214	0.0351	0.1242	-0.0787	0.0298
MB					1	0.1302	0.1411	0.02	0.0718	0.0576	0.051	0.0304	0.2621	-0.0431
PE						1	0.0659	0.1743	0.216	0.1364	0.0501	0.1435	-0.0728	0.0379
ATO							1	0.1289	0.2622	0.0732	-0.1017	0.3954	0.1855	-0.1755
ROA								1	0.8221	0.4503	0.1271	0.2025	-0.308	0.1821
ROE									1	0.4093	0.0713	0.2772	-0.2045	0.0833
EPS										1	0.1703	0.1302	-0.1417	0.0704
FAGE											1	0.2881	-0.0403	-0.1046
FSIZE												1	0.1443	-0.2998
FLEV													1	-0.2264
FCR														1

Correlation Coefficients, significant at the 5% critical value (two-tailed) = 0.0473

HCE is human capital efficiency, SCE is structural capital efficiency, CEE is capital employed efficiency, MB is market to book ratio, PE is price-earnings ratio, ATO is assets turnover, ROA is return on assets, ROE is return on equity, EPS is earnings per share, FAGE is firm age, FSIZE is firm size, FLEV is firm leverage, FCR is firm current ratio.

4.3.3 Intellectual Capital and Firm Performance

This section presents the results of the regression analyses. The analyses are divided into six categories; (i) Analysis for all companies with a dummy variable for the period of the crisis (2008-2009), (ii) Analysis for all companies for the pre-crisis period (2004-2007), (iii) Analysis for all companies for the post-crisis period (2010-2015), (iv) Analysis for manufacturing companies with a dummy variable separating the period of the crisis (2008-2009), (v) Analysis for manufacturing companies for the pre-crisis period (2004-2007), (vi) Analysis for manufacturing companies for the post-crisis period (2010-2015).

4.3.3.1 All Companies with Crisis Dummy

This analysis examines the relation between IC and market, productivity, and financial performances for all the companies within the sample, while assigning a dummy variable for the crisis period from 2008 till 2009. The goal of considering crisis period as dummy variables is to isolate the impact of the crisis on the dependent variables and study the direct effect of independent variables on dependent variables.

4.3.3.1.1 Intellectual Capital and Market Performance

Market performance of a company is measured by two benchmark ratios namely MB and PE. Table 4.7 presents the relation between IC and MB for all companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on MB for the two models, where during the crisis period MB value decreased by 44.2% and 42.9%, respectively. In addition, only CEE shows a significant positive impact on MB in Model 1. While in Model 2, only FLEV shows a positive significant effect on MB. Moreover, the findings depict an insignificant effect of VAIC and its components (HCE and SCE) on MB.

Table 4.8 presents the relation between IC and PE for all companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on PE for the two models, where during the crisis period PE value decreased by 414.3% and 410.4%, respectively. In addition, FAGE and FSIZE show a significant positive impact on PE in Model 1, while, FLEV shows a significant negative impact on PE. The results are the same for Model 2. Moreover, the findings depict an insignificant effect of VAIC and its components (HCE, SCE, and CEE) on PE.

Table 4.7 IC and MB with crisis dummy (All companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>
const	1.419	1.813	0.783	0.434	const	1.119	1.832	0.611	0.541
HCE	0.010	0.012	0.808	0.419	VAIC	0.015	0.011	1.343	0.179
SCE	-0.062	0.057	-1.088	0.276	FAGE	0.015	0.014	1.077	0.281
CEE	0.318	0.088	3.620	0.000***	FSIZE	-0.007	0.110	-0.067	0.946
FAGE	0.010	0.015	0.671	0.502	FLEV	0.269	0.161	1.671	0.094*
FSIZE	-0.010	0.111	-0.092	0.927	FCR	0.004	0.014	0.314	0.754
FLEV	0.264	0.161	1.642	0.101	Crisis	-0.429	0.146	-2.948	0.003***
FCR	0.002	0.013	0.154	0.878					
Crisis	-0.442	0.146	-3.035	0.002***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.8 IC and PE with crisis dummy (All companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-27.758	9.588	-2.895	0.004***	const	-25.921	9.092	-2.851	0.005***
HCE	-0.121	0.082	-1.481	0.141	VAIC	-0.080	0.081	-0.993	0.322
SCE	0.771	0.493	1.563	0.120	FAGE	0.267	0.093	2.874	0.004***
CEE	0.166	0.707	0.235	0.815	FSIZE	1.447	0.490	2.956	0.003***
FAGE	0.243	0.099	2.465	0.014**	FLEV	-0.335	0.143	-2.347	0.020**
FSIZE	1.564	0.522	2.999	0.003***	FCR	0.096	0.169	0.568	0.571
FLEV	-0.334	0.143	-2.337	0.020**	Crisis	-4.104	0.629	-6.521	0.000***
FCR	0.105	0.169	0.620	0.536					
Crisis	-4.143	0.638	-6.487	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.1.2 Intellectual Capital and Productivity Performance

Productivity performance of a company is measured by ATO ratio. Table 4.9 presents the relation between IC and ATO for all companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on ATO for the two models, where during the crisis period ATO value decreased by 5.9% and 6.2%, respectively. In addition, SCE and FSIZE show a significant positive impact on ATO in Model 1, while FAGE and FLEV show a significant negative impact on ATO. Whereas in Model 2, only FSIZE shows a positive significant effect on ATO, while FAGE and FLEV show a significant negative impact on ATO. Moreover, the findings depict an insignificant effect of VAIC and its components (HCE and CEE) on ATO.

Table 4.9 IC and ATO with crisis dummy (All companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-3.544	1.574	-2.252	0.025**	const	-3.324	1.62592	-2.044	0.042**
HCE	0.005	0.004	1.443	0.1512	VAIC	0.006	0.003	1.631	0.105
SCE	0.069	0.037	1.879	0.062*	FAGE	-0.048	0.012	-4.153	0.000***
CEE	-0.058	0.051	-1.153	0.250	FSIZE	0.318	0.104	3.066	0.002***
FAGE	-0.047	0.010	-4.805	0.000***	FLEV	-0.014	0.007	-2.064	0.040**
FSIZE	0.324	0.096	3.372	0.001***	FCR	-0.009	0.006	-1.533	0.127
FLEV	-0.013	0.006	-2.008	0.046**	Crisis	-0.062	0.020	-3.082	0.002***
FCR	-0.008	0.0054	-1.495	0.1371					
Crisis	-0.059	0.020	-2.958	0.003***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.1.3 Intellectual Capital and Financial Performance

Financial performance of a company is measured by three benchmarks, namely, ROA, ROE, and EPS ratio. Table 4.10 presents the relation between IC and ROA for all companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on ROA for the two models, where during the crisis period ROA value decreased by 2.6% and 2.5%, respectively. In addition, all IC components, FSIZE, and FCR show a significant positive impact on ROA in Model 1, while FLEV shows a significant negative impact on ROA. Whereas in Model 2, VAIC and FCR show a positive significant effect on ROA, while FLEV shows a significant negative impact on ROA.

Table 4.11 presents the relation between IC and ROE for all companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on ROE for the two models, where during the crisis period ROE value decreased by 435.9% and 439%, respectively. In addition, HCE, SCE, FSIZE, and FCR show a significant positive impact on ROE in Model 1, while FLEV shows a significant negative impact on ROE. Whereas in Model 2, VAIC and FCR show a positive significant effect on ROE, while FLEV shows a significant negative impact on ROE.

Table 4.10 IC and ROA with crisis dummy (All companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-0.206	0.049	-4.226	0.000***	const	-0.084	0.129	-0.656	0.512
HCE	0.006	0.001	6.397	0.000***	VAIC	0.006	0.001	6.786	0.000***
SCE	0.020	0.008	2.588	0.009***	FAGE	0.002	0.001	1.533	0.128
CEE	0.008	0.003	2.608	0.009***	FSIZE	0.002	0.008	0.234	0.816
FAGE	0.001	0.000	1.621	0.105	FLEV	-0.009	0.002	-4.584	0.000***
FSIZE	0.010	0.003	3.630	0.000***	FCR	0.004	0.002	1.666	0.098*
FLEV	-0.010	0.002	-5.047	0.000***	Crisis	-0.025	0.004	-5.748	0.000***
FCR	0.005	0.002	1.833	0.066*					
Crisis	-0.026	0.005	-5.675	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.11 IC and ROE with crisis dummy (All companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-43.527	9.119	-4.773	0.000***	const	-6.241	17.978	-0.347	0.729
HCE	0.962	0.147	6.524	0.000***	VAIC	1.102	0.163	6.765	0.000***
SCE	3.316	1.335	2.484	0.013**	FAGE	0.246	0.155	1.588	0.115
CEE	0.700	0.699	1.002	0.317	FSIZE	-0.040	1.022	-0.039	0.968
FAGE	0.005	0.071	0.074	0.941	FLEV	-1.322	0.663	-1.995	0.047**
FSIZE	2.280	0.538	4.238	0.000***	FCR	0.428	0.257	1.667	0.097*
FLEV	-1.423	0.627	-2.270	0.023**	Crisis	-4.390	0.778	-5.642	0.000***
FCR	0.516	0.272	1.896	0.058*					
Crisis	-4.359	0.790	-5.521	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.12 presents the relation between IC and EPS for all companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on EPS for the two models, where during the crisis period EPS value decreased by 38.2%. In addition, HCE, SCE, FAGE, FSIZE, and FCR show a significant positive impact on ROE in Model 1, while FLEV shows a significant negative impact on EPS. Whereas in Model 2, VAIC, FAGE, and FSIZE show a positive significant effect on EPS, while FLEV shows a significant negative impact on EPS.

Table 4.12 IC and EPS with crisis dummy (All companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>
const	−3.253	1.109	−2.933	0.003***	const	−3.161	1.111	−2.844	0.004***
HCE	0.087	0.029	2.986	0.002***	VAIC	0.088	0.028	3.172	0.001***
SCE	0.160	0.090	1.774	0.076*	FAGE	0.022	0.010	2.257	0.024**
CEE	0.053	0.066	0.812	0.417	FSIZE	0.135	0.051	2.651	0.008***
FAGE	0.022	0.010	2.282	0.022**	FLEV	−0.106	0.027	−3.892	0.000***
FSIZE	0.137	0.051	2.658	0.007***	FCR	0.040	0.025	1.640	0.101
FLEV	−0.106	0.027	−3.870	0.000***	Crisis	−0.382	0.112	−3.410	0.000***
FCR	0.041	0.025	1.674	0.094*					
Crisis	−0.382	0.113	−3.377	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.2 All Companies for Pre-and Post-Crisis

This analysis examines the relation between IC and market, productivity, and financial performances for all the companies within the sample. The main goal of this analysis is to compare between the effect of IC on firm performance before and after the crisis. The pre-crisis period is designated between 2004 and 2007, while the post-crisis period is designated between 2010 and 2015.

4.3.3.2.1 Intellectual Capital and Market Performance

Market performance of a company is measured by two benchmark ratios namely MB and PE. Table 4.13 presents the relation between IC and MB for all companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, indicate that CEE, FAGE, FLEV, and FCR have a significant positive relation with MB. Whereas, Model 2 results show a significant positive relation between VAIC, FAGE, FLEV, and FCR with MB for the same period.

On the other hand, the results of the post-crisis period for Model 1 and 2 show a significant negative relation between FCR and MB.

Table 4.13 IC and MB for Pre-and Post-Crisis (All companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	0.726	1.577	0.460	0.645	const	0.756	1.565	0.483	0.629
HCE	0.016	0.010	1.591	0.112	VAIC	0.019	0.010	1.907	0.056*
SCE	-0.089	0.072	-1.254	0.210	FAGE	0.032	0.009	3.741	0.000***
CEE	0.135	0.059	2.284	0.022**	FSIZE	-0.063	0.072	-0.887	0.375
FAGE	0.030	0.009	3.358	0.000***	FLEV	0.743	0.095	7.795	0.000***
FSIZE	-0.050	0.073	-0.6943	0.488	FCR	0.107	0.031	3.433	0.000***
FLEV	0.736	0.097	7.577	0.000***					
FCR	0.096	0.035	2.744	0.006***					
Post-Crisis									
const	1.904	2.298	0.828	0.408	const	1.577	2.093	0.753	0.451
HCE	0.014	0.011	1.250	0.211	VAIC	0.000	0.014	0.024	0.981
SCE	-0.141	0.165	-0.855	0.393	FAGE	0.007	0.017	0.415	0.678
CEE	-0.338	0.257	-1.316	0.188	FSIZE	0.010	0.118	0.087	0.931
FAGE	0.008	0.017	0.494	0.621	FLEV	0.087	0.091	0.958	0.338
FSIZE	-0.004	0.128	-0.031	0.975	FCR	-0.039	0.024	-1.675	0.093*
FLEV	0.091	0.090	1.016	0.309					
FCR	-0.042	0.023	-1.813	0.069*					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.14 IC and PE for Pre-and Post-Crisis (All companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	-9.229	6.396	-1.442	0.152	const	-7.434	6.550	-1.135	0.259
HCE	-0.058	0.057	-1.027	0.306	VAIC	0.034	0.054	0.63	0.530
SCE	3.130	1.400	2.236	0.027**	FAGE	0.077	0.044	1.762	0.081*
CEE	1.558	0.622	2.505	0.013**	FSIZE	0.774	0.346	2.234	0.027**
FAGE	0.068	0.043	1.585	0.116	FLEV	-0.919	0.305	-3.016	0.003***
FSIZE	0.800	0.350	2.283	0.024**	FCR	0.008	0.244	0.033	0.974
FLEV	-1.033	0.305	-3.388	0.001***	Adj. R2			0.036	
FCR	-0.017	0.236	-0.073	0.941					
Adj. R2		0.051							
Post-Crisis									
const	-7.895	6.531	-1.209	0.227	const	-7.247	6.633	-1.093	0.275
HCE	0.022	0.103	0.213	0.831	VAIC	0.062	0.103	0.601	0.548
SCE	0.855	0.866	0.988	0.323	FAGE	-0.039	0.047	-0.845	0.398
CEE	0.453	0.853	0.531	0.596	FSIZE	1.008	0.354	2.849	0.004***
FAGE	-0.040	0.046	-0.874	0.382	FLEV	-0.348	0.164	-2.123	0.033**
FSIZE	1.019	0.356	2.865	0.004***	FCR	0.463	0.301	1.538	0.124
FLEV	-0.353	0.161	-2.195	0.028**					
FCR	0.479	0.299	1.602	0.109					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.14 presents the relation between IC and EP for all companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, show that SCE, CEE, and FSIZE have a significant positive relation with PE. While, on the other hand, FLEV has a significant negative relation with PE. Whereas, Model 2 results show a significant positive relation between FAGE and FSIZE with PE, and a significant negative relation with FLEV for the same period.

In contrast, the results of the post-crisis period for Model 1 and 2 show a significant positive relation between FSIZE and PE, and a significant negative relation between FLEV and PE.

4.3.3.2.2 Intellectual Capital and Productivity Performance

Productivity performance of a company is measured by ATO ratio. Table 4.15 presents the relation between IC and ATO for all companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, indicate that HCE and FSIZE have a significant positive relation with ATO. While, on the other hand, CEE and FAGE have a significant negative relation with ATO. Whereas, Model 2 results show a significant positive relation between FSIZE and ATO, and a significant negative relation with FAGE for the same period.

Table 4.15 IC and ATO for Pre-and Post-Crisis (All companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	-9.816	0.930	-10.556	0.000***	const	-9.695	0.980	-9.889	0.000***
HCE	0.009	0.005	1.876	0.063*	VAIC	0.005	0.004	1.333	0.185
SCE	0.040	0.028	1.459	0.148	FAGE	-0.074	0.015	-4.886	0.000***
CEE	-0.079	0.037	-2.143	0.034**	FSIZE	0.705	0.051	13.801	0.000***
FAGE	-0.059	0.013	-4.710	0.000***	FLEV	0.016	0.011	1.491	0.139
FSIZE	0.6811	0.045	15.148	0.000***	FCR	-0.087	0.053	-1.649	0.102
FLEV	0.0181	0.011	1.610	0.110					
FCR	-0.080	0.050	-1.622	0.107					
Post-Crisis									
const	-2.040	0.732	-2.789	0.006***	const	-1.912	0.849	-2.251	0.025**
HCE	0.005	0.003	1.940	0.054*	VAIC	0.009	0.003	2.589	0.010**
SCE	0.034	0.052	0.664	0.508	FAGE	-0.033	0.009	-3.735	0.000***
CEE	0.117	0.053	2.188	0.030**	FSIZE	0.212	0.056	3.822	0.000***
FAGE	-0.033	0.008	-4.179	0.000***	FLEV	-0.008	0.004	-1.822	0.070*
FSIZE	0.219	0.047	4.611	0.000***	FCR	-0.000	0.004	-0.111	0.912
FLEV	-0.009	0.004	-2.406	0.017**					
FCR	0	0.004	-0.016	0.987					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, CEE, and FSIZE on ATO. The results also show a significant negative effect of FAGE and FLEV on ATO. However, the Model 2 results, for the same period, show a significant positive effect of VAIC and FSIZE, and a significant negative effect of FAGE and FLEV on ATO.

4.3.3.2.3 Intellectual Capital and Financial Performance

Financial performance of a company is measured by three benchmark ratios, namely, ROA, ROE and EPS. Table 4.16 presents the relation between IC and ROA for all companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, state that HCE, CEE, FSIZE, and FCR have a significant positive relation with ROA. Whereas, Model 2 results show a significant positive relation between VAIC, FAGE, FSIZE, and FCR with ROA for the same period.

Table 4.16 IC and ROA for Pre-and Post-Crisis (All companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
<i>Pre-Crisis</i>									
const	-0.844	0.162	-5.197	0.000***	const	-0.870	0.163	-5.339	0.000***
HCE	0.004	0.001	3.186	0.001***	VAIC	0.004	0.001	4.353	0.000***
SCE	0.018	0.017	1.064	0.290	FAGE	0.006	0.003	1.907	0.059*
CEE	0.012	0.006	2.170	0.032**	FSIZE	0.034	0.009	3.946	0.000***
FAGE	0.004	0.003	1.459	0.148	FLEV	-0.002	0.005	-0.465	0.643
FSIZE	0.035	0.008	4.097	0.000***	FCR	0.021	0.006	3.325	0.001***
FLEV	-0.002	0.005	-0.493	0.622					
FCR	0.020	0.006	3.391	0.001***					
<i>Post-Crisis</i>									
const	-0.173	0.167	-1.035	0.303	const	-0.084	0.148	-0.566	0.573
HCE	0.004	0.001	3.100	0.002***	VAIC	0.006	0.002	3.726	0.000***
SCE	0.025	0.009	2.727	0.007***	FAGE	0.005	0.001	3.254	0.001***
CEE	0.022	0.010	2.183	0.030**	FSIZE	-0.005	0.009	-0.586	0.559
FAGE	0.004	0.002	2.736	0.007***	FLEV	-0.007	0.002	-3.532	0.000***
FSIZE	0.000	0.010	0.003	0.997	FCR	0.009	0.002	3.773	0.000***
FLEV	-0.007	0.002	-4.013	0.000***					
FCR	0.009	0.002	3.888	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, SCE, CEE, FAGE and FCR on ROA. The results also show a

significant negative effect of FLEV on ROA. However, the Model 2 results, for the same period, show a significant positive effect of VAIC, FAGE and FCR, and a significant negative effect of FLEV on ROA.

Table 4.17 presents the relation between IC and ROE for all companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, state that HCE, FAGE, and FCR have a significant positive relation with ROE. The results also show a significant negative effect of FLEV on ROE as well as in Model 2. Whereas, Model 2 results show a significant positive relation between VAIC, FAGE with ROE for the same period.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, SCE, CEE, FSIZE and FCR on ROE. The results also show a significant negative effect of FLEV on ROE. However, the Model 2 results, for the same period, show a significant positive effect of VAIC, FAGE and FCR on ROE.

Table 4.17 IC and ROE for Pre-and Post-Crisis (All companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	-86.386	44.139	-1.957	0.053*	const	-87.780	43.736	-2.007	0.047**
HCE	0.774	0.213	3.639	0.000***	VAIC	0.812	0.197	4.128	0.000***
SCE	1.542	2.639	0.584	0.560	FAGE	1.020	0.545	1.873	0.063*
CEE	1.221	0.908	1.345	0.182	FSIZE	2.791	2.538	1.100	0.274
FAGE	0.951	0.570	1.667	0.098*	FLEV	-1.223	0.637	-1.921	0.057*
FSIZE	2.830	2.641	1.072	0.286	FCR	1.197	0.604	1.982	0.050*
FLEV	-1.227	0.637	-1.9268	0.056*					
FCR	1.166	0.620	1.882	0.062*					
Post-Crisis									
const	-53.531	11.603	-4.614	0.000***	const	-16.258	36.599	-0.444	0.658
HCE	0.781	0.243	3.212	0.001***	VAIC	1.054	0.323	3.260	0.001***
SCE	6.353	1.728	3.675	0.000***	FAGE	0.902	0.370	2.438	0.016**
CEE	2.977	1.448	2.056	0.039**	FSIZE	-0.927	2.206	-0.420	0.675
FAGE	0.024	0.077	0.315	0.753	FLEV	-1.113	0.792	-1.405	0.162
FSIZE	2.555	0.643	3.974	0.000***	FCR	1.206	0.392	3.077	0.002***
FLEV	-1.249	0.701	-1.781	0.074*					
FCR	1.259	0.397	3.171	0.001***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.18 presents the relation between IC and EPS for all companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, state that HCE, FAGE, FSIZE, and FCR have a significant positive relation with EPS. Whereas, Model 2 results show a significant positive relation between FSIZE and FCR with EPS for the same period.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, FAGE, and FSIZE on EPS. The results also show a significant negative effect of FLEV on EPS as well as in Model 2. However, the Model 2 results, for the same period, show a significant positive effect of VAIC, FAGE, FSIZE and FCR on EPS.

Table 4.18 IC and EPS for Pre-and Post-Crisis (All companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
<i>Pre-Crisis</i>									
const	-4.638	1.461	-3.174	0.001***	const	-9.777	3.833	-2.550	0.012**
HCE	0.035	0.019	1.836	0.066*	VAIC	0.039	0.028	1.414	0.161
SCE	0.267	0.239	1.116	0.264	FAGE	0.101	0.065	1.545	0.125
CEE	0.088	0.065	1.364	0.173	FSIZE	0.349	0.196	1.782	0.077*
FAGE	0.039	0.016	2.473	0.013***	FLEV	0.004	0.037	0.098	0.923
FSIZE	0.183	0.081	2.272	0.023***	FCR	0.088	0.051	1.716	0.089*
FLEV	-0.032	0.047	-0.6804	0.496					
FCR	0.106	0.048	2.216	0.026**					
<i>Post-Crisis</i>									
const	-3.993	1.379	-2.896	0.003***	const	-4.007	1.377	-2.910	0.003***
HCE	0.105	0.047	2.218	0.026**	VAIC	0.105	0.044	2.383	0.017**
SCE	0.092	0.083	1.110	0.267	FAGE	0.024	0.012	2.115	0.034**
CEE	0.155	0.134	1.153	0.249	FSIZE	0.163	0.060	2.712	0.006***
FAGE	0.024	0.012	2.109	0.035**	FLEV	-0.113	0.036	-3.170	0.001***
FSIZE	0.163	0.061	2.654	0.008***	FCR	0.074	0.047	1.593	0.111
FLEV	-0.113	0.036	-3.168	0.001***					
FCR	0.074	0.046	1.601	0.109					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.3 Manufacturing Companies with Crisis Dummy

This analysis investigates the relation between IC and market, productivity, and financial performances for the manufacturing companies within the sample, while assigning a dummy variable for the crisis period from 2008 till 2009. The purpose of considering crisis period as dummy variables is to separate the impact of the crisis on the

dependent variables and study the direct effect of independent variables on dependent variables.

4.3.3.3.1 Intellectual Capital and Market Performance

Market performance of a company is measured by two benchmark ratios namely MB and PE. Table 4.19 presents the relation between IC and MB for manufacturing companies with a crisis dummy variable.

The results indicate that the crisis has a significant negative effect on MB for the two models, where during the crisis period MB value decreased by 45% and 44.8%, respectively. In addition, only FLEV and FCR show a significant positive impact on MB in Model 1. While in Model 2, FAGE, FLEV, and FCR show a positive significant effect on MB. Moreover, the findings depict an insignificant effect of VAIC and its components (HCE, SCE, and CEE) on MB.

Table 4.19 IC and MB with crisis dummy (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>
const	2.602	1.922	1.354	0.176	const	2.544	1.856	1.371	0.170
HCE	0.018	0.013	1.419	0.156	VAIC	0.019	0.012	1.565	0.118
SCE	-0.042	0.053	-0.804	0.421	FAGE	0.029	0.017	1.660	0.096*
CEE	0.152	0.106	1.433	0.152	FSIZE	-0.152	0.104	-1.467	0.142
FAGE	0.026	0.018	1.489	0.137	FLEV	0.797	0.159	5.014	0.000***
FSIZE	-0.148	0.109	-1.358	0.174	FCR	0.092	0.033	2.765	0.005***
FLEV	0.792	0.160	4.948	0.000***	Crisis	-0.448	0.138	-3.240	0.001***
FCR	0.089	0.033	2.671	0.007***					
Crisis	-0.450	0.139	-3.239	0.001***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.20 presents the relation between IC and PE for manufacturing companies with a crisis dummy variable.

The results show that the crisis has a significant negative effect on PE for the two models, where during the crisis period PE value decreased by 421.4% and 413.1%, respectively. In addition, SCE, CEE, and FSIZE show a significant positive impact on PE in Model 1, while, HCE and FLEV show a significant negative impact on PE. Whereas in Model 2, FAGE and FSIZE show a positive significant effect on PE, while only FLEV shows a significant negative impact on PE. Moreover, the findings depict an insignificant effect of VAIC on PE.

Table 4.20 IC and PE with crisis dummy (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-32.366	15.450	-2.095	0.038**	const	-32.543	16.119	-2.019	0.046**
HCE	-0.185	0.082	-2.247	0.026**	VAIC	-0.129	0.082	-1.589	0.115
SCE	1.373	0.780	1.760	0.081*	FAGE	0.200	0.111	1.804	0.074*
CEE	1.042	0.557	1.871	0.064*	FSIZE	1.954	0.937	2.085	0.039**
FAGE	0.159	0.107	1.477	0.143	FLEV	-0.410	0.174	-2.356	0.020**
FSIZE	1.983	0.892	2.222	0.028**	FCR	-0.344	0.308	-1.118	0.266
FLEV	-0.435	0.181	-2.406	0.017**	Crisis	-4.131	0.776	-5.326	0.000***
FCR	-0.374	0.306	-1.222	0.224					
Crisis	-4.214	0.772	-5.456	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.3.2 Intellectual Capital and Productivity Performance

Productivity performance of a company is measured by ATO ratio. Table 4.21 presents the relation between IC and ATO for manufacturing companies with a crisis dummy variable.

The results show that the crisis has a significant negative effect on ATO for the two models, where during the crisis period ATO value decreased by 4.2% and 4.4%, respectively. In addition, only FSIZE shows a significant positive impact on ATO in Model 1, while FAGE, FLEV, and FRC show a significant negative impact on ATO. Whereas in Model 2, only FSIZE shows a positive significant effect on ATO, while FAGE and FLEV show a significant negative impact on ATO. Moreover, the findings depict an insignificant effect of VAIC and its components (HCE, SCE, and CEE) on ATO.

Table 4.21 IC and ATO with crisis dummy (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-6.674	1.729	-3.860	0.000***	const	-6.708	1.823	-3.679	0.000***
HCE	0.004	0.004	1.057	0.293	VAIC	0.003	0.004	0.942	0.348
SCE	0.018	0.019	0.976	0.331	FAGE	-0.060	0.013	-4.729	0.000***
CEE	-0.057	0.067	-0.867	0.388	FSIZE	0.521	0.117	4.438	0.000***
FAGE	-0.057	0.010	-5.658	0.000***	FLEV	-0.046	0.014	-3.454	0.000***
FSIZE	0.514	0.106	4.828	0.000***	FCR	-0.033	0.021	-1.629	0.106
FLEV	-0.045	0.014	-3.334	0.001***	Crisis	-0.044	0.020	-2.203	0.029**
FCR	-0.031	0.018	-1.725	0.087*					
Crisis	-0.042	0.020	-2.144	0.034**					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.3 Intellectual Capital and Financial Performance

Financial performance of a company is measured by three benchmarks, namely, ROA, ROE, and EPS ratio. Table 4.22 presents the relation between IC and ROA for manufacturing companies with a crisis dummy variable.

The results point out that the crisis has a significant negative effect on ROA for the two models, where during the crisis period ROA value decreased by 3% and 2.9%, respectively. In addition, HCE, CEE, FAGE, FSIZE, and FCR show a significant positive impact on ROA in Model 1, while FLEV shows a significant negative impact on ROA. Whereas in Model 2, VAIC all control variables except FLEV show a positive significant effect on ROA, where FLEV shows a significant negative impact on ROA.

Table 4.22 IC and ROA with crisis dummy (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>
const	−0.361	0.059	−6.114	0.000***	const	−0.364	0.058	−6.238	0.000***
HCE	0.005	0.001	5.892	0.000***	VAIC	0.006	0.001	6.639	0.000***
SCE	0.019	0.015	1.264	0.206	FAGE	0.001	0.000	2.176	0.029**
CEE	0.014	0.004	3.265	0.001***	FSIZE	0.017	0.003	5.595	0.000***
FAGE	0.001	0.000	1.978	0.048**	FLEV	−0.014	0.002	−7.129	0.000***
FSIZE	0.016	0.003	5.316	0.000***	FCR	0.015	0.003	5.143	0.000***
FLEV	−0.015	0.002	−7.138	0.000***	Crisis	−0.029	0.005	−6.276	0.000***
FCR	0.015	0.003	5.202	0.000***					
Crisis	−0.030	0.005	−6.356	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.23 presents the relation between IC and ROE for manufacturing companies with a crisis dummy variable.

The results show that the crisis has a significant negative effect on ROE for the two models, where during the crisis period ROE value decreased by 553.3.9% and 545.5%, respectively. In addition, HCE, CEE, FAGE, FSIZE, and FCR show a significant positive impact on ROE in Model 1, while FLEV shows a significant negative impact on ROE. Whereas in Model 2, VAIC and all control variables show a positive significant effect on ROE except FLEV which shows a significant negative impact on ROE.

Table 4.23 IC and ROE with crisis dummy (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>
const	−63.845	10.526	−6.065	0.000***	const	−64.232	10.635	−6.039	0.000***
HCE	0.899	0.147	6.119	0.000***	VAIC	0.972	0.138	7.060	0.000***
SCE	3.299	2.756	1.197	0.231	FAGE	0.113	0.063	1.792	0.073*
CEE	2.316	0.870	2.661	0.007***	FSIZE	3.148	0.536	5.872	0.000***
FAGE	0.100	0.060	1.662	0.096*	FLEV	−2.588	0.669	−3.870	0.000***
FSIZE	3.083	0.524	5.885	0.000***	FCR	1.353	0.287	4.709	0.000***
FLEV	−2.629	0.677	−3.886	0.000***	Crisis	−5.455	0.837	−6.518	0.000***
FCR	1.330	0.289	4.597	0.000***					
Crisis	−5.533	0.840	−6.587	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.24 presents the relation between IC and EPS for manufacturing companies with a crisis dummy variable.

The results point out that the crisis has a significant negative effect on EPS for the two models, where during the crisis period EPS value decreased by 51.9% and 51.2%, respectively. In addition, HCE, FAGE, FSIZE, and FCR show a significant positive impact on EPS in Model 1, while FLEV shows a significant negative impact on EPS. Whereas in Model 2, VAIC and all control variables show a positive significant effect on EPS except FLEV which shows a significant negative impact on EPS.

Table 4.24 IC and EPS with crisis dummy (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>
const	−6.679	2.273	−2.938	0.003***	const	−6.687	2.260	−2.959	0.003***
HCE	0.083	0.030	2.729	0.006***	VAIC	0.090	0.030	2.940	0.003***
SCE	0.345	0.243	1.420	0.156	FAGE	0.030	0.013	2.198	0.027**
CEE	0.152	0.113	1.347	0.178	FSIZE	0.288	0.099	2.901	0.003***
FAGE	0.029	0.013	2.176	0.029**	FLEV	−0.152	0.051	−2.960	0.003***
FSIZE	0.281	0.102	2.760	0.005***	FCR	0.177	0.085	2.078	0.037**
FLEV	−0.153	0.052	−2.961	0.003***	Crisis	−0.512	0.148	−3.460	0.000***
FCR	0.176	0.085	2.066	0.038**					
Crisis	−0.519	0.149	−3.472	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.4 Manufacturing Companies for Pre-and Post-Crisis

This analysis examines the relation between IC and market, productivity, and financial performances for the manufacturing companies within the sample. The main objective of this analysis is to compare between the effect of IC on firm performance

before and after the crisis. The pre-crisis period is specified between 2004 and 2007, while the post-crisis period is designated between 2010 and 2015.

4.3.3.4.1 Intellectual Capital and Market Performance

Market performance of a company is measured by two benchmark ratios namely MB and PE. Table 4.25 presents the relation between IC and MB for manufacturing companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, indicate that CEE, FAGE, FLEV, and FCR have a significant positive relation with MB. Whereas, Model 2 results show a significant positive relation between VAIC, FAGE, FLEV, and FCR with MB for the same period.

On the other hand, the results of the post-crisis period for Model 1 and 2 show a significant negative relation between FCR and MB.

Table 4.25 IC and MB for Pre-and Post-Crisis (Manufacturing companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	0.726	1.577	0.460	0.645	const	0.756	1.565	0.483	0.629
HCE	0.016	0.010	1.591	0.112	VAIC	0.019	0.010	1.907	0.056*
SCE	-0.089	0.072	-1.254	0.210	FAGE	0.032	0.009	3.741	0.000***
CEE	0.135	0.059	2.284	0.022**	FSIZE	-0.063	0.072	-0.887	0.375
FAGE	0.030	0.009	3.358	0.000***	FLEV	0.743	0.095	7.795	0.000***
FSIZE	-0.050	0.073	-0.694	0.488	FCR	0.107	0.031	3.433	0.000***
FLEV	0.736	0.097	7.577	0.000***					
FCR	0.096	0.035	2.744	0.006***					
Post-Crisis									
const	1.919	2.265	0.847	0.397	const	1.614	2.050	0.787	0.431
HCE	0.009	0.010	0.923	0.356	VAIC	-0.002	0.013	-0.174	0.861
SCE	-0.138	0.165	-0.841	0.400	FAGE	0.007	0.017	0.395	0.693
CEE	-0.331	0.255	-1.299	0.194	FSIZE	0.010	0.115	0.089	0.929
FAGE	0.008	0.017	0.468	0.640	FLEV	0.085	0.063	1.353	0.176
FSIZE	-0.002	0.125	-0.020	0.984	FCR	-0.039	0.024	-1.639	0.101
FLEV	0.087	0.061	1.428	0.153					
FCR	-0.041	0.024	-1.763	0.077*					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.26 presents the relation between IC and EP for manufacturing companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, show that SCE, CEE, and FSIZE have a significant positive relation with PE. While, on the other hand, FLEV has a

significant negative relation with PE. Whereas, Model 2 results show a significant positive relation between FAGE and FSIZE with PE, and a significant negative relation with FLEV for the same period.

In contrast, the results of the post-crisis period for Model 1 and 2 show a significant positive relation between FSIZE and PE, and a significant negative relation between FLEV and PE in Model 2 only.

Table 4.26 IC and PE for Pre-and Post-Crisis (Manufacturing companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	−9.229	6.397	−1.442	0.152	const	−7.434	6.550	−1.135	0.259
HCE	−0.058	0.057	−1.027	0.306	VAIC	0.034	0.054	0.630	0.530
SCE	3.130	1.400	2.236	0.027**	FAGE	0.077	0.044	1.762	0.081*
CEE	1.558	0.622	2.505	0.013**	FSIZE	0.774	0.346	2.234	0.027**
FAGE	0.068	0.043	1.585	0.116	FLEV	−0.919	0.305	−3.016	0.003***
FSIZE	0.800	0.350	2.283	0.024**	FCR	0.008	0.244	0.033	0.974
FLEV	−1.033	0.305	−3.388	0.001***	Adj. R ²			0.036	
FCR	−0.017	0.236	−0.0738	0.941					
Adj. R ²			0.052						
Post-Crisis									
const	−22.971	16.084	−1.428	0.155	const	−7.183	6.643	−1.081	0.280
HCE	−0.100	0.127	−0.790	0.431	VAIC	0.038	0.097	0.391	0.696
SCE	1.005	0.954	1.054	0.294	FAGE	−0.030	0.047	−0.645	0.519
CEE	−1.177	0.972	−1.211	0.228	FSIZE	0.980	0.353	2.775	0.005***
FAGE	−0.040	0.229	−0.175	0.861	FLEV	−0.239	0.123	−1.945	0.051*
FSIZE	1.839	0.751	2.450	0.015**	FCR	0.491	0.300	1.638	0.101
FLEV	−0.124	0.104	−1.191	0.236					
FCR	0.251	0.396	0.634	0.527					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.4.2 Intellectual Capital and Productivity Performance

Productivity performance of a company is measured by ATO ratio. Table 4.27 presents the relation between IC and ATO for manufacturing companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, show that HCE and FSIZE have a significant positive relation with ATO. While, on the other hand, CEE and FAGE have a significant negative relation with ATO. Whereas, Model 2 results show a significant positive relation between FSIZE and ATO, and a significant negative relation with FAGE for the same period.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, CEE, and FSIZE on ATO. The results also show a significant negative effect of FAGE and FLEV on ATO. However, the Model 2 results, for the same period, show a significant positive effect of VAIC and FSIZE, and a significant negative effect of FAGE and FLEV on ATO.

Table 4.27 IC and ATO for Pre-and Post-Crisis (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z / t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z / t-ratio</i>	<i>p-value</i>
Pre-Crisis									
const	-9.816	0.930	-10.556	0.000***	const	-9.695	0.980	-9.889	0.000***
HCE	0.009	0.005	1.877	0.063*	VAIC	0.005	0.004	1.334	0.185
SCE	0.040	0.028	1.459	0.148	FAGE	-0.074	0.015	-4.886	0.000***
CEE	-0.079	0.037	-2.143	0.034*	FSIZE	0.705	0.051	13.801	0.000***
FAGE	-0.059	0.013	-4.710	0.000***	FLEV	0.016	0.011	1.491	0.139
FSIZE	0.681	0.045	15.148	0.000***	FCR	-0.087	0.053	-1.649	0.102
FLEV	0.018	0.011	1.610	0.110					
FCR	-0.080	0.050	-1.622	0.108					
Post-Crisis									
const	-2.032	0.732	-2.776	0.006***	const	-1.900	0.859	-2.211	0.028**
HCE	0.005	0.002	1.980	0.049**	VAIC	0.008	0.003	2.614	0.009***
SCE	0.035	0.052	0.683	0.496	FAGE	-0.033	0.009	-3.789	0.000***
CEE	0.115	0.053	2.172	0.031**	FSIZE	0.212	0.056	3.790	0.000***
FAGE	-0.033	0.008	-4.242	0.000***	FLEV	-0.005	0.003	-2.001	0.047**
FSIZE	0.218	0.047	4.621	0.000***	FCR	-0.0002	0.004	-0.056	0.956
FLEV	-0.006	0.003	-2.3741	0.018**					
FCR	0.000	0.004	0.046	0.964					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

4.3.3.4.3 Intellectual Capital and Financial Performance

Financial performance of a company is measured by three benchmark ratios, namely, ROA, ROE and EPS. Table 4.28 presents the relation between IC and ROA for manufacturing companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, state that HCE, CEE, FSIZE, and FCR have a significant positive relation with ROA. Whereas, Model 2 results show a significant positive relation between VAIC, FAGE, FSIZE, and FCR with ROA for the same period.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, SCE, CEE, FAGE and FCR on ROA. The results also show a

significant negative effect of FLEV on ROA. However, the Model 2 results, for the same period, show a significant positive effect of VAIC, FAGE and FCR on ROA.

Table 4.28 IC and ROA for Pre-and Post-Crisis (Manufacturing companies)

Model1					Model2				
	Coefficient	Std. Error	z / t-ratio	p-value		Coefficient	Std. Error	z / t-ratio	p-value
Pre-Crisis									
const	−0.844	0.162	−5.197	0.000***	const	−0.870	0.163	−5.339	0.000***
HCE	0.004	0.001	3.186	0.001***	VAIC	0.004	0.001	4.353	0.000***
SCE	0.018	0.017	1.064	0.290	FAGE	0.006	0.003	1.907	0.059*
CEE	0.012	0.006	2.170	0.032**	FSIZE	0.034	0.009	3.946	0.000***
FAGE	0.004	0.003	1.459	0.148	FLEV	−0.002	0.005	−0.465	0.643
FSIZE	0.035	0.008	4.097	0.000***	FCR	0.021	0.006	3.325	0.001***
FLEV	−0.002	0.005	−0.493	0.623					
FCR	0.020	0.006	3.391	0.001***					
Post-Crisis									
const	−0.153	0.168	−0.917	0.360	const	−0.054	0.157	−0.346	0.729
HCE	0.004	0.001	2.739	0.006***	VAIC	0.005	0.001	3.352	0.001***
SCE	0.026	0.009	2.840	0.005***	FAGE	0.004	0.002	2.840	0.005***
CEE	0.020	0.009	2.238	0.026**	FSIZE	−0.006	0.009	−0.645	0.520
FAGE	0.004	0.002	2.447	0.015**	FLEV	−0.003	0.003	−1.356	0.177
FSIZE	−0.0004	0.010	−0.047	0.962	FCR	0.009	0.002	3.909	0.000***
FLEV	−0.0035	0.003	−1.344	0.181					
FCR	0.010	0.002	4.001	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.29 presents the relation between IC and ROE for manufacturing companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, state that HCE, FAGE, and FCR have a significant positive relation with ROE. The results also show a significant negative effect of FLEV on ROE as well as in Model 2. Whereas, Model 2 results show a significant positive relation between VAIC, FAGE, and FCR with ROE for the same period.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, SCE, CEE, FAGE and FCR on ROE. However, the Model 2 results, for the same period, show a significant positive effect of VAIC, FAGE and FCR on ROE.

Table 4.29 IC and ROE for Pre-and Post-Crisis (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z / t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z / t-ratio</i>	<i>p-value</i>
Pre-Crisis									
const	-86.386	44.139	-1.957	0.053*	const	-87.780	43.736	-2.007	0.047**
HCE	0.774	0.213	3.639	0.000***	VAIC	0.812	0.197	4.128	0.000***
SCE	1.542	2.639	0.584	0.560	FAGE	1.020	0.545	1.873	0.063*
CEE	1.221	0.908	1.345	0.182	FSIZE	2.791	2.538	1.100	0.274
FAGE	0.951	0.570	1.667	0.098*	FLEV	-1.223	0.637	-1.921	0.057*
FSIZE	2.830	2.641	1.072	0.286	FCR	1.197	0.604	1.982	0.050*
FLEV	-1.227	0.637	-1.926	0.056*					
FCR	1.166	0.620	1.882	0.062*					
Post-Crisis									
const	-38.908	36.740	-1.059	0.291	const	-14.527	38.789	-0.3745	0.709
HCE	0.536	0.290	1.850	0.066*	VAIC	0.843	0.324	2.603	0.010**
SCE	6.065	2.022	3.000	0.003***	FAGE	0.838	0.392	2.139	0.034**
CEE	4.514	2.049	2.203	0.029**	FSIZE	-0.856	2.369	-0.361	0.718
FAGE	0.694	0.361	1.922	0.056*	FLEV	-0.700	0.478	-1.464	0.145
FSIZE	0.513	2.114	0.243	0.809	FCR	1.254	0.381	3.289	0.001***
FLEV	-0.715	0.459	-1.557	0.122					
FCR	1.334	0.394	3.385	0.000***					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

Table 4.30 presents the relation between IC and EPS for manufacturing companies for the pre- and post-crisis periods.

The results of Model 1, for the pre-crisis period, state that HCE, FAGE, FSIZE, and FCR have a significant positive relation with EPS. Whereas, Model 2 results show a significant positive relation between FSIZE and FCR with EPS for the same period.

In contrast, the results of the post-crisis period for Model 1 show a significant positive effect of HCE, FAGE, FSIZE, and FCR on EPS. The results also show a significant negative effect of FLEV on EPS as well as in Model 2. However, the Model 2 results, for the same period, show a significant positive effect of VAIC, FAGE, FSIZE and FCR on EPS.

Table 4.30 IC and EPS for Pre-and Post-Crisis (Manufacturing companies)

Model1					Model2				
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z / t-ratio</i>	<i>p-value</i>		<i>Coefficient</i>	<i>Std. Error</i>	<i>z / t-ratio</i>	<i>p-value</i>
Pre-Crisis									
const	-4.638	1.461	-3.174	0.001***	const	-9.777	3.833	-2.550	0.012**
HCE	0.035	0.019	1.836	0.066*	VAIC	0.039	0.028	1.414	0.161
SCE	0.267	0.239	1.116	0.264	FAGE	0.101	0.065	1.545	0.125
CEE	0.088	0.065	1.364	0.173	FSIZE	0.349	0.196	1.782	0.077*
FAGE	0.039	0.016	2.473	0.013**	FLEV	0.004	0.037	0.098	0.923
FSIZE	0.183	0.081	2.272	0.023**	FCR	0.088	0.051	1.716	0.089*
FLEV	-0.032	0.047	-0.680	0.496					
FCR	0.106	0.048	2.216	0.026**					
Post-Crisis									
const	-3.921	1.372	-2.858	0.004***	const	-3.891	1.368	-2.844	0.004***
HCE	0.094	0.043	2.189	0.028**	VAIC	0.095	0.041	2.346	0.019**
SCE	0.112	0.082	1.363	0.173	FAGE	0.026	0.011	2.244	0.024**
CEE	0.124	0.131	0.950	0.342	FSIZE	0.153	0.060	2.576	0.010***
FAGE	0.026	0.011	2.239	0.025**	FLEV	-0.065	0.038	-1.754	0.079*
FSIZE	0.154	0.060	2.552	0.010**	FCR	0.081	0.048	1.683	0.092*
FLEV	-0.066	0.038	-1.733	0.083*					
FCR	0.081	0.048	1.697	0.089*					

Coefficients of regression reported as standardized coefficients. *** Significant at the 0.01 level, ** Significant at the 0.05 level and * Significant at the 0.10 level. VIF value for all control and independents variables are less than 3, means there is no Multicollinearity.

CONCLUSION

The use of information and information technology in corporate management has encouraged the rise of knowledge based-economy. In this new economy, companies that use knowledge intensively have obtained impetus. Intellectual capital is considered as the vital driver of value and plays a significant role in increasing financial performance as well as market value of knowledge-based companies (Bozbura, 2004; Petty and Guthrie, 2000; Roslender and Fincham, 2001). Several researchers (Chen Goh, 2005b; James Guthrie, 2001; Lev, 2001a) have described IC as the fourth element of production in addition to labor, land, and financial capital.

Several pilots and empirical studies outside Turkey have been conducted to investigate the relationship between IC and business' financial performance. However, some of these studies have indicated the existence of a positive association between IC and financial performance (Al-Musali and Ismail, 2014; Cabrita and Bontis, 2008; Cabrita and Vaz, 2005; M. Chen et al., 2005b; Fathi et al., 2013; Hassanzadeh et al., 2012; Janosevic et al., 2013; Joshi et al., 2010, 2013, Kamath, 2007, 2008; Komnenic and Pokrajčić, 2012; Li and Wu, 2004; Mehri et al., 2013; Molodchik and Bykova, 2011; Mondal and Ghosh, 2012; Mosavi et al., 2012; Radianto, 2011; Rehman et al., 2012; Riahi-Belkaoui, 2003; Shih et al., 2010; M. S. Wang, 2011; Zeghal and Maaloul, 2010; Zehri et al., 2012), while others have indicated the existence of a negative or no relationship between IC and financial performance (Firer and Williams, 2003; Janosevic et al., 2013; Yu et al., 2010; Zehri et al., 2012).

On the other hand, IC study in Turkey is in its initial phase where few researches have been conducted to examine the relationship between IC and corporate financial performance (Aras et al., 2011; Calisir, Altin Gumussoy, Bayraktaroğlu, et al., 2010; Kayali et al., 2007; Ozkan et al., 2016; Yalama and Coskun, 2007), but it remains limited in terms of industry and time period.

The number of studies that have been conducted in Turkey are motivating to undertake the current study to investigate the impact of IC on the corporate financial performance of Turkish companies over a twelve-year period from 2004 till 2015. The study period is divided into two periods, pre-crisis period from 2004 till 2007, and post-crisis period from 2010 till 2015. The main reason of this division is to compare the results of the study between the pre-crisis and post-crisis periods.

The study used Pulic's (1998, 2000) VAIC method to measure the relationship between IC and firm performance. The VAIC method has been widely used in several empirical researches because of its simplicity. It is also considered as a quantitative approach that uses accounting information and produces efficiency indicators which take into consideration all types of resources (intellectual and physical).

The VAIC method is an aggregate measure of human capital efficiency, structural capital efficiency, and capital employed efficiency. The firm performance is represented by market, productivity, and financial performance. Market performance is measured by market to book value (MB) and price-earning ration (PE), productivity performance is measured by assets turnover (ATO), and financial performance is measured by return on assets (ROA), return on equity (ROE), and earning per share (EPS).

To achieve the goal of this study, a regression analysis was used. Firstly, we analyzed the full period from 2004 till 2015 while isolating the crisis period by considering the years 2008 and 2009 as dummy variables. Secondly, OLS regression analysis is used to examine the impact of intellectual capital on firm performance while comparing between the pre-crisis (2004-2007) and post-crisis (2010-2015) periods. Thirdly, where the OLS regression is not applicable, the panel regression analysis (through its two types; random effect and fixed effect models) has been applied.

From tables 4.7, 4.8, 4.9, 4.10, 4.11, and 4.12 in section 4.3.3.1, one can say that the crisis period negatively affected firm performance of all companies. This is something to be expected where normally in such cases the crisis affects firm performance negatively. After the isolation of the impact of the crisis period on the dependent variables, and examining the direct effect of independent variables (HCE, SCE, CEE, and VAIC) on dependent variables (MB, PE, ATO, ROA, ROE, and EPS), the results of table 4.7 and table 4.8 in section 4.3.3.1.1 show that VAIC and its components have limited effect on market performance. This finding supports that the conventional accounting practices failed to account one of the most important intangible assets (IC) of the organization, where the traditional accounting point of view considers the physical assets as a key factor when evaluating a firm's market performance (Chen et al., 2005; Firer and Williams, 2003; Riahi-Belkaoui, 2003). In addition to the high volatility of the PE ratio (Zeghal and Maaloul, 2010).

From table 4.9 in section 4.3.3.1.2 we can see that VAIC and its components, except SCE, do not affect productivity performance (ATO). This finding supports that the investment in SC is considered as important for efficiency enhancement as demonstrated

by the significant impact of SCE on ATO. However, the positive significant relation between SCE and ATO seems to suggest that Turkish companies use their SC to extract more revenue sources (Li et al., 2016).

From table 4.10, 4.11, and 4.12 in section 4.3.3.1.3 we can indicate that VAIC and its components have an effect of financial performance. This finding supports the important role of IC in creating value for the companies and other stakeholders. Moreover, most previous studies have been suggested a significant positive association between VAIC and its components and corporate financial performance (Calisir et al., 2010; Chan, 2009; Chen Goh, 2005b; Chen et al. 2005b; Firer and Williams, 2003; Kamath, 2008; Maditiniset al. 2011; Mavridis, 2004; Mehralian et al. 2012; Mondal and Ghosh, 2012; Ting and Lean, 2009; Zeghal and Maaloul, 2010).

Table 5.1 summarize the impact of VAIC and its components on market, productivity, and financial performance variables for all companies with crisis dummy.

Table 5.1 VAIC and its components on dependent variables for all companies with crisis dummy

	Market performance		Productivity performance	Financial performance		
	MB	PE	ATO	ROA	ROE	EPS
HCE				+	+	+
SCE			+	+	+	+
CEE	+			+		
VAIC				+	+	+

From table 4.13 and table 4.14 in section 4.3.3.2.1 we understand that VAIC and its components have limited effect on market performance of all companies before the crisis, while they have no effect on market performance after the crisis. The findings show that the direct relationship between corporate IC and market performance has not been supported in the study sample companies listed in Borsa Istanbul. This can be attributed to the fact that the IC is not recognized and reflected in the financial statements. This cause a growing gap between the market value of a company and its real value (Chen et al., 2005; Firer and Williams, 2003; Riahi-Belkaoui, 2003).

From table 4.15 in section 4.3.3.2.2 one can indicate that VAIC and its component SCE have no effect on productivity performance (ATO). Whereas, HCE has a significant positive effect on ATO, CEE has a significant negative impact on ATO before the crisis. This result implies that the Turkish companies may dictate a trade-off between human capital and tangible assets. That is, companies in Turkey is seeking to increase their productivity through the employment of intangible assets more than utilizing its tangible resource. Alternatively, a firm focusing attention on human resource assets appeared to

give less emphasis to the effective use of tangible assets before the crisis. On the other hand, table 4.15 show that VAIC and its components, except SCE, have an effect on productivity performance. This indicate the Turkish companies use a unique mixed between intangible and tangible resources for create value after the crisis. The positive impact of VAIC and its components on productivity performance indicate that Turkish companies are managing their capital efficiently so that they can create substantial value.

From table 4.16, 4.17, and 4.18 in section 4.3.3.2.3, we can say that VAIC and its components have an effect of financial performance strongly after the crisis. This finding supports the important role of IC in creating value for the companies and other stakeholders. Moreover, most previous studies have been suggested a significant positive association between VAIC and its components and corporate financial performance (Calisir et al., 2010; Chan, 2009; Chen Goh, 2005b; Chen et al. 2005b; Firer and Williams, 2003; Kamath, 2008; Maditiniset al. 2011; Mavridis, 2004; Mehralian et al. 2012; Mondal and Ghosh, 2012; Ting and Lean, 2009; Zeghal and Maaloul, 2010).

Table 5.2 summarize the impact of VAIC and its components on market, productivity, and financial performance variables for all companies before and after the crisis.

Table 5.2 VAIC and its components on dependent variables for all companies before and after the crisis

	Pre-Crisis					
	Market performance		Productivity performance	Financial performance		
	MB	PE	ATO	ROA	ROE	EPS
HCE			+	+	+	+
SCE		+				
CEE	+	+	-	+		
VAIC	+			+	+	
	Post-Crisis					
HCE			+	+	+	+
SCE				+	+	
CEE			+	+	+	
VAIC			+	+	+	+

From tables 4.19, 4.20, 4.21, 4.22, 4.23, and 4.24 in section 4.3.3.3, one can say that the crisis period negatively affected firm performance of manufacturing companies. This is something to be expected where normally in such cases the crisis affects firm performance negatively. After the isolation of the impact of the crisis period on the dependent variables, and examining the direct effect of independent variables (HCE, SCE, CEE, and VAIC) on dependent variables (MB, PE, ATO, ROA, ROE, and EPS),

the results of table 4.19 and table 4.20 in section 4.3.3.3.1 show that VAIC and its components have limited effect on market performance. This finding supports that the conventional accounting practices failed to account one of the most important intangible assets (IC) of the organization, where the traditional accounting point of view considers the physical assets as a key factor when evaluating a firm's market performance (Chen et al., 2005; Firer and Williams, 2003; Riahi-Belkaoui, 2003). In addition to the high volatility of the PE ratio (Zeghal and Maaloul, 2010).

From table 4.21 in section 4.3.3.3.2, one can say that, VAIC and its components have no effect on productivity performance (ATO). This finding supports the findings of (Dženopoljac et al., 2016; Clarke et al., 2011; Mehralian et al., 2012; Bontis et al., 2015) where they did not find any relation between IC and productivity performance.

From tables 4.22, 4.23, and 4.24 in section 4.3.3.3.3 we can indicate that VAIC and its components, except SCE, have an effect on financial performance. This finding supports the important role of IC in creating value for the companies and other stakeholders. Moreover, most previous studies have been suggested a significant positive association between VAIC and its components and corporate financial performance (Calisir et al., 2010; Chan, 2009; Chen Goh, 2005b; Chen et al. 2005b; Firer and Williams, 2003; Kamath, 2008; Maditiniset al. 2011; Mavridis, 2004; Mehralian et al. 2012; Mondal and Ghosh, 2012; Ting and Lean, 2009; Zeghal and Maaloul, 2010).

Table 5.3 summarize the impact of VAIC and its components on market, productivity, and financial performance variables for manufacturing companies with crisis dummy.

Table 5.3 VAIC and its components on dependent variables for manufacturing companies with crisis dummy

	Market performance		Productivity performance	Financial performance		
	MB	PE	ATO	ROA	ROE	EPS
HCE		-		+	+	+
SCE		+				
CEE		+		+	+	
VAIC				+	+	+

From table 4.25 and table 4.26 in section 4.3.3.4.1 we can understand that VAIC and its components have limited effect on market performance of manufacturing companies before the crisis, while they have no effect on market performance after the

crisis. The findings show that the direct relationship between corporate IC and market performance has not been supported in the study sample companies listed in Borsa Istanbul. This can be attributed to the fact that IC is not recognized and reflected in the financial statements. This cause a growing gap between the market value of a company and its real value (Chen et al., 2005; Firer and Williams, 2003; Riahi-Belkaoui, 2003).

From table 4.27 in section 4.3.3.4.2, one can indicate that, VAIC and its component SCE have no effect on productivity performance (ATO). Whereas, HCE has a significant positive effect on ATO, CEE has a significant negative impact on ATO before the crisis. This result implies that the Turkish companies may dictate a trade-off between human capital and tangible assets. That is, companies in Turkey is seeking to increase their productivity through the employment of intangible assets more than utilizing its tangible resource.

Alternatively, a firm focusing attention on human resource assets appeared to give less emphasis to the effective use of tangible assets before the crisis. On the other hand, table 4.27 show that VAIC and its components, except SCE, have an effect on productivity performance. This may indicate that Turkish companies use a unique mixed between intangible and tangible resources for create value after the crisis. The positive impact of VAIC and its components on productivity performance indicate that Turkish companies are managing their capital efficiently so that they can create substantial value.

From tables 4.28, 4.29, and 4.30 in section 4.3.3.4.3, one can say that, VAIC and its components have an effect of financial performance strongly after the crisis. This finding supports the important role of IC in creating value for the companies and other stakeholders. Moreover, most previous studies have been suggested a significant positive association between VAIC and its components and corporate financial performance (Calisir et al., 2010; Chan, 2009; Chen Goh, 2005b; Chen et al. 2005b; Firer and Williams, 2003; Kamath, 2008; Maditiniset al. 2011; Mavridis, 2004; Mehralian et al. 2012; Mondal and Ghosh, 2012; Ting and Lean, 2009; Zeghal and Maaloul, 2010).

Table 5.4 summarize the impact of VAIC and its components on market, productivity, and financial performance variables for manufacturing companies before and after the crisis.

Table 5.4 VAIC and its components on dependent variables for manufacturing companies before and after the crisis

	Pre-Crisis					
	Market performance		Productivity performance	Financial performance		
	MB	PE	ATO	ROA	ROE	EPS
HCE			+	+	+	+
SCE		+				
CEE	+		-	+		
VAIC	+			+	+	
	Post-Crisis					
HCE			+	+	+	+
SCE				+	+	
CEE			+	+	+	
VAIC			+	+	+	+

According to the previous tables 5.3 and 5.4, the results of the regression analysis regarding the effect of intellectual capital on firm performance while comparing between the pre- and post-crisis periods show that HCE is the most important factor in value creation in Turkish companies. In addition, VAIC is positively affecting productivity and financial performance of Turkish companies. These results are showed in the following table 5.5 which summarizes the accepted and rejected hypotheses; where (A) means Accepted and (R) means Rejected.

Table 5.5 Accepted and rejected hypotheses

	Pre-Crisis					Post-Crisis			
		HCE	SCE	CEE	VAIC	HCE	SCE	CEE	VAIC
All Companies	MB	R	R	A	A	R	R	R	R
	PE	R	A	A	R	R	R	R	R
	ATO	A	R	R	R	A	R	A	A
	ROA	A	R	A	A	A	A	A	A
	ROE	A	R	R	A	A	A	A	A
	EPS	A	R	R	R	A	R	R	A
Manufacturing Companies	MB	R	R	A	A	R	R	R	R
	PE	R	A	R	R	R	R	R	R
	ATO	A	R	R	R	A	R	A	A
	ROA	A	R	A	A	A	A	A	A
	ROE	A	R	A	A	A	A	A	A
	EPS	A	R	R	R	A	R	R	A

This study provides an important practical implication as well as supporting evidence for previous studies. The findings reflect that the effective use of intellectual capital should be through a significant interrelation among intellectual capital components. It has been clarified that organizations can no longer rely on financial capital only, but they have to consider both physical and intellectual assets in order to compete in the era of the knowledge based-economy.

The study discovered that Turkish companies depend heavily on the human capital component of intellectual capital, followed by structural capital and capital

employed, which seems good for value creation of the companies. This reinforces the idea that companies should pay more attention to invest in human capital than structural capital or capital employed to achieve more performance. Therefore, companies should extend and improve understanding, acceptance, and implementations of intellectual capital to enhance and maximize firm performance and competitive advantage. Companies can improve employee commitment and awareness to the importance of intellectual capital by conducting necessary training and education, as a side of employee development programs.

In conclusion of this study, taking into consideration the previous research literature, the following recommendations can be suggested.

- A company should work on building a knowledge infrastructure to enhance sharing and learning at all levels, which will in return accelerate the company's capability to survive.
- For good management of intellectual capital, Turkish companies should identify and develop their intellectual resources. Identifying intellectual capital means understanding its nature and components, while developing intellectual capital means to create a policy for growing and maintaining it.
- Creating a strong information and knowledge system which facilitates easy and efficient information acquisition, which will help Turkish companies maximize their values.
- To achieve the desired benefit of intellectual assets, like tangible assets, they should be reported, disclosed, and audited. Turkish companies can apply the suggested income statement by Pulic (2008) and Iazzolino and Laise (2013) as shown in table 3.2. The use of such reports to reflect intellectual capital in the financial statements gives management the ability to recognize the potential of its intellectual capital which can dramatically improve the company's financial position. In addition, these reports can increase the confidence of creditors and investors and decrease the risk regarding the providing of loans and capital.

For governments and research centers, we highly recommend establishing an intellectual capital center such as the Croatian Intellectual Capital Center, UK center for business performance, Austrian Intellectual Capital Research Center and others. In addition, universities and research centers can make conferences or workshops to raise the awareness of the importance of intellectual capital and its implications on Turkish companies.

The critical limitation of this study is represented by the lack of access to quantitative information from a variety of sources, where the study depends in gathering the data on Finnet database, where a lot of data is missing.

This study focused on investigating the impact of IC on firm performance by examining all companies from one side and manufacturing companies in the other side, while comparing between two periods; pre- and post-crisis periods. This can open the door to other researches which can be conducted on different aspects like public organizations and universities. In addition, the model can be conducted on various industries or sectors such as; Financial, Pharmaceutical, Technology, Real estate, and other sectors.



REFERENCES

- Abdolmohammadi, M. J. (2005). Intellectual capital disclosure and market capitalization. *Journal of Intellectual Capital*, 6(3), 397–416. <https://doi.org/10.1108/14691930510611139>
- Abdulai, M.-S., Kwon, Y., & Moon, J. (2012). Intellectual Capital and Firm Performance: An Empirical Study of Software Firms in West Africa. *The African Journal of Information Systems*, 4(1), 1.
- Abdulsalam, F., Al-Qaheri, H., & Al-Khayyat, R. (2011). The Intellectual Capital Performance of Kuwaiti Banks: An Application of vaicTM1 Model. *iBusiness*, 03(01), 88–96. <https://doi.org/10.4236/ib.2011.31014>
- Abeysekera, I. (2003a). Accounting for intellectual assets and liabilities. *Journal of Human Resource Costing & Accounting*, 7(3), 7–14.
- Abeysekera, I. (2003b). Intellectual accounting scorecard-measuring and reporting intellectual capital. *The Journal of American Academy of Business*, 3(2003), 422–427.
- Abeysekera, I. (2008). *Intellectual capital accounting: practices in a developing country*. London; New York: Routledge.
- Akpınar, A. T., & Akdemir, A. (1999). Intellectual capital. In *third European Conference* (pp. 332–340).
- Aktaş, İ. (2015). *Effect of the intellectual capital on company value and an application* (Master Thesis). Türk Hava Kurumu Üniversitesi, Turkey.
- Al-Ali, N. (2003). *Comprehensive intellectual capital management: step-by-step*. New York: Chichester: Wiley.
- Alcaniz, L., Gomez-Bezares, F., & Roslender, R. (2011). Theoretical perspectives on intellectual capital: A backward look and a proposal for going forward. In *Accounting Forum* (Vol. 35, pp. 104–117). Elsevier.
- Al-Musali, M. A. K., & Ismail, K. N. I. K. (2014). Intellectual Capital and its Effect on Financial Performance of Banks: Evidence from Saudi Arabia. *Procedia - Social and Behavioral Sciences*, 164, 201–207. <https://doi.org/10.1016/j.sbspro.2014.11.068>
- Al-Zoubi, M. R. (2013). The Impact of Intellectual Capital on SWOT Analysis among Jordanian Banking Industry“Empirical Study.” *International Journal of Business and Social Science*, 4(2).
- Andriessen, D. (2004). *Making sense of intellectual capital: designing a method for the valuation of intangibles*. Amsterdam; Boston: Elsevier.

- Andriesson, D. (2005). Implementing the KPMG Value Explorer: Critical success factors for applying IC measurement tools. *Journal of Intellectual Capital*, 6(4), 474–488.
<https://doi.org/10.1108/14691930510628771>
- April, K. A. (2002). Guidelines for developing a k-strategy. *Journal of Knowledge Management*, 6(5), 445–456. <https://doi.org/10.1108/13673270210450405>
- Aras, G., Aybars, A., & Kutlu, O. (2011). The interaction between corporate social responsibility and value added intellectual capital: empirical evidence from Turkey. *Social Responsibility Journal*, 7(4), 622–637. <https://doi.org/10.1108/17471111111175173>
- Archer, N. P., Ghasemzadeh, F., Brooking, A., Board, P., & Jones, S. (1998). The predictive potential of intellectual capital. *International Journal of Technology Management*, 16(1–3), 115–125.
- Ayvacak, E. (2012). *A practice and the measurement of the influence of intellectual capital on firm value* (Master Thesis). Atatürk Üniversitesi, Turkey.
- Basso, L. F. C., Kimura, H., & da Aguiar, J. F. (2010). Intellectual capital and value creation in the production and assembly of vehicles and auto-parts sector in Brazil: a panel data analysis. *Journal of Modern Accounting and Auditing*, 6(8), 15.
- Beattie, V. A., & Thomson, S. J. (2010). *Intellectual capital reporting: academic utopia or corporate reality in a brave new world?* Edinburgh: Institute of Chartered Accountants of Scotland.
- Berzkalne, I., & Zelgalve, E. (2014). Intellectual Capital and Company Value. *Procedia - Social and Behavioral Sciences*, 110, 887–896. <https://doi.org/10.1016/j.sbspro.2013.12.934>
- Bin Ahmad, S., & Mushraf, A. M. (2011). The Relationship between Intellectual capital and Business Performance: An empirical study in Iraqi industry (Vol. 6, pp. 104–109). Presented at the International Conference on Management and Artificial Intelligence, Bali, Indonesia: IACSIT Press.
- Bismuth, A., & Tojo, Y. (2008). Creating value from intellectual assets. *Journal of Intellectual Capital*, 9(2), 228–245. <https://doi.org/10.1108/14691930810870319>
- Bontis, N. (1998a). Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, 36(2), 63–76.
- Bontis, N. (1998b). Intellectual capital: an exploratory study that develops measures and models. *Management Decision*, 36(2), 63–76. <https://doi.org/10.1108/00251749810204142>

- Bontis, N. (2001). Assessing knowledge assets: a review of the models used to measure intellectual capital. *International Journal of Management Reviews*, 3(1), 41–60.
- Bontis, N. (2002). *World Congress of Intellectual Capital Readings*. Woburn, MA: Butterworth-Heinemann/KMCI Press.
- Bontis, N., Chua Chong Keow, W., & Richardson, S. (2000). Intellectual capital and business performance in Malaysian industries. *Journal of Intellectual Capital*, 1(1), 85–100.
- Bontis, N., Dragonetti, N. C., Jacobsen, K., & Roos, G. (1999). The knowledge toolbox: A review of the tools available to measure and manage intangible resources. *European Management Journal*, 17(4), 391–402.
- Bose, S., & Thomas, K. (2007). Applying the balanced scorecard for better performance of intellectual capital. *Journal of Intellectual Capital*, 8(4), 653–665.
<https://doi.org/10.1108/14691930710830819>
- Boujelbene, M. A., & Affes, H. (2013). The impact of intellectual capital disclosure on cost of equity capital: A case of French firms. *Journal of Economics, Finance & Administrative Science*, 18(34).
- Bounfour, A. (2003). The IC-dVAL approach. *Journal of Intellectual Capital*, 4(3), 396–413.
<https://doi.org/10.1108/14691930310487833>
- Bozbura, F. T. (2004). Measurement and application of intellectual capital in Turkey. *The Learning Organization*, 11(4/5), 357–367.
- Brooking, A. (1996a). *Intellectual Capital: Core Assets for the Third Millennium Enterprise*. London, UK: Thomson Business Press.
- Brooking, A. (1996b). On the Importance of Managing Intangible Assets as Part of Corporate Strategy. *Electronic Journal of Knowledge Management*, 8(2), 217–224.
- Cabrita, M. D. R., & Bontis, N. (2008). Intellectual capital and business performance in the Portuguese banking industry. *International Journal of Technology Management*, 43(1–3), 212–237.
- Cabrita, M. D. R., & Vaz, J. L. (2005). Intellectual Capital and Value Creation: Evidence from the Portuguese Banking Industry. *Electronic Journal of Knowledge Management*, 4(1), 11–20.
- Calisir, F., Altin Gumussoy, C., Bayraktaroğlu, A. E., & Deniz, E. (2010). Intellectual capital in the quoted Turkish ITC sector. *Journal of Intellectual Capital*, 11(4), 538–554.
<https://doi.org/10.1108/14691931011085678>

- Calisir, F., Altin Gumussoy, C., Cirit, F., Yorulmaz, E., & Bayraktaroglu, A. E. (2010). Intellectual Capital in Turkish Private Banks (pp. 189–194). SciTePress - Science and Technology Publications. <https://doi.org/10.5220/0003088201890194>
- Canibano, L., Garcia-Ayuso, M., & Sanchez, P. (2000). Accounting for intangibles: a literature review. *Journal of Accounting Literature*, 19, 102–130.
- Cariola, A., La Rocca, M., & La Rocca, T. (2007). Corporate governance, intellectual capital and value creation. *Intellectual Capital and Value Creation (September 15, 2007)*.
- Casta, J. F., Ramond, O., & Escaffre, L. (2005). Intangibles Investments and Accounting Numbers Usefulness: An Empirical Study of the European Stock Market. *1st European Institute for Advanced Studies in Management (EIASM): “Visualizing, Measuring, and Managing Intangibles and Intellectual Capital”*., Ferrara, Italy.
- Chan, K. H. (2009). Impact of intellectual capital on organisational performance: An empirical study of companies in the Hang Seng Index (Part 2). *The Learning Organization*, 16(1), 22–39. <https://doi.org/10.1108/09696470910927650>
- Chang, W. S. (2010). The Different Proportion of IC Components and Firms’ Market Performance: Evidence from Taiwan. *The International Journal of Business and Finance Research*, 4(4), 121–134.
- Chen Goh, P. (2005a). Intellectual capital performance of commercial banks in Malaysia. *Journal of Intellectual Capital*, 6(3), 385–396. <https://doi.org/10.1108/14691930510611120>
- Chen Goh, P. (2005b). Intellectual capital performance of commercial banks in Malaysia. *Journal of Intellectual Capital*, 6(3), 385–396. <https://doi.org/10.1108/14691930510611120>
- Chen, J., Zhu, Z., & Yuan Xie, H. (2004). Measuring intellectual capital: a new model and empirical study. *Journal of Intellectual Capital*, 5(1), 195–212. <https://doi.org/10.1108/14691930410513003>
- Chen, M., Cheng, S., & Hwang, Y. (2005a). An empirical investigation of the relationship between intellectual capital and firms’ market value and financial performance. *Journal of Intellectual Capital*, 6(2), 159–176. <https://doi.org/10.1108/14691930510592771>
- Chen, M., Cheng, S., & Hwang, Y. (2005b). An empirical investigation of the relationship between intellectual capital and firms’ market value and financial performance. *Journal of Intellectual Capital*, 6(2), 159–176. <https://doi.org/10.1108/14691930510592771>

- Cheng, M., Lin, J., Hsiao, T., & Lin, T. W. (2010). Invested resource, competitive intellectual capital, and corporate performance. *Journal of Intellectual Capital*, 11(4), 433–450.
<https://doi.org/10.1108/14691931011085623>
- Choo, C. W., & Bontis, N. (Eds.). (2002). *The strategic management of intellectual capital and organizational knowledge*. Oxford; New York: Oxford University Press.
- Clarke, M., Seng, D., & Whiting, R. H. (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12(4), 505–530.
- Claver-Cortes, E., Lopez-Gamero, M. D., Molina-Azorin, J. F., & Zaragoza-Saez, P. D. C. (2007). Intellectual and environmental capital. *Journal of Intellectual Capital*, 8(1), 177–182.
<http://dx.doi.org/10.1108/14691930710715123>
- Cohen, S., & Kaimenakis, N. (2007). Intellectual capital and corporate performance in knowledge-intensive SMEs. *The Learning Organization*, 14(3), 241–262.
<https://doi.org/10.1108/09696470710739417>
- Çolak, N. (2012). *The effect of intellectual capital on firm value and an econometric analysis* (Master Thesis). Bülent Ecevit Üniversitesi, Turkey.
- Crook, T. R., Todd, S. Y., Combs, J. G., Woehr, D. J., & Ketchen, D. J. (2011). Does human capital matter? A meta-analysis of the relationship between human capital and firm performance. *Journal of Applied Psychology*, 96(3), 443–456. <https://doi.org/10.1037/a0022147>
- Davenport, T. H., & Prusak, L. (1998). *Working knowledge: how organizations manage what they know*. Boston, Mass: Harvard Business School Press.
- Demartini, P., & Paoloni, P. (2013). Implementing an intellectual capital framework in practice. *Journal of Intellectual Capital*, 14(1), 69–83. <https://doi.org/10.1108/14691931311289020>
- Demediuk, P. (2002). Intellectual capital reporting: New accounting for the new economy. *Asian Academy of Management Journal*, 7(1), 57–74.
- Derun, I. (2013). The essence of intellectual capital in economics and accounting. *Management Theory and Studies for Rural Business and Infrastructure Development*, 35(4), 497.
- Dženopoljac, V., Janošević, S., & Bontis, N. (2016). Intellectual capital and financial performance in the Serbian ICT industry. *Journal of Intellectual Capital*, 17(2), 373–396.
<https://doi.org/10.1108/JIC-07-2015-0068>
- Edvinsson, L. (1997). Developing intellectual capital at Skandia. *Long Range Planning*, 30(3), 366–373.

- Edvinsson, L. (2000). Some perspectives on intangibles and intellectual capital 2000. *Journal of Intellectual Capital*, 1(1), 12–16. <https://doi.org/10.1108/14691930010371618>
- Edvinsson, L. (2006). *Corporate longitude: what you need to know to navigate the knowledge economy*. London, UK.
- Edvinsson, L., & Malone, M. S. (1997). *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower* (1st edition). New York: Harper Business.
- El-Bannany, M. (2008). A study of determinants of intellectual capital performance in banks: the UK case. *Journal of Intellectual Capital*, 9(3), 487–498.
<https://doi.org/10.1108/14691930810892045>
- El-Bannany, M. (2012). Global financial crisis and the intellectual capital performance of UAE banks. *Journal of Human Resource Costing & Accounting*, 16(1), 20–36.
<https://doi.org/10.1108/14013381211272626>
- Fathi, S., Farahmand, S., & Khorasani, M. (2013). Impact of intellectual capital on financial performance. *International Journal of Academic Research in Economics and Management Sciences*, 2(1), 6.
- Ferchichi, J., & Paturel, R. (2013). The effect of intellectual capital disclosure on the value creation: An empirical study using Tunisian annual reports. *International Journal of Accounting and Financial Reporting*, 3(1), 81.
- Fijalkowska, J. (2008). Review of guidelines for the intellectual capital statement: how to manage and communicate the company's knowledge. *Portuguese Journal of Management Studies*, 13(3), 327–340.
- Firer, S., & Williams, S. M. (2003). Intellectual capital and traditional measures of corporate performance. *Journal of Intellectual Capital*, 4(3), 348–360.
<https://doi.org/10.1108/14691930310487806>
- Galabova, L., & Ahonen, G. (2011). Is intellectual capital-based strategy market-based or resource-based? On sustainable strategy in a knowledge-based economy. *Journal of Human Resource Costing & Accounting*, 15(4), 313–327. <http://dx.doi.org/10.1108/14013381111197243>
- García-Ayuso, M. (2003). Intangibles: Lessons from the past and a look into the future. *Journal of Intellectual Capital*, 4(4), 597–604. <https://doi.org/10.1108/14691930310504590>
- García-Meca, E. (2005). Bridging the gap between disclosure and use of intellectual capital information. *Journal of Intellectual Capital*, 6(3), 427–440. <https://doi.org/10.1108/14691930510611157>

- Garcia-Meca, E., & Martinez, I. (2005). Assessing the quality of disclosure on intangibles in the Spanish capital market. *European Business Review*, 17(4), 305–313.
<https://doi.org/10.1108/09555340510607352>
- Gigante, G. (2013). Intellectual Capital and Bank Performance in Europe. *Accounting and Finance Research*, 2(4).
- Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the Fittest? Entrepreneurial Human Capital and the Persistence of Underperforming Firms. *Administrative Science Quarterly*, 42(4), 750. <https://doi.org/10.2307/2393656>
- Gülcemal, T. (2016). *The Effect of intellectual capital on performance of the firms that have gone public* (PhD Thesis). Erciyes Üniversitesi, Turkey.
- Guo, W.-C., Shiah-Hou, S.-R., & Chien, W.-J. (2012). A study on intellectual capital and firm performance in biotech companies. *Applied Economics Letters*, 19(16), 1603–1608.
<https://doi.org/10.1080/13504851.2011.646062>
- Guthrie, J., Petty, R., Yongvanich, K., & Ricceri, F. (2004). Using content analysis as a research method to inquire into intellectual capital reporting. *Journal of Intellectual Capital*, 5(2), 282–293.
<https://doi.org/10.1108/14691930410533704>
- Guthrie, James. (2001). The management, measurement and the reporting of intellectual capital. *Journal of Intellectual Capital*, 2(1), 27–41.
- Haghshenas, H., & Barzegar, G. (2014). Intellectual Capital and Knowledge Assets for Value Creation. *Science and Nature*, 21.
- Hall, B., Jaffe, A., & Trajtenberg, M. (2001). Market Value and Patent Citations: A First Look. *Rand Journal of Economics*, 36(1), 16–38.
- Hamzah, N., & Ismail, M. N. (2008). The importance of intellectual capital management in the knowledge-based economy. *Contemporary Management Research*, 4(3).
- Hang Chan, K. (2009). Impact of intellectual capital on organisational performance: An empirical study of companies in the Hang Seng Index (Part 1). *The Learning Organization*, 16(1), 4–21.
<https://doi.org/10.1108/09696470910927641>
- Hassanzadeh, R., Lalepour, M., & Imanzadeh, P. (2012). Effect of Intellectual Capital Efficiency on Financial Performance and Market Value of Companies. *Australian Journal of Basic and Applied Sciences*, 6(13), 258–266.

- Hatane, S. E., & sany. (2014). The Impact of Value Added of Intellectual Capital to Firms Profitability and Productivity. *Proceeding of 4th International Conference on Management (4th ICM 2014)* (pp. 342–355). Conference Master Resources.
- Holienka, M., & Pilková, A. (2014). Impact of Intellectual Capital and its Components on Firm Performance Before and After Crisis. *Electronic Journal of Knowledge Management*, 12(4).
- Huang, C., & Wang, M.-C. (2008). The effects of economic value added and intellectual capital on the market value of firms: An empirical study. *International Journal of Management*, 25(4), 722.
- Huggins, R., & Weir, M. (2012). Intellectual assets and small knowledge-intensive business service firms. *Journal of Small Business and Enterprise Development*, 19(1), 92–113.
<https://doi.org/10.1108/14626001211196424>
- Hunter, L., Webster, E., & Wyatt, A. (2005). Measuring Intangible Capital: A Review of Current Practice. *Australian Accounting Review*, 15(36), 4–21.
- IAS 38 — Intangible Assets. (2016, July 21). Retrieved August 7, 2016, from <http://www.iasplus.com/en/standards/ias/ias38>
- Iazzolino, G., & Laise, D. (2013). Value added intellectual coefficient (VAIC): A methodological and critical review. *Journal of Intellectual Capital*, 14(4), 547–563. <https://doi.org/10.1108/JIC-12-2012-0107>
- Iazzolino, G., Laise, D., & Migliano, G. (2013). Measures of Value Creation: a comparison between VAIC and EVA. In *International Forum on Knowledge Asset Dynamic IFKAD* (pp. 501–514). Zagreb, Croatia.
- Ismail, T. H. (2009). Intellectual capital reporting in knowledge economy: Evidence from Egypt. In *International Conference on “Economic Directions III: Economic Policy in a Rapidly Changing World”, the College of Business Administration, Kuwait University, Kuwait, December 2008*.
- Itami, H., & Roehl, T. W. (2009). *Mobilizing Invisible Assets*. Cambridge: Harvard University Press.
- Jafari, E. (2013). Intellectual Capital and its Effects on Firms’ market value and Financial Performance in Iran: An Investigating Pulic Model. *Research Journal of Recent Sciences*, 2(3), 1–6.
- Janosevic, S., Dzenopoljac, V., & Bontis, N. (2013). Intellectual Capital and Financial Performance in Serbia: Intellectual Capital in Serbia. *Knowledge and Process Management*, 20(1), 1–11.
<https://doi.org/10.1002/kpm.1404>

- Joia, L. A. (Ed.). (2007). *Strategies for information technology and intellectual capital: challenges and opportunities*. Hershey: Information Science Reference.
- Joshi, M., Cahill, D., & Sidhu, J. (2010). Intellectual capital performance in the banking sector: An assessment of Australian owned banks. *Journal of Human Resource Costing & Accounting*, 14(2), 151–170. <https://doi.org/10.1108/14013381011062649>
- Joshi, M., Cahill, D., Sidhu, J., & Kansal, M. (2013). Intellectual capital and financial performance: an evaluation of the Australian financial sector. *Journal of Intellectual Capital*, 14(2), 264–285. <https://doi.org/10.1108/14691931311323887>
- Jurczak, J. (2008a). Intellectual Capital Measurement Methods. *Economics and Organization of Enterprise*, 1(1), 37–45. <https://doi.org/10.2478/v10061-008-0005-y>
- Jurczak, J. (2008b). Intellectual Capital Measurement Methods. *Economics and Organization of Enterprise*, 1(1), 37–45. <https://doi.org/10.2478/v10061-008-0005-y>
- Kamath, G. B. (2007). The intellectual capital performance of the Indian banking sector. *Journal of Intellectual Capital*, 8(1), 96–123. <https://doi.org/10.1108/14691930710715088>
- Kamath, G. B. (2008). Intellectual capital and corporate performance in Indian pharmaceutical industry. *Journal of Intellectual Capital*, 9(4), 684–704. <https://doi.org/10.1108/14691930810913221>
- Kamath, G. B. (2015). Impact of Intellectual Capital on Financial Performance and Market Valuation of Firms in India. *International Letters of Social and Humanistic Sciences*, 48, 107–122. <https://doi.org/10.18052>
- Kannan, G., & Aulbur, W. G. (2004). Intellectual capital: Measurement effectiveness. *Journal of Intellectual Capital*, 5(3), 389–413. <https://doi.org/10.1108/14691930410550363>
- Kaplan, R. S. (2008). Conceptual foundations of the balanced scorecard. *Handbooks of Management Accounting Research*, 3, 1253–1269.
- Kaplan, R. S., & Norton, D. P. (1996a). *The balanced scorecard: Translating Strategy into Action*. USA: Harvard Business School Press.
- Kaplan, R. S., & Norton, D. P. (1996b). Using the Balanced Scorecard as a Strategic Management System. *Harvard Business Review*, 74(1), 75–85.
- Kaya, F. B., Sahin, G. G., & Gurson, P. (2010). Intellectual capital in organizations. *Problems and Perspectives in Management*, 8(1).

- Kayali, C. A., Yerele, A. N., & Şebnem, A. D. A. (2007). Entelektüel katma değer katsayısı yöntemi kullanılarak entelektüel sermayenin firma değeri üzerindeki etkisinin belirlenmesine yönelik bir araştırma. *Yönetim ve Ekonomi: Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 14(1), 67–90.
- Khalique, M., Shaari, N., Abdul, J., & Isa, A. H. B. M. (2011). Intellectual capital and its major components. *International Journal of Current Research*, 3(6), 343–347.
- Khalique, M., Shaari, N., Abdul, J., Isa, A. H. B. M., & Ageel, A. (2011). Relationship of Intellectual Capital with The Organizational Performance of Pharmaceutical Companies in Pakistan. *Australian Journal of Basic and Applied Sciences*, 5(12), 1964–1969.
- Kim, T. T., Kim, W. G., Park, S. S.-S., Lee, G., & Jee, B. (2012). Intellectual Capital and Business Performance: What Structural Relationships Do They Have in Upper-Upscale Hotels. *International Journal of Tourism Research*, 14(4), 391–408. <https://doi.org/10.1002/jtr.1868>
- Kim, T. T., Yoo, J. J.-E., & Lee, G. (2011). The HOINCAP scale: measuring intellectual capital in the hotel industry. *The Service Industries Journal*, 31(13), 2243–2272. <https://doi.org/10.1080/02642069.2010.504817>
- Kızıllı, C. (2009). *The measurement, evaluation and accounting of intellectual capital in banking sector* (PhD Thesis). Kadir Has Üniversitesi, Turkey.
- Kocapınar, E. (2010). *The effect of intellectual capital on entrepreneurship orientation and relationship with firm performance* (PhD Thesis). Gebze Yüksek Teknoloji Enstitüsü, Turkey.
- Koçoğlu, İ., İmamoğlu, S. Z., & İnce, H. (2009). The relationship between firm intellectual capital and the competitive advantage. *Journal of Global Strategic Management*, 6, 181.
- Komnenic, B., & Pokrajčić, D. (2012). Intellectual capital and corporate performance of MNCs in Serbia. *Journal of Intellectual Capital*, 13(1), 106–119. <https://doi.org/10.1108/14691931211196231>
- Krugman, P. (2000, October 22). Reckonings; Unsound Bytes? *The New York Times*.
- Kujansivu, P., & Lönnqvist, A. (2007). Investigating the value and efficiency of intellectual capital. *Journal of Intellectual Capital*, 8(2), 272–287. <https://doi.org/10.1108/14691930710742844>
- Laing, G., Dunn, J., & Hughes-Lucas, S. (2010a). Applying the VAIC™ model to Australian hotels. *Journal of Intellectual Capital*, 11(3), 269–283. <https://doi.org/10.1108/14691931011064545>
- Laing, G., Dunn, J., & Hughes-Lucas, S. (2010b). Applying the VAIC™ model to Australian hotels. *Journal of Intellectual Capital*, 11(3), 269–283. <https://doi.org/10.1108/14691931011064545>

- Lev, B. (2001). *Intangibles: management, measurement, and reporting*. Washington: Brookings Institution Press.
- Lev, B., Canibano, L., & Marr, B. (2005). An accounting perspective on intellectual capital. *Perspectives on Intellectual Capital*, 42–55.
- Li, D. Q., & Wu, X. B. (2004). Empirical study on the linkage of Intellectual Capital and firm Performance. Presented at the Engineering Management Conference, Engineering Management Conference. <https://doi.org/10.1109/IEMC.2004.1407188>
- Li, Z., Chen, Z., Lui, T. T. S., & Chu, S. K. W. (2016). The Impact of Intellectual Capital on Companies' Performance: A Study Based on MAKE Award Winners and Non-MAKE Award Winner Companies. *Procedia Computer Science* 99 (pp. 181 – 194). Vienna, Austria.
- Liao, P. C., Ling-Ching Chan, A., & Seng, J. (2013). Intellectual capital disclosure and accounting standards. *Industrial Management & Data Systems*, 113(8), 1189–1205. <https://doi.org/10.1108/IMDS-01-2013-0026>
- Liu, Q., & Wong, K. P. (2009). Intellectual Capital and Financing Decisions: Evidence from the U.S. Patent Data. <https://ssrn.com/abstract=1358366>.
- Lock Lee, L., & Guthrie, J. (2010). Visualising and measuring intellectual capital in capital markets: a research method. *Journal of Intellectual Capital*, 11(1), 4–22. <https://doi.org/10.1108/14691931011013307>
- Luthy, D. H. (1998). Intellectual capital and its measurement. In *Proceedings of the Asian Pacific Interdisciplinary Research in Accounting Conference (APIRA), Osaka, Japan* (pp. 16–17). Citeseer.
- Maditinos, D., Chatzoudes, D., Tsairidis, C., & Theriou, G. (2011). The impact of intellectual capital on firms' market value and financial performance. *Journal of Intellectual Capital*, 12(1), 132–151. <https://doi.org/10.1108/14691931111097944>
- Majdalany, G., & Manassian, A. (2012). Voluntary disclosure of intellectual assets and intellectual liabilities: a literature review. In *European Conference on Intellectual Capital* (p. 507). Academic Conferences International Limited.
- Malhotra, Y. (2003). Measuring knowledge assets of a nation: knowledge systems for development. In *Research Papers prepared for the Invited Keynote Presentation at meeting „Knowledge Systems for Development*. Citeseer.

- Marr, B. (Ed.). (2005). *Perspectives on intellectual capital*. Amsterdam ; Boston: Elsevier Butterworth Heinemann.
- Marr, B. (2012). *Perspectives on Intellectual Capital*. Routledge.
- Marr, B., Schiuma, G., & Neely, A. (2004). The dynamics of value creation: mapping your intellectual performance drivers. *Journal of Intellectual Capital*, 5(2), 312–325.
<https://doi.org/10.1108/14691930410533722>
- Marr, B., & Spender, J. -C. (2004). Measuring knowledge assets – implications of the knowledge economy for performance measurement. *Measuring Business Excellence*, 8(1), 18–27.
<https://doi.org/10.1108/13683040410524702>
- Martensson, M. (2000). A critical review of knowledge management as a management tool. *Journal of Knowledge Management*, 4(3), 204–216.
- Mavridis, D. G. (2004). The intellectual capital performance of the Japanese banking sector. *Journal of Intellectual Capital*, 5(1), 92–115. <https://doi.org/10.1108/14691930410512941>
- Mavridis, D. G., & Kyrmizoglou, P. (2005). Intellectual capital performance drivers in the Greek banking sector. *Management Research News*, 28(5), 43–62. <https://doi.org/10.1108/01409170510629032>
- Mayo, A. (2001). *The human value of the enterprise: valuing people as assets: monitoring, measuring, managing*. London, UK: Nicholas Brealey.
- McConnachie, G. (1997). The Management of Intellectual Assets: Delivering Value to the Business. *Journal of Knowledge Management*, 1(1), 56–62. <https://doi.org/10.1108/EUM0000000004580>
- Mehralian, G., Rajabzadeh, A., Reza Sadeh, M., & Reza Rasekh, H. (2012). Intellectual capital and corporate performance in Iranian pharmaceutical industry. *Journal of Intellectual Capital*, 13(1), 138–158. <https://doi.org/10.1108/14691931211196259>
- Mehralian, G., Rasekh, H. R., Akhavan, P., & Sadeh, M. R. (2012). The impact of intellectual capital efficiency on market value: An Empirical Study from Iranian Pharmaceutical Companies. *Iranian Journal of Pharmaceutical Research*, 11(1), 195–207.
- Mehri, M., Umar, M. S., Saeidi, P., Hekmat, R. K., & Naslmosavi, S. (2013). Intellectual Capital and Firm Performance of High Intangible Intensive Industries: Malaysia Evidence. *Asian Social Science*, 9(9). <https://doi.org/10.5539>

- Meihami, B., Varmaghani, Z., & Meihami, H. (2013). Role of Intellectual Capital on Firm Performance (Evidence from Iranian Companies). *International Letters of Social and Humanistic Sciences*, 12, 43–50. <https://doi.org/10.18052>
- Mention, A., & Bontis, N. (2013). Intellectual capital and performance within the banking sector of Luxembourg and Belgium. *Journal of Intellectual Capital*, 14(2), 286–309. <https://doi.org/10.1108/14691931311323896>
- Miller, M., DuPont, B. D., Fera, V., Jeffrey, R., Mahon, B., Payer, B. M., & Starr, A. (1999). Measuring and Reporting Intellectual Capital from a Diverse Canadian Industry Perspective: Experiences, Issues, and Prospects. *OECD Symposium, Amsterdam*.
- Molodchik, M., & Bykova, A. (2011). Applying the VAIC™ Model to Russian Industrial Enterprises. In *Proceedings of the 3rd European Conference on Intellectual Capital* (pp. 268–277).
- Mondal, A., & Ghosh, S. K. (2012). Intellectual capital and financial performance of Indian banks. *Journal of Intellectual Capital*, 13(4), 515–530. <https://doi.org/10.1108/14691931211276115>
- Moradi, M., Saeedi, M., Hajizadeh, H., & Mohammadi, M. (2013). The Influence of Intellectual Capital on the Improvement of Companies' Financial Performance. *International Journal of Economics, Business and Finance*, 1(5), 120–139.
- Morgan, J., Ihrke, F., & Hurley, J. (2010). A Review of Intellectual Capital Literature Proposing Balance Sheet Disclosures of Intellectual Capital. *Advances in Business Research*, 1(1), 36–44.
- Mosavi, S. A., Nekoueizadeh, S., & Ghaedi, M. (2012). A study of relations between intellectual capital components, market value and finance performance. *African Journal of Business Management*, 6(4). <https://doi.org/10.5897/AJBM11.1466>
- Mouritsen, J., Nikolaj Bukh, P., & Marr, B. (2004). Reporting on intellectual capital: why, what and how? *Measuring Business Excellence*, 8(1), 46–54. <https://doi.org/10.1108/13683040410524739>
- Muhammad, N. M. N., & Ismail, M. K. A. (2009). Intellectual capital efficiency and firm's performance: study on Malaysian financial sectors. *International Journal of Economics and Finance*, 1(2), 206.
- Muhammad, N. M. N., & Ismail, M. K. A. (2014). Intellectual capital efficiency and firm's performance: Study on Malaysian Financial Sectors. *International Journal of Economics and Finance*, 1(2), p206.

- Muller, C. (2004). The three Ms of IC – measuring, monitoring and managing. Presented at the Proceedings of the Fifth European Conference on Organizational Knowledge, Learning, and Capabilities, Innsbruck, Austria.
- Nazari, J. A. (2015). Intellectual Capital Measurement and Reporting Models. In *Knowledge Management for Competitive Advantage During Economic Crisis* (p. 23). Simon Fraser University, Canada: IGI.
- Nazari, J. A., & Herremans, I. M. (2007). Extended VAIC model: measuring intellectual capital components. *Journal of Intellectual Capital*, 8(4), 595–609.
<https://doi.org/10.1108/14691930710830774>
- Ngwenya, B. (2013). Intellectual Capital's Leverage on Shareholder Value Growth: A Lesson for Developing Economies. *American Journal of Educational Research*, 1(5), 149–155.
<https://doi.org/10.12691/education-1-5-1>
- Odabaşoğlu, Ş. (2016). *The effects of the intellectual capital to financial performance in aviation managements* (PhD Thesis). Haliç Üniversitesi, Turkey.
- O'Donnell, D., O'Regan, P., Coates, B., Kennedy, T., Keary, B., & Berkery, G. (2003). Human interaction: the critical source of intangible value. *Journal of Intellectual Capital*, 4(1), 82–99.
- OECD. (2008). *Intellectual Assets and Value Creation Synthesis Report*. Paris-France: OECD.
- Owais, W. O., & Ali, O. A. (2012). The Extent of Using Intellectual Capital Criteria at Jordanian Public Shareholding Companies - A Field Study from the Jordanian Shareholding Companies' Point of View. *International Business Research*, 5(12). <https://doi.org/10.5539/ibr.v5n12p68>
- Özbek, G. (2016). *Measurement of intellectual capital and the analysis of its effect on performance ratios: A study on communication companies traded on BIST* (Master Thesis). Celal Bayar Üniversitesi, Turkey.
- Ozer, G., Ergun, E., & Yilmaz, O. (2015). Effects of intellectual capital on qualitative and quantitative performance: Evidence from Turkey. *South African Journal of Economic and Management Sciences*, 18(2), 143–154. <https://doi.org/10.17159/2222-3436/2015/v18n2a1>
- Ozkan, N., Cakan, S., & Kayacan, M. (2016). Intellectual Capital and Financial Performance: A Study of the Turkish Banking Sector. *Borsa Istanbul Review*. <https://doi.org/10.1016/j.bir.2016.03.001>
- Pasaribu, H., Purnamasari, D. I., & Hapsari, I. T. (2012). The role of corporate intellectual capital. *American International Journal of Contemporary Research*, 2(9).

- Peng, T. A., Pike, S., & Roos, G. (2007). Intellectual capital and performance indicators: Taiwanese healthcare sector. *Journal of Intellectual Capital*, 8(3), 538–556.
<https://doi.org/10.1108/14691930710774902>
- Peppard, J., & Rylander, A. (2001). Using an intellectual capital perspective to design and implement a growth strategy: the case of APiON. *European Management Journal*, 19(5), 510–525.
[https://doi.org/10.1016/S0263-2373\(01\)00065-2](https://doi.org/10.1016/S0263-2373(01)00065-2)
- Petty, R., & Guthrie, J. (2000). Intellectual capital literature review: measurement, reporting and management. *Journal of Intellectual Capital*, 1(2), 155–176.
- Pew Tan, H., Plowman, D., & Hancock, P. (2007). Intellectual capital and financial returns of companies. *Journal of Intellectual Capital*, 8(1), 76–95. <https://doi.org/10.1108/14691930710715079>
- Pouraghajan, A., Ramezani, A., & Mohammadzadeh, S. (2013). Impact of Intellectual Capital on Market Value and Firms' Financial Performance: Evidences from Tehran Stock Exchange. *World of Science Journal*, 1(12), 197–208.
- Pulic, A. (1998). Measuring the performance of intellectual potential in knowledge economy. In *2nd McMaster Word Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential*.
- Pulic, A. (2000). VAIC™—an accounting tool for IC management. *International Journal of Technology Management*, 20(5–8), 702–714.
- Pulic, A. (2004). Intellectual capital – does it create or destroy value? *Measuring Business Excellence*, 8(1), 62–68. <https://doi.org/10.1108/13683040410524757>
- Pulic, A. (2005). Basic information on VAIC™. www.vaic-On.net.
- Pulic, A. (2008). The principles of intellectual capital efficiency-A brief description. *Croatian Intellectual Capital Center, Zagreb*, 76.
- Radianto, W. E. (2011). The influence of intellectual capital on banking industry performance: a case in indonesia stock exchange before and after the 2008 global financial crisis. *Asia Pacific Journal of Accounting and Finance*, 2, 1.
- Ramirez, Y., Lorduy, C., & Rojas, J. A. (2007). Intellectual capital management in Spanish universities. *Journal of Intellectual Capital*, 8(4), 732–748. <https://doi.org/10.1108/14691930710830873>
- Rastogi, P. . (2000). Knowledge management and intellectual capital – the new virtuous reality of competitiveness. *Human System Management*, 19, 39–44.

- Ratnatunga, J. (2002). The valuation of capabilities: a new direction for management accounting research. *Journal of Applied Management Accounting Research*, 1(1), 1–15.
- Ray, S. (2012). Efficacy of Economic Value-Added Concept in Business Performance Measurement. *Advances in Information Technology and Management (AITM)*, 2(2), 260–267.
- Rehman, W. U., Rehman, H. U., Usman, M., & Asghar, N. (2012). A Link of intellectual capital performance with corporate performance: comparative study from banking sector in Pakistan. *International Journal of Business and Social Science*, 3(12).
- Riahi-Belkaoui, A. (2003). Intellectual capital and firm performance of US multinational firms: A study of the resource-based and stakeholder views. *Journal of Intellectual Capital*, 4(2), 215–226.
<https://doi.org/10.1108/14691930310472839>
- Roos, G., & Roos, J. (1997). Measuring your company's intellectual performance. *International Journal of Strategic Management, Long Range Planning*, 30(3), 413–426.
- Roos, G., Roos, J., Dragonetti, N. C., & Edvinsson, L. (1997). *Intellectual Capital: Navigating in the New Business Landscape*. London, UK: Macmillan Publications.
- Roslender, R., & Fincham, R. (2001). Thinking critically about intellectual capital accounting. *Accounting, Auditing & Accountability Journal*, 14(4), 383–399.
<https://doi.org/10.1108/09513570110403425>
- Seetharaman, A., Helmi Bin Zaini Sooria, H., & Saravanan, A. S. (2002). Intellectual capital accounting and reporting in the knowledge economy. *Journal of Intellectual Capital*, 3(2), 128–148.
<https://doi.org/10.1108/14691930210424734>
- Serrat, O. (2011). A primer on intellectual capital. *Washington, DC: Asian Development Bank*, 106, 1–7.
- Sewdass, N. (2005). Interrelationship between document management, information management and knowledge management. *South African Journal of Information Management*, 7(3).
- Shaari, N., Abdul, J., Khaliq, M., & Isa, A. H. B. M. (2011). Ranking of public and domestic private sector commercial banks in Pakistan on the basis of the intellectual capital performance. *KASBIT Business Journal*, 4, 61–68.
- Sharabati, A. A., Naji Jawad, S., & Bontis, N. (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Management Decision*, 48(1), 105–131.
<https://doi.org/10.1108/00251741011014481>

- Shih, K., Chang, C., & Lin, B. (2010). Assessing knowledge creation and intellectual capital in banking industry. *Journal of Intellectual Capital*, 11(1), 74–89.
<https://doi.org/10.1108/14691931011013343>
- Shil, N. C. (2009). Performance measures: An application of economic value added. *International Journal of Business and Management*, 4(3), 169.
- Sledzik, K. (2006). Multidimensional Intellectual Capital Valuation–MV/BV and VAIC™ Ratio Application: 2006-2009 Polish Banks Perspective. *BV and VAIC™ Ratio Application*, 2009.
- Śledzik, K. (2012). How to Measure Intangible Resources in Listed Companies. *Theory of Management*, 5, 224–249.
- Sledzik, K. (2013). The Intellectual Capital Performance of Polish Banks: An Application of VAIC (TM) Model. *E-Finanse*, 9(2), 92.
- Souissi, M., & Itoh, K. (2006). Implementing the Balanced Scorecard. *The Journal of Corporate Accounting & Finance*, 57–61. <https://doi.org/10.1002/jcaf>
- Stahle, P., Stahle, S., & Aho, S. (2011). Value added intellectual coefficient (VAIC): a critical analysis. *Journal of Intellectual Capital*, 12(4), 531–551. <https://doi.org/10.1108/14691931111181715>
- Starovic, D., & Marr, B. (2003). Understanding corporate value: managing and reporting intellectual capital. *Chartered Institute of Management Accountants (CIMA)*, 28.
- Stewart, T. (1997). *Intellectual Capital: The New Wealth of Organizations* (illustrated, reprint). Business Digest, New York: Doubleday / Currency.
- Stewart, T. (2002). *The Wealth of Knowledge: Intellectual Capital and the Twenty-First Century Organization*. London: Nicholas Brealey Publishing Limited.
- Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450–463.
- Sudarsanam, S., Marr, B., & Sorwar, G. (2005). A Finance Perspective on Intellectual Capital. *Perspectives on Intellectual Capital*, 56.
- Sudarsanam, S., Sorwar, G., & Marr, B. (2003). Valuation of Intellectual Capital and Real Option Models (pp. 1–29). Presented at the PMA Intellectual Capital Symposium, Cranfield University.
- Sudarsanam, S., Sorwar, G., & Marr, B. (2006). Real options and the impact of intellectual capital on corporate value. *Journal of Intellectual Capital*, 7(3), 291–308.
<https://doi.org/10.1108/14691930610681410>

- Sullivan Jr, P. H., & Sullivan Sr, P. H. (2000). Valuing intangibles companies-An intellectual capital approach. *Journal of Intellectual Capital*, 1(4), 328–340.
- Sullivan, P. H. (1999). Profiting from intellectual capital. *Journal of Knowledge Management*, 3(2), 132–143. <https://doi.org/10.1108/13673279910275585>
- Sumedrea, S. (2013). Intellectual Capital and Firm Performance: A Dynamic Relationship in Crisis Time. *Procedia Economics and Finance*, 6, 137–144. [https://doi.org/10.1016/S2212-5671\(13\)00125-1](https://doi.org/10.1016/S2212-5671(13)00125-1)
- Sveiby, K. E. (1997). *The new organizational wealth: managing & measuring knowledge-based assets* (1st ed). San Francisco: Berrett-Koehler Publishers.
- Sveiby, K. E. (2001a). A knowledge-based theory of the firm to guide in strategy formulation. *Journal of Intellectual Capital*, 2(4), 344–358. <https://doi.org/10.1108/14691930110409651>
- Sveiby, K. E. (2001b). Measuring Intangible Assets.
- Sveiby, K. E. (2010). Methods for Measuring Intangible Assets. *Sveiby Knowledge Association Article*, [Online]. Retrieved from <http://www.sveiby.com/articles/IntangibleMethods.htm>
- Sveiby, K.-E. (2001). A Knowledge Based Theory of the Firm to Guide in Strategy Formulation. *Journal of Intellectual Capital*, 2(4), 344.
- Swartz, N., & Firer, S. (2005). Board structure and intellectual capital performance in South Africa. *Meditari Accountancy Research*, 13(2), 145–166. <https://doi.org/10.1108/10222529200500017>
- Sydler, R., Haeffliger, S., & Pruksa, R. (2014). Measuring intellectual capital with financial figures: Can we predict firm profitability? *European Management Journal*, 32(2), 244–259. <https://doi.org/10.1016/j.emj.2013.01.008>
- Talukdar, A. (2008). What is Intellectual Capital. *And Why It Should Be Measured*. Mumbai: Attainix Consulting.
- Tan, H. P., Plowman, D., & Hancock, P. (2007). Intellectual capital and financial returns of companies. *Journal of Intellectual Capital*, 8(1), 76–95. <https://doi.org/10.1108/14691930710715079>
- Tayles, M., Pike, R. H., & Sofian, S. (2007). Intellectual capital, management accounting practices and corporate performance: Perceptions of managers. *Accounting, Auditing & Accountability Journal*, 20(4), 522–548. <https://doi.org/10.1108/09513570710762575>
- Ting, I. W. K., & Lean, H. H. (2009). Intellectual capital performance of financial institutions in Malaysia. *Journal of Intellectual Capital*, 10(4), 588–599. <https://doi.org/10.1108/14691930910996661>

- Ulum, I., Ghozali, I., & Purwanto, A. (2014a). Intellectual Capital Performance of Indonesian Banking Sector: A Modified VAIC (M-VAIC) Perspective. *Asian Journal of Finance & Accounting*, 6(2), 103. <https://doi.org/10.5296/ajfa.v6i2.5246>
- Ulum, I., Ghozali, I., & Purwanto, A. (2014b). Intellectual Capital Performance of Indonesian Banking Sector: A Modified VAIC (M-VAIC) Perspective. *Asian Journal of Finance & Accounting*, 6(2), 103. <https://doi.org/10.5296/ajfa.v6i2.5246>
- van den Berg, H. A. (2007). Models of Intellectual Capital Valuation: A Comparative Evaluation. *Strategies for Information Technology and Intellectual Capital: Challenges and Opportunities*, 49.
- Vaz, R., Zarelli, P. R., Werutsky, V. D. G., Maur, P., & others. (2015). Measurement Models of Intellectual Capital for the Decision Making and Performance Variables. *Global Journal of Management and Business Research*, 15(1).
- Vishnu, S., & Kumar Gupta, V. (2014). Intellectual capital and performance of pharmaceutical firms in India. *Journal of Intellectual Capital*, 15(1), 83–99. <https://doi.org/10.1108/JIC-04-2013-0049>
- Wall, A., Kirk, R., & Martin, G. (2004). *Intellectual capital: measuring the immeasurable?* Amsterdam: Elsevier.
- Wang, J. (2008). Investigating market value and intellectual capital for S&P 500. *Journal of Intellectual Capital*, 9(4), 546–563. <https://doi.org/10.1108/14691930810913159>
- Wang, M. S. (2011a). Intellectual Capital and Firm Performance. *Annual Conference on Innovations in Business & Management* (pp. 1–26). London, UK.
- Wang, M. S. (2011b). Measuring intellectual capital and its effect on financial performance: Evidence from the capital market in Taiwan. *Frontiers of Business Research in China*, 5(2), 243–265. <https://doi.org/10.1007/s11782-011-0130-7>
- Wang, W., & Chang, C. (2005). Intellectual capital and performance in causal models: Evidence from the information technology industry in Taiwan. *Journal of Intellectual Capital*, 6(2), 222–236. <https://doi.org/10.1108/14691930510592816>
- Watson, A., Stanworth, J., Healeas, S., Purdy, D., & Stanworth, C. (2005). Retail franchising: an intellectual capital perspective. *Journal of Retailing and Consumer Services*, 12(1), 25–34. <https://doi.org/10.1016/j.jretconser.2004.02.001>

- Williams, S. M. (2001). Is intellectual capital performance and disclosure practices related? *Journal of Intellectual Capital*, 2(3), 192–203. <https://doi.org/10.1108/14691930110399932>
- Yalama, A., & Coskun, M. (2007). Intellectual capital performance of quoted banks on the Istanbul stock exchange market. *Journal of Intellectual Capital*, 8(2), 256–271.
<https://doi.org/10.1108/14691930710742835>
- Yanfei, W., Pingfeng, L., & Xi, H. (2010). An Empirical Study on Interaction among Intellectual Capital, Organization Culture and Firm Performance. *Management and Service Science (MASS), 2010 International Conference*, 1–4. <https://doi.org/10.1109/ICMSS.2010.5576188>
- Yıldız, S. (2010). *The effect of intellectual capital on business performance: A research on banking sector* (PhD Thesis). Marmara Üniversitesi, Turkey.
- Yu, K. Y., Ng, H. T., Wong, W. K., Chu, K. W., & Chan, K. H. (2010). An empirical study of the impact of intellectual capital performance on business performance. In *Proceedings of the 7th International Conference on Intellectual Capital Knowledge Management and Organizational Learning, Hong Kong* (pp. 11–12).
- Zeghal, D., & Maaloul, A. (2010). Analysing value added as an indicator of intellectual capital and its consequences on company performance. *Journal of Intellectual Capital*, 11(1), 39–60.
<https://doi.org/10.1108/14691931011013325>
- Zehri, C., Abdelbaki, A., & Bouabdellah, N. (2012). How Intellectual Capital Affects a Firm's Performance? *Australian Journal of Business and Management Research*, 2(8), 24.