THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL AND FIRM PERFORMANCE

Amina Mohamed Buallay *

* Brunel University, UK
Contact details: Brunel University London, Kingston Lane, Uxbridge, Middlesex, UB8 3PH, UK

How to cite this paper: Buallay, A. M. (2017). The relationship between intellectual capital and firm performance. *Corporate Governance and Organizational Behavior Review, 1(1),* 32-41.
http://doi.org/10.22495/cgobr_v1_i1_p4

ISSN Online: 2521-1889
ISSN Print: 2521-1870

Received: 18.07.2017
Accepted: 31.10.2017

JEL Classification*:* L25, O34, D22

DOI: 10.22495/cgobr_v1_i1_p4

Abstract

This study aimed to measure the impact of intellectual capital on firm performance of listed firms in Saudi stock exchange. The study methodology was a pooled data collected from the Saudi stock exchange (TADAUWL) for the period from 2012 to 2014. The study sample is 489 observations from 171 listed firms. The study independent variable is Intellectual Capital components (HCE, SCE and CEE). The dependent variable is firm performance which measured using ROA, ROE and Tobin's Q. The study also utilized five control variables in order to help measure the relationship between Intellectual Capital and Firm Performance. In conclusion, the study found that the Intellectual Capital level tends to be higher with firms that have high performance. However, there is variation in the level across the sectors. Random effect regression model was incorporated; the results revealed that there is no significant impact of Intellectual Capital on firm's operational performance (ROA). However, there is the significant positive impact of Human capital on financial performance (ROE). Additionally, the study concluded that there is the negative significant impact on structural capital efficiency and positive significant impact on Capital Employed Efficiency on firms' market performance (TQ). These results are expected to broaden the understanding of IC and its impact on firms' performance in GCC economies in general and specifically in Saudi economic. Moreover, it will be useful for GCC firms to place their priorities and financial plans for effective and efficient use of Intellectual Capital.

Keywords: Intellectual Capital, Firm performance, Resources-based theory, Saudi Arabia

1. INTRODUCTION

By the beginning of the twenty-first century in a competitive world, the aphorism that "knowledge is power" has a rising significance than before (Rechberg and Syed, 2013). Nowadays, one serious research line pays attention to intangible assets which consist of knowledge and experience of manpower, database, and systems, business relationship, goodwill, and alliance (Saunders, 2016). Development of knowledge has changed the firm's value from tangible assets to intangible assets. Therefore, the importance of knowledge and intellectual capital as intangible assets is essential to firm performance which eventually affects the whole economy.

Many academic research fields have discussed the significant relationship between intellectual capital and performance (Celenza, 2014; Singh et al., 2016; Inkinen, 2015). However, these studies showed that firms still suffered from inefficient utilization of intellectual capital. Besides, their knowledge management strategy should be adjusted to consider Intellectual Capital as a part of the strategy to achieve their goals for better performance (Wang et al., 2016). This fact underlines that studies and theories pretend to be inefficient so far in determining how IC inside the firms influence their performances.

There are few attempts to measure the relationships between IC and firms' performance, particularly in GCC countries (Al-Musali et al., 2014).

However, these studies are focusing on the financial sectors such as Banks and not considering other sectors. However, there is a need in GCC to explore the IC efficiency of firms across all sectors. Since GCC countries try to establish a market with diversification rather than oil base; they should manage their intellectual capital in order to generate a higher competitive advantage.

The largest emerging economy in GCC has been selected (Saudi), this is due to the fact that Saudi government is attempting to meet international and regional commitment as a member of World trade organization and GCC council. Therefore, establishing and maintaining strong competitive advantage is important for all Saudi firms to outperform their competitors and to attract national and international investors.

Considering the fact that firms' main resources are knowledge and intellectual capital and it functions the most significant role in firm value-creating process, it is necessary to have sufficient information about the value efficiency and analyse how well intellectual capital is utilized.

Intellectual Capital and firm's performance are assumed to be significant for all stakeholders; hence factors affecting the relationship between IC and performance need to be highlighted. This study contributes to the intellectual capital literature in many ways. First, it sheds the light on the rare prior IC studies that measuring IC efficiency considering all sectors in GCC economies. Second, it will provide empirical evidence on the relationship between IC and firms' operational, financial market performance by using data from listed firms of the biggest country in the GCC. Thus, the results are expected to broaden the understanding of IC and its impact on firms' performance in GCC economies. Third, this study will employ the VAIC model by using three coefficients; namely human capital, structural capital and capital employed. This adds the significant power of these components on firms' performance. Forth, the current study adds new sectors other than financial sectors that not have been used previously for the analysis the relationship between IC and performance. Furthermore, such information will help the stakeholders, investors, decision maker, regulators, policymakers and scholars to improve their knowledge about IC. Finally, it will be useful for firms to place their priorities and financial plans for effective and efficient use of IC.

The main Objective of this study is to determine IC Efficiency level across the sectors and to assess the relationship between Intellectual Capital components and the Firm operational, financial, and market performance among all Saudi listed firms.

The first section being an introduction, the rest of this study is divided into five sections. Section 2 discusses literature review and developing hypotheses. Section 3 presents the design and research methodology. Section 4 shows the descriptive statistics. Section 5 presents empirical analysis results. Section 6 presents the study's conclusion, recommendations, limitation and the scope for further research.

2. LITERATURE REVIEW

2.1. Definition and evaluation of intellectual capital

In 1996 IC has been defined by Edvinsson and Sullivan as the knowledge that can be converted into value. After one year in 1997 Stewart (1997) broadens the definition of IC to the collection of knowledge, information, intellectual property rights and experience of each person in a business entity. In the same year, Edvinsson and Malone (1997) have added some concepts to the definition "IC is the possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide a company with a competitive edge in the market". Later, Zéghal and Maaloul (2010) define IC as "the sum of all knowledge a firm is able to use in the process of conducting businesses to create value for the company". Recently, (Alipour, 2012) defines the IC as "the group of knowledge assets that are owned and/or controlled by an organization and most significantly drive organization value creation mechanisms for targeted company key stakeholders". More recently, Chen et al. (2014) summarizing previous literature, conclude that IC can be defined as "knowledge-related intangible assets embedded in an organization that includes intellectual competences, intellectual property, and intellectual resources".

Arguably, the last two decades have been exposed the importance of intellectual capital (IC) efficiency to firms' performance. The debate of IC has been approved as an important academic discipline to be considered all over the world (Serenko and Bontis, 2013). Therefore, the intellectual capital discipline has become a crucial factor of firms in enhancing their competitive advantage and attaining better performance (Wang & Chang, 2005). Intellectual capital efficiency is hard to be identified, disclosed and measured in the firms' financial reporting. According to the International Accounting Standard (IAS 38), which addressed the issues regarding the intangible assets, it is not easy to measure IC components of firms by adopting the current traditional accounting practice. This lead to a gap between firms' value as reported in financial reporting and actual market value (Rahman, 2012). The call for IC efficiency valuation has increased, there are different methods established to measure the value of IC and its efficiency such as, Skandia IC Report Method (Edvinsson and Malone, 1997), Intangible Asset Monitor Approach (Sveiby, 1997) and Value Added Intellectual Coefficient (VAIC) Model (Pulic, 1998). The VAIC Model is widely used in calculating the IC efficiency; Laing et al. (2010) showed that VAIC Model is a strong tool for assessing the value of IC.

2.2. Intellectual capital and performance

Bassi and van Buren (1999) wrote the first study measured the relationship between intellectual capital efficiency and performance. The sample size was 500 US-listed firms. They found a positive relationship between IC and financial performance. Zéghal and Maaloul (2010) examined the role of value added as a measure of IC, and its effects on the firm's economic, financial and stock market

performance. They adopted the VAIC method on 300 listed firms on United Kingdom stock exchange. The findings showed that IC has a positive impact on economic and financial performance. In contra to Zéghal and Maaloul (2010), Celenza (2014) examined the relationship between IC and firm's performance and market value for 23 Italian listed firms by employing eight regression models. The results showed the insignificant relationship between IC and firms' financial performance. However, Morariu (2014) tested IC performance of the Romanian firms. The study found that capital employed efficiency has insignificant role in both value creation and in reducing company's production costs. While HCE plays a major role in productivity variation. Different results found by Pitelli et al. (2014), they pointed out a significant negative relationship between IC components and market value in Brazilian real estate firms except for CEE. Shifting from Europe to ASEAN countries, Nimtrakoon (2015) tested the IC of five ASEAN countries; he examined the relationship between IC, market value, and financial performance. He selects 213 firms from the technology sector. The findings showed that there is no significant difference in IC efficiency across those countries. In addition, the findings showed that CEE and HCE are more significant than SCE. Razafindrambinina and Anggreni (2011) examined the relationship between IC and performance of listed firms in Jakarta Stock Exchange. The study findings revealed that IC contributed to the financial performance except the revenue growth. The findings confirmed that future performance is affected by the level of IC. The study also showed that assets of physical, financial and structural nature are the most significant underlying driver of performance. Phusavat et al. (2011) tested the relationship between IC and large manufacturing performance in Thailand. The findings showed that the IC has a significant positive relationship with return on assets, return on equity, revenue growth, and employee productivity. Pew Tan et al. (2007) applied their studies on 150 Singaporean listed firms to examine the relationship between IC and performance. They found that IC positively is associated with performance. The firms' IC is correlated to the future performance of companies and the rate of growth of the firms' IC is positively associated with firms' performance. Moving to Middle East Countries, Alipour (2012) analysed 39 Iranian insurance firms; he found that IC and its components have a significant positive relationship with return on assets as a measure of companies' performance. Sharabati et al. (2010) applied their study by distributing a survey to 132 top- and middle-level managers from all members of the Jordanian Association of Pharmaceutical Manufacturers. The findings showed that the IC components have a significant relationship with performance. Those studies adopted in developed countries are focusing on one sector only to identify the relationship between IC and performance. To the best of our knowledge as we noted from the previous literature, In GCC countries there is no single attempt to measure the IC efficiency in sectors other than Banks. Al-Musali et al. (2014) examine the effect of intellectual capital (IC) on Saudi banks performance using value-added intellectual coefficient model, for three years period from 2008 to 2010, the findings show that IC performance is low and it has positive association with ROA and ROE. However, the relationships between IC components and financial performance were varying. Another study was conducted by Razak et al. (2016) to measure the intellectual capital performance of Saudi commercial banks using VAIC to examine IC of 12 commercial banks listed on Saudi Stock Exchange for one-year period (2014). The results show that the banks have higher human capital efficiency than structural and capital efficiency. Moving broader to GCC countries Ismail et al. (2011) examines whether IC influence the bank's financial performance in Bahrain for the period from 2005 to 2007. The study uses two regression models to test if the VAIC, and associated with financial performance. The result was in line with Saudi studies and shows that intellectual capital has a positive impact on the financial performance of banks in Bahrain. However, the study found that HCE and CEE are positively associated with the financial performance but there was no significant association between SCE and financial performance of the banks in Bahrain. Al-Musali al. (2011) examines the intellectual capital performance of 74 GCC listed banks in stock exchange for the period from 2008 to 2011 using VAIC method. The study extends prior studies by considering corporate governance dimensions as independent variables; the findings show that board size and independency, family ownership and institutional ownership have a significant relationship with IC performance. Abdulsalam et al. (2011) measure the IC efficiency of banks sectors in Kuwait using a ten-year period from 1996 to 2006 and adopting VAIC model. The bank sector was divided into commercial and non-commercial banks. The ranking results based on HCE showed similar results as that of VAIC. While the ranking results CEE results are not in line with VAIC. El-Bannany (2012) investigates the IC performance of UAE banks for seven years from 2004 to 2010. The results show that financial crisis and market structure have a significant impact on IC performance. Moving from GCC countries to Arab countries

As aforementioned, an argument on IC and firms' performance is important issue; it is interesting to further explore the effect of IC and performance of all listed firms rather than only financial sector in developed countries (eg. Saudi Arabia).

In this study, we depend on the resource-based theory developed by Grant (1991) which consider the intellectual capital as the main strategic asset in creating and maintaining firms` competitive advantage. Therefore, we construct IC and its components to be positively associated with firm performance. The main hypothesis can be divided into the three sub-hypothesis according to Dženopoljac (2016):

H1 VAIC positively affects the operational performance of Saudi listed Firms.

- *H1a* Firms that have greater HCE are more likely to have higher ROA.
- *H1b* Firms that have greater SCE are more likely to have higher ROA.
- *H1c* Firms that have greater CEE are more likely to have higher ROA

H2 VAIC positively affects the financial performance of Saudi listed Firms.

- *H2a* Firms that have greater HCE are more likely to have higher ROE.
- *H2b* Firms that have greater SCE are more likely to have higher ROE.
- *H2c* Firms that have greater CEE are more likely to have higher ROE.

H3 VAIC positively affects the market performance of Saudi listed Firms.

- *H3a* Firms that have greater HCE are more likely to have higher TQ.
- *H3b* Firms that have greater SCE are more likely to have higher TQ.
- *H3c* Firms that have greater CEE are more likely to have higher TQ.

3. RESEARCH METHODOLOGY

3.1. Study population, sample, and resources of data

The study depends on the selected sample which is 498 observations for 171 listed firms in Saudi stock exchange for three years from 2012 to 2014. The Data used in this study was collected from the Saudi stock exchange database (TADAWUL). Firms used in the sample were selected according to the data available in the period of 2012 to 2014. Firms have not been turned off or merged with other firms during the research period. Data were obtained from Saudi stock exchange database; we used in our sample the pooled data which combines both time series data and cross-sectional data in our sample.

Twenty-four observations among all sectors were excluded as shown in Table 1. The sample contains divers listed firms from fifteen sectors. Firms included in the sample classified by sectors for the periods (2012-2014). The table shows that there are 7% of Saudi listed firms from Banks & Financial Services sector, 8.2% from Petrochemical Industries sector, 8.2% from Cement sector, 8.8% from Retail sector, 1.2% from Energy & Utilities, 9.4% from Agriculture & Food Industries sector, 2.3% from Telecommunication & Information Technology, 20.5% from Insurance sector, 4.1% from Multi-investment sector, 8.8% from Industrial Investment sector, 9.9% from Building & Construction sector, 4.7% from Real Estate Development sector, 2.9% from Transport sector, 1.8% from Media & Publishing sector, 2.2% from Hotel & Tourism sector.

Table 1. Sample selection

Sector	*Listed Companies*	*Total Observations*	*Excluded Observations*	*Study Sample*
Agriculture & Food Industries	16	48	3	45
Banks & Financial Services	12	36	0	36
Building & Construction	17	51	1	50
Cement	14	42	5	37
Energy & Utilities	2	6	0	6
Hotel & Tourism	4	12	0	12
Industrial Investment	15	45	4	41
Insurance	35	105	8	97
Media & Publishing	3	9	3	6
Multi-investment	7	21	0	21
Petrochemical Industries	14	42	0	42
Real Estate Development	8	24	0	24
Retail	15	45	0	45
Telecommunication & Information Technology	4	12	0	12
Transport	5	15	0	15
Total	*171*	*513*	*24*	*489*

3.2. Variables

This study aims at investigating the relationship between Intellectual Capital and firm's performance, to do so the study uses three types of performance including financial, operational and market performance. Following Singh et al. (2016) the firm operational performance was measured using ROA, Celenza (2014) the firm financial performance measured using ROE and Hejazi et al., (2016) the firm market performance was measured using Tobin's Q. Those three performance aspects were used as dependent variables in different regression models.

The independent variable (Intellectual Capital) have been measured using Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) and Capital Employed Efficiency(CEE) in order to measure the value of intellectual capital, the efficiency of IC can be measured using VAIC method following previous studies (Celenza, 2014; Singh et al., 2016; Inkinen, 2015 and Nimtrakoon, 2015, Sarea & Alansari, 2016). Table 2 shows the steps followed in the study to reach the value added of intellectual capital (VAIC).

Five control variables will be discussed for all estimated models of our study. They are Firm Size (total assets) as used by Buallay. et al., (2017), Firm age (Fan et al., 2011), Board of directors Size (Al-Musalli et al., 2011); Audit Quality (Gan et al., 2013) and the Sectors (Firer. et al., 2003).

Table 2. Value added Intellectual Capital

Variable	*Formula*
Value added (VA)	Operating profit + employee cost + Depreciation + Amortization
Capital employed (CE)	Equity + long-term liabilities
Human capital (HC)	Total costs invested on employees
Structural capital (SC)	Value added (VA) – human capital (HC)
Human Capital Efficiency (HCE)	VA / HC
Structural Capital Efficiency (SCE)	SC / VA
Capital Employed Efficiency (CEE)	VA / CE
Value Added Intellectual Capital (VAIC)	HCE+SCE+CEE

3.3. Study Model

In order to measure the relationship between intellectual capital and performance; the study estimates the following linear regression models.

$$Perf_{it} = b_0 + b_1 HCE_{it} + b_2 SCE_{it} + b_3 CEE_{it} + b_4 Age_{it} + b_5 FSize5_{it} + b_6 BSize_{it} + b_7 Audit_{it} + b_8 Sctr_{it} + \varepsilon_{it} \quad (1)$$

Where, Perf is a continuous variable; the dependent variable is the firm performance measured by three models: ROA is the ratio of net income divided by total assets, for the company (i), in the period (t) and ROE: is the ratio of net income divided by shareholders' equity, for the company (i), in the period (t) and Tobin's Q: is the ratio of current liabilities plus market value of share capital divided by total assets, for the company (i), in the period (t). β_0 is constant. $\beta_{1\text{-}8}$ is the slope of the controls and independent variables. b_1HCE: is a continuous variable, the independent variable, is the ratio of value added divided by Human capital, for the company (i), in the period (t).b_2SCE is a continuous variable, the dependent variable, is the ratio of structural capital divided by value added, for the company (i), in the period (t).b_3CEE is a continuous variable, the independent variable, is the ratio of value added divided by capital employed, for the company (i), in the period (t). b_4Age is a continuous variable, the control variable, is the number of years since the company was established, for the company (i), in the period (t).b_5FSize is a logarithmic variable, the control variable, the total assets of the company, for the company (i), in the period (t). b_6BSize is a continuous variable, the control variable, the number of board of director members in the company, for the company (i), in the period (t).b_7Audit is a dummy variable, the control variable, the company's external auditor one of the big four audit firms, for the company (i), in the period (t).b_8Sctr is a dummy variable, the control variable, the area of the economy in which companies work in the same field or have related product or service, for the company (i), in the period (t). ε_{it}: random error.

Table 3. Model validity

Variables	*Labels*	*Normality*	*Collinearity*	*Stationarity*	*Heteroscedasticity*	*Autocorrelation*
		Shapiro-Wilk test	*VIF test*	*ADF test*	*Breusch-Pagan test*	*Durbin Watson test*
Dependent variables:						
Return on Assets	ROA	0.000		-18.320***	0.719	1.209
Return on Equity	ROE	0.000		-17.220***	0.668	1.354
Tobin's Q	TQ	0.000		-9.664***	0.822	2.301
Independent variable:						
Human Capital Efficiency	HCE	0.000	1.755	-1.082***		
Structural capital Efficiency	SCE	0.000	2.014	-1.633***		
Capital Employed Efficiency	CEE	0.000	1.986	-1.787***		

*Note: Significance at: *10%, **5% and *** 1 levels.*

3.4. Model validity

Multiple regression models were used to test the impact of intellectual capital on firm's performance. We, therefore, run several tests to check whether data of this study could meet the assumptions of the multiple regression models.

As presented in Table 3, in order to secure approximation of data to a normal distribution, Shapiro–Wilk test parametric test was used. The null hypothesis of this test is that the population is normally distributed. Thus, if the p-value is less than the chosen 0.05 then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population; in other words, the data are not normal. As is shown Table 3, we noticed that the value for all variables was less than 0.05. This ascertains that the study data are normally distributed.

However, empirical research that uses time series, like the case of this study, presupposes stability of these series. Autocorrelation might occur in the model because time series on which this study is based is non-stationary (Gujarati, 2003). To check stationarity of time series, Unit Root test, which includes the parametric Augmented Dicky-Fuller test (ADF), was used. As is presented in Table 3, we can notice that the (ADF) test is statistically significant at the level of 1% which meant that the data of time series (2012-2014) was stationary.

As for the strength of the Multiple Regression Model, it basically depends on the hypothesis that every variable from the independent ones is by itself independent. If this condition is not realized, the Multiple Regression Model will then be inapplicable. It can never be considered good for parameters'

evaluation. To actualize this, Collinearity Diagnostics Standard used incessant Tolerance quotient for every variable of the independent ones. Variance Inflation Factor (VIF) has to be found afterward. This test is the standard that measures the effect of independent variables. Gujarati, (2003) stated that getting a (VIF) higher than (10) indicates that there is a Multicollinearity problem for the independent variable of concern. As presented in Table 3, it can be noticed that the (VIF) values for all independent variables are less than (10) which means that we do not have any collinearity problems in the study models.

To test the autocorrelation problem in the study models, we used Durbin Watson (D-W) test. Table 3 shows that the (D-W) values of the Models are within the (1.5-2.5) range. This indicates there is no autocorrelation in this model.

Finally, one of the significant assumptions of the regression models is the presence of Homoskedasticity. Its mean should be equal to zero. If the Heteroskedasticity is present in the model, then some statistical methods will be used to overcome this problem, like using (Breusch-Pagan test). As is shown in Table 3, we find that p-value of the three models is more than (0.05) which indicates admitting the null hypothesis; these models do not suffer from actual Heteroskedasticity.

4. DESCRIPTIVE RESULTS

In this section, we used the descriptive statistics to achieve the study aims and prove hypotheses. Thus, first, we theoretically describe each variable then we show the mean and standard deviation of the variables (Table 4). Moreover, we show the intellectual capital and performance in each sector separately (Table 5). Finally, we use path analysis for more advances descriptive.

Table 4. Variables measurement and descriptive

Labels	*Variables*	*Measurements*	*Descriptive statistics*	
		Dependent variables:	***Mean***	***SD***
ROA	Operational performance	The ratio of net income divided by total assets.	.0315	.315
ROE	Financial performance	The ratio of net income divided by shareholder's equity	.0615	.386
Tobin's Q	Market performance	The (Market value of equity + Book value of short-term liabilities) ÷ Book value of total assets.	1.915	1.660
		Independent variables:		
HCE	Human Capital Efficiency	The ratio of value added divided by Human capital	4.084	14.95
SCE	Structural Capital Efficiency	The ratio of structure capital divided by value added	5.211	117.26
CEE	Capital Employed Efficiency	The ratio of value added divided by capital employed	.144	.332
		Control variables:		
Assets	Firm Size	The total assets of the company.	20,133,508	60,119
Age	Firm Age	The number of years since the company was established.	20.783	14.915
Audit	Auditing quality	The company's external auditor one of the big four audit firms (KPMG, E&Y, PWC, Deloitte)	0.662	0.474
BSize	The Size of board of directors	The number of board of director members in the company	7.454	1.493
Sctr	Industrial dummy	Dummy variable that equals one for industrial companies.		

Table 5. Intellectual Capital and performance by sector

Sector	*Intellectual Capital*			*Performance*		
	HCE	SCE	CEE	ROA	ROE	TQ
Banks & Financial Services	5.984	0.827	0.045	0.019	0.139	0.933
Petrochemical Industries	7.291	0.747	0.091	0.055	0.101	1.045
Cement	11.214	0.863	0.213	0.125	0.156	2.102
Retail	2.815	0.556	0.258	-0.037	0.051	3.256
Energy & Utilities	6.146	0.794	0.080	0.054	0.092	0.953
Agriculture & Food Industries	1.503	-3.189	0.174	0.060	0.119	3.110
Telecommunication & IT	2.457	1.453	0.152	0.002	-0.020	1.249
Insurance	0.992	-24.927	0.005	-0.018	-0.069	2.016
Multi-investment	1.531	0.779	0.018	0.007	-0.035	1.411
Industrial Investment	2.532	0.498	0.133	0.065	0.115	1.668
Building & Construction	2.721	0.146	0.218	0.039	0.104	1.557
Real Estate Development	8.743	0.674	0.114	0.051	0.064	1.269
Transport	5.301	0.721	0.620	0.079	0.113	2.083
Media & Publishing	1.172	0.235	0.361	-0.001	-0.032	1.506
Hotel & Tourism	4.272	.724	.291	.097	.200	2.394
ANOVA F-Statistic (Sig.)	1.740 (.045)	0.285 (0.995)	5.968 (0.000)	0.757 (0.716)	1.638 (0.066)	7.953 (0.000)

As shown in Table 5, the Intellectual Capital and Performance were divided into fifteen sectors. The path analysis based on the value of the calculated mean of Intellectual Capital and performance to identify the difference between the sectors. Cement sector ranked the highest HCE among all sectors while Telecommunication & IT has biggest SCE and Transport sector found to be the most efficient in Capital employed. On the other hand, Insurance sector found to be the least efficient among the three intellectual capital components (HCE, SCE and CEE). The retail sector

has the highest TQ ratio among all other sectors but it was found that it has the lowest ROA ratio. The ROE ratio found to be highest in Hotel & Tourism sector however ranked the lowest in the Insurance sector. The Banks & Financial Services tend to be the greater TQ among all sectors while Cement sector has the greatest ratio of ROA.

The significant level is determined at 5%, where if F value is less than the significant level the model is assumed to be correct. For the IC component, the HCE and CEE results of ANOVA test show that the whole model is relevant, (F) value was 1.740 at 0.045 which means that there is a significant impact for sector type on HCE and CEE. However, there is an insignificant impact for sector type on SCE since the significant level of F value was greater than 5%.

For the performance, the ROA and ROE results of ANOVA test show that the whole model is irrelevant, a significant level of F values were greater than 5% which means that there is no significant impact for sector type on ROA and ROE. However, there is a significant impact for sector type on TQ since the significant level of F value was 0.00 which is less than 5%.

More Advances, as shown in Table 6 the Intellectual Capital level was divided into two categories; firms with high Intellectual Capital and firms with low Intellectual Capital. The path analysis based on the value of the calculated median of Intellectual Capital index. To identify the significance of the variance between the means of the two samples t-statistic test and z-statistic tests were used. The three performance indicators namely, ROA, ROE, and TQ tend to be higher with firms that have high Intellectual Capital efficiency.

By using the t-statistic the path analysis of ROA was found to be insignificance in the variance between the means of ROA). Whereas, the results found that the variance between the means of the two samples for Tobin's Q and ROE are insignificance. Different results were found by using the z-statistic, the path analysis of ROA analysis was found to be significant in the variance between the means of the two samples for operational (ROA), financial (ROE) but was insignificant with market performance (TQ).

Table 6. Advanced descriptive analysis

Performance	***Intellectual Capital level***			
	With:		*Difference Tests*	
	High IC	*Low IC*	*Independent Samples t-statistic (Sig.)*	*Mann-Whitney Test z-statistic (Sig.)*
ROA	.138	.023	2.787 (0.371)	-5.951*** (0.000)
ROE	.194	.054	3.508** (0. 025)	-6.172*** (0.000)
Tobin's Q	-.0325	-.627	-2.180** (0.003)	-1.479 (0.139)

*Note: The t-statistic is based on parametric test Two-Independent Sample t-test, and z-statistic is based on non-parametric test Kolmogorov-Smirnov Z. The difference Significance at: *10%; **5% and ***1% levels.*

5. EMPIRICAL RESULTS

5.1 ROA model results

The results specify that the three IC components (HCE, SCE and CEE) are not influenced the operational performance (ROA), which is not significant at 5% (0.151, 0.641 and 0.140). Therefore, H1a,b and c are rejected. This indicates that managers of Saudi firms are not able to realize the full potential of the firm`s human capital, structural capital and capital employed to maximize their ROA. This result is in contra to study adopted by Ismail et al. (2011) which found that HCE is positively and significantly affect the ROA of Saudi firms.

To clarify the results of human capital, Saudi Arabia firms greatly depends on foreign labour; most Saudis refuse to take unskilled or menial jobs as these are often considered socially unsuitable. The policy of 'Saudisation' aims to raise the share of skilled and educated Saudi nationals employed in the domestic economy which in return will have a great impact on assets utilization. Job creation for the young and a rapidly growing population constitute the most serious stress points in the labour market. The issue of labour market rigidity also needs to be addressed. The most necessary reforms should include the liberalisation of regulations governing the hiring and firing of Saudis. At present, these include archaic regulations restricting the hiring of women (although these are gradually being relaxed), lengthy dismissal procedures and high mandatory severance pay in the public and private sectors. Another issue is that Saudi market consists of large merchant families with strong connections to the family dominating the private sector, which has benefited extensively from the business environment. That said, some within the private sector, mostly the young and Western-educated, acknowledge the need for reform and change (Country insight report: Saudi Arabia, 2017). The BOD and managers of Saudi firms should consider the human capital to structure relevant strategies and policies on how to obtain; best utilize, develop and retain their employees for a better return on asset.

With the passage of years, it was noticed that there are no improvements in the structural capital in relation to assets efficiency. This gives us an indicator that most of the Saudi firms pay less attention to its intangible assets such as patents, trademarks, and databases as a source that contribute towards assets efficiency. This is due to lack of awareness on the importance of structured capital as an indicator in measuring the return on assets.

Finally, the CEE results indicated that firms in Saudi are not increasing their ROA by concentrating on tangible and financial assets and invest in their capital.

5.2. ROE model results

The result of ROE shows that HCE has a significant relationship with ROE. The results are in line with the study adopted by Musali et al. (2014) in Saudi who examines the effect of intellectual capital for the period from 2008 to 2010, they found a positive association with ROE. However, SCE has not influenced the ROE, which is not significant at 5% (0.335). Therefore, H2b is rejected. The results suggest that in Saudi scenario, the market is underdeveloped and to have such results means that the stakeholders do not consider the equity performance of the firm in terms of tangible assets equally to in terms of intangible assets. Thus, the investors in Saudi firms are not considered the structural capital such as patents, trademarks, and databases as a source that contributes towards equity-efficiency. This is a bad indicator that Saudi firms are not aware of the importance of SCE as an indicator in measuring the return on equity.

In addition, CEE has not influenced the ROE, which is not significant at 5% (0.071). Therefore, H2c is rejected. To explain this, Saudi firms are not efficient at managing their working capital provides superior returns to shareholders. Shin and Soenen (1998) demonstrate that firms with higher returns have better working capital management due to their greater dominance in the market. Thus, better working capital management may translate to better shareholder performance because of the association with superior profitability and market position.

5.3. Tobin's Q model results

The results of Tobin's Q Model present the worst Adjusted R Square (0.020). Table 7 shows that the SCE has influenced the TQ at 0.05 (0.000), therefore H3b and c are accepted. This indicates that in Saudi market the SCE is effective as the market is valuing an asset above its replacement cost. This is largely because firms do not blindly base fixed investment decisions on movements in the stock price; rather they examine future interest rates and the present value (including the structural capital) of expected profits.

Further, in line with Hejazi et al., (2016), we found that CEE has a significant impact with TQ at 0.05 (0.000). This can lead to precious results implies that a firm's stock is more expensive than the replacement cost of its assets if the Saudi firms have efficient IC, which implies that the stock is overvalued in firms with higher VAIC.

Finally, the results indicate that HCE is not significantly contributed to a physical asset's market value and its replacement value. Therefore, H3a is rejected since the p-value is more than 5% (0.952).

5.4. Control Variables

As is shown in Table 7, all control variables have an insignificant effect on ROA and ROE model. However, the board size and sector are controlling the TQ model and have a significant effect on the model.

Table 7. Random-effect regression results

Variable	*ROA Model*		*ROE Model*		*Tobin's Q Model*	
	β	*t-Statistic*	*β*	*t-Statistic*	*β*	*t-Statistic*
Intellectual Capital Components						
Human Capital Efficiency (HCE)	0.001	1.439 (0.151)	0.003	2.199** (0.028)	0.000	-0.061 (0.952)
Structural Capital Efficiency (SCE)	0.001	0.467 (0.641)	-0.002	-0.966 (0.335)	-0.076	-7.642*** (0.000)
Capital Employed Efficiency (CEE)	0.065	1.479 (0.140)	0.097	1.810* (0.071)	0.870	4.222*** (0.000)
Control Variables						
Board Size	0.013	1.253 (0.211)	0.016	1.287 (0.199)	-0.149	-3.080*** (0.002)
Firm Age	0.000	0.655 (0.513)	0.000	0.182 (0.856)	0.000	-0.158 (0.874)
Firm Size	0.000	0.603 (0.547)	0.000	0.280 (0.779)	0.000	-0.974 (0.330)
Sector	0.000	-0.017 (0.986)	-0.003	-0.521 (0.602)	-0.056	-2.776 (0.006)***
Audit quality	-0.001	-0.038 (0.970)	0.047	1.211 (0.226)	-0.117	-0.777 (0.437)
R Square	0.016		0.035		0.202	
Adjusted R Square	-0.000		0.018		0.189	
F-Statistic	0.969		2.145		14.999	
p-value (F-Statistic)	(0.459)		(0.030)		(0.000)	

*Note: Significance at: *10%; **5% and ***1% levels. t-Critical: at df 489, and confidence level of 99% is 2.326 and level of 95% is 1.645 and level of 90% is 1.282. F-Critical (df for denominator n-β-1 = 489-8-1 = 480) and (df for numerator =β =8 and confidence level of 99% is 2.510 and confidence level of 95% is 1.940 and confidence level of 10% is 1.67.*

6. CONCLUSION, FUTURE RESEARCH, AND LIMITATION

The main objective of the study is to evaluate the level of Intellectual Capital in the listed firms in Saudi stock exchange and to investigate the relationship between intellectual capital components and firm's performance of Saudi listed firms based on operational, financial and market performance.

The study used a sample of 171 Saudi listed firms. Data was collected from Saudi stock exchange database "TADAWUL". The data collected was pooled data which use both cross-sectional data and time series data using the financial information of the year 2012, 2013 and 2014 we end up with 489 observations. Operational performance (ROA), financial performance (ROE) and market performance (TQ) are used as dependent variables

and Intellectual Capital components (HCE, SCE and CEE) as independent variables.

The descriptive results show that Intellectual Capital level tends to be higher with firms that have high performance. However, the path analysis found that there are differences in Intellectual capital efficiency and performance among the sectors.

The ROA regression model results show that there is no significant relationship between Intellectual capital components on firm's operational performance in the listed firms in Saudi stock exchange. The ROE regression model results show that there is a positive significant relationship between Human Capital Efficiency on firm's financial performance. After testing the effect of control variables on ROA and ROE we found that there are insignificant relationships with all variables. Different results were found in TQ regression model, the result revealed that there is the negative significant impact on structural capital efficiency and positive significant of Capital Employed Efficiency on firms' market performance. However, sector and board size found to be negatively significant to market performance (TQ).

The study recommends that Capital Market Authority in Saudi focus more on IAS 38 adoption to assure that all listed companies in stock exchange are controlling and reporting the intellectual capital; also it should conduct a workshop about the importance of Intellectual Capital. In Saudi, the laws associated with protecting Intellectual Capital are weak, therefore, we recommend the Capital Market Authority to pay more attention to Intellectual Capital to avoid the gap between firms' value as reported in financial statement and actual market value. Moreover, the Capital Market Authority should have a clear and mandatory law associated with intellectual capital. Added to that, the stakeholders such as investors, shareholders, creditors and debtors are recommended to increase their knowledge about the term of Intellectual Capital and its importance in the business to make better investment choices. Generally, we suggest that organizers like capital market authority, the ministry of finance, external auditors and stock exchange organizer to take the intellectual capital into consideration to assure more reliable financial information to all business parties.

We suggest that future research has to be undertaken for investigation factors that might affect the relationship between intellectual capital and performance. More interestingly, we recommend a future research to compares the intellectual capital between Islamic and conventional banks.

Conducting the current research has few limitations. Firstly, VAIC is considered as a method to calculate the intellectual capital efficiency. However, recently modified VAIC is the most efficient method but we face a problem with data disclosed in Saudi firm's websites about the relational capital efficiency that prevent us from calculating the relational capital. Another limitation is the absence of an online database in TADAWUL database caused the data to be collected by visiting 36 different sites in order to download and go over 36 different annual reports.

REFERENCES

1. Abdulsalam, F., Al-Qaheri, H., & Al-Khayyat, R. (2011). The intellectual capital performance of KuwaitiBanks: An application of vaicTM1 model. iBusiness. *Scientific Research, 3(1),* 88-96. https://doi.org/10.4236/ib.2011.31014
2. Alipour, M. (2012). The effect of intellectual capital on firm performance: An investigation of Iran insurance companies. *Measuring Business Excellence, 16(1),* 53-66. https://doi.org/10.1108/13683041211204671
3. 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
4. Al-Musalli, M. A. K., & Ismail, K. N. I. K. (2012). Corporate governance, bank specific characteristics, banking industry characteristics, and intellectual capital (IC) performance of banks in Arab Gulf Cooperation Council (GCC) countries. *Asian Academy of Management Journal of Accounting and Finance, 8(1),* 115-135.
5. Bassi, L. J., & Van Buren, M. E. (1999). Valuing investments in intellectual capital. *International Journal of Technology Management, 18(5-8),* 414-432. https://doi.org/10.1504/IJTM.1999.002779
6. Buallay, A., Hamdan, A., & Zureigat, Q. (2017). Corporate governance and firm performance: Evidence from Saudi Arabia. *Australasian Accounting, Business and Finance Journal, 11(1),* 78-98. https://doi.org/10.14453/aabfj.v11i1.6
7. Celenza, D., & Rossi, F. (2014). Intellectual capital and performance of listed companies: empirical evidence from Italy. *Measuring Business Excellence, 18(1),* 22-35. https://doi.org/10.1108/MBE-10-2013-0054
8. Chen, F. C., Liu, Z. J., & Kweh, Q. L. (2014). Intellectual capital and productivity of Malaysian general insurers. *Economic Modelling, 36,* 413-420. https://doi.org/10.1016/j.econmod.2013.10.008
9. Country insight report: Saudi Arabia. (2017). *D&B Country Report: Saudi Arabia Dec. 2016: 1+. Business Insights: Global Web.* Retrieved from the World Wide Web: http://bi.galegroup.com.vlib.interchange.at/global/article/GALE%7CA473921935/34fa106ab8dfa90b63976e9334982046?u=wash89460
10. Dženopoljac, V., Janoševic, 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
11. Edvinsson, L., & Malone, M. S. (1997). *Intellectual capital: Realizing your company\'s true value by finding its hidden brainpower.* USA: HarperCollins.
12. 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
13. Fan, L., Yuan, X., & Wang, S. (2011, August). Research on the relationship between intellectual capital and company performance–an empirical analysis based on panel data. *Proceedings of the Sixth International Symposium of Corporate Governance, M&D Forum, Dalian, 21.*
14. Firer, S., & Mitchell Williams, S. (2003). Intellectual capital and traditional measures of corporate

performance. *Journal of intellectual capital, 4(3),* 348-360. https://doi.org/10.1108/14691930310487806
15. Gan, K., Saleh, Z., Abessi, M., & Huang, C. C. (2013). Intellectual capital disclosure in the context of corporate governance. *International Journal of Learning and Intellectual Capital, 10(1),* 52-70. https://doi.org/10.1504/IJLIC.2013.052077
16. Grant, R. M. (1991). The resource-based theory of competitive advantage: Implications for strategy formulation. *California management review, 33(3),* 114-135. https://doi.org/10.2307/41166664
17. Gujarati, D. N., & Porter, D. C. (2003). *Basic econometrics.* (4th. ed.). New York: McGraw-Hill.
18. Hejazi, R., Ghanbari, M., &Alipour, M. (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management, 23(4),* 259-273. https://doi.org/10.1002/kpm.1529
19. Inkinen, H. (2015). Review of empirical research on intellectual capital and firm performance. *Journal of Intellectual Capital, 16(3),* 518-565. https://doi.org/10.1108/JIC-01-2015-0002
20. Ismail, K. N. I. K., & Karem, M. A. (2011). Intellectual capital and financial performance of banks in Bahrain. *Journal of Business Management and Accounting, 1(1),* 63-77.
21. Laing, G., Dunn, J., Hughes-Lucas, S. (2010). Applying the VAIC™ model to Australian hotels. *Journal of Intellectual Capital, 11(3),* 269–283. https://doi.org/10.1108/14691931011064545
22. Maria Morariu, C. (2014). Intellectual capital performance in the case of Romanian public companies. *Journal of Intellectual Capital, 15(3),* 392-410. https://doi.org/10.1108/JIC-05-2014-0061
23. Nimtrakoon, S. (2015). The relationship between intellectual capital, firms' market value and financial performance: Empirical evidence from the ASEAN. *Journal of Intellectual Capital, 16(3),* 587-618. https://doi.org/10.1108/JIC-09-2014-0104
24. 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
25. Phusavat, K., Comepa, N., Sitko-Lutek, A., & Ooi, K. B. (2011). Interrelationships between intellectual capital and performance: Empirical examination. *Industrial Management & Data Systems, 111(6),* 810-829. https://doi.org/10.1108/02635571111144928
26. Pitelli Britto, D., Monetti, E., & da Rocha Lima Jr, J. (2014). Intellectual capital in tangible intensive firms: the case of Brazilian real estate companies. *Journal of Intellectual Capital, 15(2),* 333-348. https://doi.org/10.1108/JIC-10-2013-0108
27. Pulic, A. (1998). Measuring the performance of intellectual potential in knowledge economy. *Paper presented at the 2nd McMaster Word Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential.*
28. Rahman, S. (2012). The role of intellectual capital in determining differences between stock market and financial performance. *International Research Journal of Finance and Economics, 89(1),* 46-77.
29. Razfindrambinina, D., & Anggreni, T. (2011). Intellectual capital and corporate financial performance of selected listed companies in Indonesia. *Malaysian Journal of Economic Studies, 48(1),* 61-77.
30. Razak, R. A., Mohammad, J., & Tobiagi, S. M. (2016). Intellectual capital disclosures practices and intellectual capital performance in Saudi Arabia financial institution. *Journal of Business Studies Quarterly, 7(4),* 1-14.
31. Rechberg, I., & Syed, J. (2013). Ethical issues in knowledge management: Conflict of knowledge ownership. *Journal of Knowledge Management, 17(6),* 828-847. https://doi.org/10.1108/JKM-06-2013-0232
32. Sarea, A., & Alansari, S. (2016). The relationship between intellectual capital and earnings quality: Evidence from listed firms in Bahrain Bourse. *International Journal of Learning and Intellectual Capital, 13(4),* 302-315. https://doi.org/10.1504/IJLIC.2016.079350
33. Saunders, A., & Brynjolfsson, E. (2016). Valuing Information technology related intangible assets. *Mis Quarterly, 40(1),* 83-110. https://doi.org/10.25300/MISQ/2016/40.1.04
34. Serenko, A., & Bontis, N. (2013). Investigating the current state and impact of the intellectual capital academic discipline. *Journal of Intellectual Capital, 14(4),* 476-500. https://doi.org/10.1108/JIC-11-2012-0099
35. Sharabati, A. 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
36. Shin H., & Soenen L. (1998) Efficiency of working capital and corporate profitability. *Financial Pracice and Education, 8*, 37-45.
37. Singh, S., Sidhu, J., joshi, M. and Kansal, M. (2016). Measuring intellectual capital performance of Indian banks: A public and private sector comparison. *Managerial Finance, 42(7),* 635-655. https://doi.org/10.1108/MF-08-2014-0211
38. Stewart, T., & Ruckdeschel, C. (1998). Intellectual capital: The new wealth of organizations. *Performance Improvement, 37(7),* 56-59. DOI: 10.1002/pfi.4140370713
39. Sveiby, K. E. (1997). *The new organizational wealth: Managing & measuring knowledge-based assets.* USA: Berrett-Koehler Publishers.
40. Wang, W. Y., & 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
41. Wang, Z., Wang, N., Cao, J., & Ye, X. (2016). The impact of intellectual capital–knowledge management strategy fit on firm performance. *Management Decision, 54(8),* 1861-1885. https://doi.org/10.1108/MD-06-2015-0231
42. Wei Kiong Ting, I., Hooi Lean, H. (2009).Intellectual capital performance of financial institutions in Malaysia. *Journal of Intellectual capital, 10(4),* 588-599. https://doi.org/10.1108/14691930910996661
43. Zéghal, 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