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Impact of Intellectual Capital on Performance of Karachi Stock Exchange 30-Index Companies of Pakistan

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Abstract

The aim of this paper is to investigate the impact of Intellectual Capital (IC) on the financial performance of the organization. IC relationship is measured with the firm performance by using Pulic's method known as value added intellectual coefficient (VAIC^{TM}) and its mechanisms i.e., human, structural and capital employed efficiencies (HCE, SCE, CEE). The outcome provides an additional empirical confirmation for the contribution of IC on the company's financial performance. The financial indicators of this study are Karachi stock exchange (KSE)-30 index companies. In this regard, quantitative data is collected by the companies of Pakistan from the period of 2010 to 2014. In the era of competition, every company is seeking for the efficient way to increase their financial performance, the IC plays a significant role in the economy as found evidence in developed countries, this study will help the organizations to make modern operations by using different sources in order to increase their financial performance. The study of IC has endured on various stages, from initial conscious awareness efforts to the sorting of IC, and to the search for suitable measures of IC. This article presents the first study that explores IC impact on financial performance of KSE-30 index companies in Pakistan.

Keywords: Intellectual Capital, Financial Performance, Growth Revenue

Introduction

Globally, industrial and trade economies are going to be change through an information-based system rapid fluctuation, and intensive technology concentration in the economy (Clarke et al., 2011). The growth of the "novel economy" is mainly driven by information and data, which directed to an increased interest in IC (Tan et al., 2002). The research of IC has experienced a number of stages in early extensive efforts to sort out and the exploration of suitable procedures for IC (Tan et al., 2002). Highly qualified employees are the symbol of IC, worth in any organization. Their role is significant in the company's positive growth. They also have a major effect on the size of the market and their financial goals (Brennan, 2001; Petty and Guthrie, 2000; Tunc Bozbura, 2004). Staff ability, proficiency, skills and buyer association considered as novel intangibles and information technology (IT) departments have not obtained any appreciation in the old style financial and organizational reporting system (Stewart, 1997).

The IC acknowledgment is very important to improve consecutive financial or monetary growth in globalized rivalry challenges (Huang, 2005; Jen Huang and Ju Liu, 2005). The Pharmaceutical sector highly recognized IC on the basis of knowledge, skills, and competencies (Daum, 2005). An opinion that represented as the word of ''intellectual'' essentially denotes the company's human resource who summarize the data and information. The basic idea of IC might be expended to comprise all worth making the task that is accomplished by employees. The organiza-

tion's intellectual human resource, shareholder and management are considered as breathing organism (Seng et al., 2009). IC refers as a main driving force of any organization. The competitive benefits are connected to IC, it depends on the firm's capability to utilize and manage (Marr, 2004).

(Rastogi, 2003) considered IC as an excellent nexus of a firm with the human resource, and societal capital. Nowadays, IC is broadly familiar as the main and real source of maintainable and worthwhile benefit (Marr, 2004). Majority of the developed nations thought that the IC effects on the performance of various sectors, for instance, Germany, Australia, and Japan. The utilization of modern accounting system has expanded in majority sectors that verified the significance of IC in the trade market (Poh et al., 2018). The progress and deviation in the field of business, the companies are confident that the IC become a significant element to analyze and calculate the performance of the business (Poh et al., 2018).

(Wiig, 1997) considered the IC, assets are an important source in the business. Likewise, generally good marketplaces are expanding to create excellent output in the county. That is based upon the outcomes of several idealistic who recognized the basic IC Philosophies, their notions simplified the overview and application of IC in the 1990s. Primarily, the IC was frequently determined by experts who had been experienced IC by launching many projects in the various countries. However, their input for the development of IC is important which based on knowledge, book publications, writing articles, and theories. Similarly, as speaker, presented IC in academic seminars, conferences, and events. In the commencement of the 21st century, the IC was formally identified as a scientific discipline in the field of management (Serenko and Bontis, 2013).

In the era of competition many companies are suffering due to lack of competitive advantages, and because of survival difficulties merging or acquiring to expand their businesses. This research plays a pivotal role for the companies working in Pakistan whereas, the IC might be considered as the competitive advantage for those firms to maintain their performance at the highest level. For this purpose, this study finds the relationship between IC and financial performance of the KSE-30 index listed companies Pakistan. It is also helpful to the organizations that could not recognize their IC ability to accomplish the goals effectively and efficiently.

In order to measure the impact of IC on the financial performance of the organization, two indicators are determined, (1) How VAIC effects the return on equity (ROE), return on asset (ROA), and growth revenue (GR). (2) Is there any positive relationship between companies' VAIC and their financial performance?

Literature review

Although, the economic changes are increasing in the alarming condition all over the world which based on IC, the IC of any firms denotes the financial growth, plans, capability, and competency to invent and execute that reflect the upcoming days of the company (Sharabati et al., 2010). (Bassi and McMurrer, 1999), Discusses when human resource investments are familiar in the monetary accounts, generally, it becomes a column of expenses instead of an asset on the financial statement. The IC because of its worth has converted into a private business. This era perhaps confidential as non-science by the reason of IC exists not as a separate field of science so far. Meanwhile, in 1980s IC begun demonstrating symbol of an academic discipline and step ahead into the pre-science period of its historical development (Serenko et al., 2010). But, throughout this phase many IC publications still required a strong theoretical evidence, Human capital varying methodology, figure out problems at the significant abstract point and needs the dominance of the school of thought (Kaufmann and Schneider, 2004).

Another research was led by Nick Bontis (2000), the basic objective of that study was to examine three mechanisms of IC, i.e., Customer Capital (CC), Human Capital (HC), and Structural Capital (SC) of Malaysia's service and non-service sector business. The output of the research reveals that SC has a significant effect on the positive growth of both sectors. Although, HC role was also significant in both sectors and had a better impact on the construction of a tangible than intangible oriented organizations. At this point, it is necessary to simplify the meaning of IC and connection between a firm's growth and IC. In the study by (Carlucci et al., 2004), IC is explained as the cluster of information resources that are characteristics of a firm and most important contribution to enhance the competitive image of the firm by additional values to explain major investors. Moreover, (Edvinsson and Sullivan, 1996) defined that human resource SC is an asset that helps as a tool to improve their innovative knowledge and information. (Bontis, 1998) points out that the role of SC within the organization to the utilization of accessible knowledge for the company, in other words, the company's rules and regulation. The competency of employees in the various firms may be well-defined as the combined efforts and capabilities of human resource to resolve the issues of the customer. The organization-wide knowledge of human resource and records data, information about the subject is significant for the organization. IC is an asset for the reason it can make a reputation for the organization so far, it would be problematic for the organization to convey its value without the human resource (Edvinsson and Sullivan, 1996).

(Stewart, 1997) describes IC as the intelligent substantial which has been dignified, captured, and beneficial to increase wealth by generating highly valuable assets. This working area generally looks at the company's IC as a fixed resource in the firm (Sharabati et al., 2010). It is significant to understand that IC is a reality and deserve for appreciating value (Andreou and Bontis, 2007). The aim of human resource accounting (HRA) is to compute the financial value of employees in the firm, contribute to the financial and administrative decisions. Following are the three types of HRA analytical models proposed by researchers: Monetary, cost, and HR models (Jin et al., 2004). It is recognized that a significant input is given by HRA in the 1970s, and hence it has been regarded as an imperative outlet of IC analyzer. Service offering firms widely utilize HRA models for analysis of HC in terms of finance, where human resource contained an important share of firm value (Jin et al., 2004).

(Nonaka, 1995) is induced that global competences are extremely important for a short time process. (Maditinos, 2011) extended to create a general explanation by describing IC as the intellectual material that could be systemized and take benefits to produce an advance value resource or asset. (Stewart, 1997) explored that intellectual capital assets are the main helping resource for the improvement of wealth and explained IC as the novel capital of a firm. Further, (Bornemann, 1999) precisely explained that IC could be evaluated by gathering three following highlighted components; Human resource (skilled, competent), structural resource (firm structure, database), and customer resource (relationship with supplier and purchaser). Furthermore, (Maditinos, 2011) acknowledged that many complications that integral to the straight evaluation of IC could be determined through the utilization of distinct indicators.

(Pulic, 2000) established an appropriate method for evaluation of IC. As he reasoned that the marketplace was a goodwill of firm which formed by HC and IC, later comprised of SC & HC. The recommended method by (Pulic, 2000) is to deliver knowledge about the value making competency of following two assets of a firm: Capital employed (Tangible), Human & structural Capital (Intangible). This method is known as VAIC which is unique for the reason it is indirectly evaluated IC by the analysis of capital employed efficiency (VACA) Human capital efficiency (VAHU) and structural capital efficiency (STVA). The firm's goodwill reflects the best usage of VAIC.

Figure 1. IC relation with Firm performance

As stated by (Andriessen, 2004), the utilization of VAIC is to point out the IC for justifying the appropriate obtained financial information which models can apply as input. (Ahangar, 2011) showed in the study of employee and VAIC to analyze IC progress as well as its effect on monetary outputs of Iranian firms, also determined that human capital efficiency (HCE) is an important and growing impression on economic output of the firms. However, the association of physical and structural was not powerful with financial outcomes of firms. There are two types of investigators that are actively started working on IC, (1) Business (2) Academics. Both have a core objective to know the details which linked the idea of IC. The supporting for IC argues, trust at once effort to determine the 'TRUE' worth of a firm. These intangible resources seem in the product equity, data, information, well-informed employees, organizational environment, stakeholder association, entrée in the market, a strong position, and a multitude of additional off-balance worksheet resources (Harvey and Lusch, 1999). In another study, to analyze the empirical association of IC with the monetary performance of top most 25 pharmaceutical companies utilize VAIC and determine that HCE significance level is higher than structural capital efficiency (SCE) and capital efficiency of employees (CEE) to increase the profitability and efficiency of pharma sector (Kamath, 2007). Another study by (Yalama, 2007) has utilized VAIC methodology conducted from 1995 to 2005, concluded that IC has an optimistic impact on the firm's profitability.

(Tan et al., 2007) studied the empirical affiliation of 150 Singapore's stock exchange listed companies and concluded, IC has an important and positive association with current and upcoming financial progress of those companies. (Mavridis, 2004) analyzed the IC effectiveness by implication of VAIC model on banking sector of Japan from 2000 to 2001 and revealed that in Japanese banks have momentous variation than other European banks. As well as more determined that the adverse association with Value Added (VA) and HC that means mismanagement of human proficiency. While an alternative study that based on Greek banking sector on the duration of 1996 to 1999 concluded the empirical association with the human resource is more significant than a physical resource (Mavridis, D. & Kyrmizoglou, 2005). (Kamath, 2007) examined empirical kinship of Indian banks to evaluate IC by using the VAIC model, the conclusion of that study was foreign banks have important HCE although, Public banks also have physical capital efficiency. A study conducted by (Zahid, 2011) examined the IC outcomes of 53 banks of Portuguese to apply structural acquisition method (SEM) with partial least square (PLS) and inspected the positive impact of human, structural and relational resource/capital that eventually consolidate the bank's efficiency. (Tan et al., 2007) conducted a study to evaluate an empirical liaison with Singapore's stock exchange 150 listed companies in this study founded IC has an important and positive liaison with current and upcoming financial progress of these companies.

(Firer and Mitchell Williams, 2003) examined the relationship of IC, and evaluate by applying VAIC on firm's performance. The area of study was 75 South African business firms, the result shows that there is no any positive relation found among three components called value added efficiency mechanism besides these are dependent variables: profitability, output, and market. Their conclusion exposed that South African firms are dependent on physical assets, and pay the slightest value of SC, whereas market output seems negative to companies that focused on the improvement of humanoid assets. Generally, the study of (Firer and Mitchell Williams, 2003) recommends that tangible assets remain most valuable in South African firms that based on resources of firm's performance, even with strive to improve the IC in the state.

Methodology

It is a quantitative research study that based on empirical work which investigates the impact of IC, as measured by VAIC on the financial performance of the KSE-30 index listed organizations. The sample data collected by annual financial reports http://www.ksestocks.com/MarketIndexes/KSE-30 i.e. income and loss accounts, balance sheets and monetary condition of the organizations available at their official websites. Sample design refers to a specific arrangement to get the case among a huge number of available populations. The data is gathered from Pakistan's KSE-30 index companies belonging to different sectors covering (05) years period from 2010 to 2014. In this research study all the thirty companies are selected from KSE-30 index which include Oil and Gas Development Company Limited (OGDC), Pakistan Petroleum Limited (PPL), Pakistan Oilfields Limited (POL), Mari Petroleum Company Limited (MARI), Pakistan Telecommunication Company Limited (PTC), TRG Pakistan Limited (TRG), K-Electric Limited (KEL), Hub Power Company Limited (HUBC), Kot Addu Power Company Limited (KAPCO), National Bank Of Pakistan (NBP), Habib Bank Limited (HBL), United Bank Limited (UBL), MCB Bank Limited (MCB), Fauji Cement Company Limited (FCCL), Maple Leaf Cement Factory Limited (MLCF), D.G. Khan Cement Company Limited (DGKC), Lucky Cement Limited (LUCK), Pioneer Cement Limited (PIOC), Engro Fertilizers Limited (EFERT), Fauji Fertilizer Company Limited (FFC), Fauji Fertilizer Bin Qasim Limited (FFBL), Engro Corporation Limited (ENGRO), Engro Foods Limited (EFOODS), Jahangir Siddiqui Company Limited (JSCL), Pak Elektron Limited (PAEL), Nishat Mills Limited (NML), Pakistan State Oil Company Limited (PSO), Hascol Petroleum Limited (HASCOL) and Honda Atlas Cars (Pakistan) Limited (HCAR).

In previous revisions, the performance analysis conducted by the following ways: Return on assets (ROA), Return on equity (ROE), Revenue growth(RG), and employee productivity (EP) (Chen Goh, 2005; Firer and Mitchell Williams, 2003; Seng et al., 2009). This study focused on the following variables:

(1) Return on assets (ROA) = Profit before tax/Average total assets.

(2) Return on equity (ROE) = Profit before tax/Average common stock equity.

(3) Revenue growth (RG) = Current year revenue/Prior year revenue) – 1.

(4) Employee productivity (EP) = Profit before tax/Number of employees.

There has been an effort (Chen Goh, 2005), VAIC and its three components, HCE, SCE, and CEE signify the independent variables. As described earlier, VAIC evaluates the level of IC of companies and delivers info about the value making efficacy of physical and intangible resources inside a company.

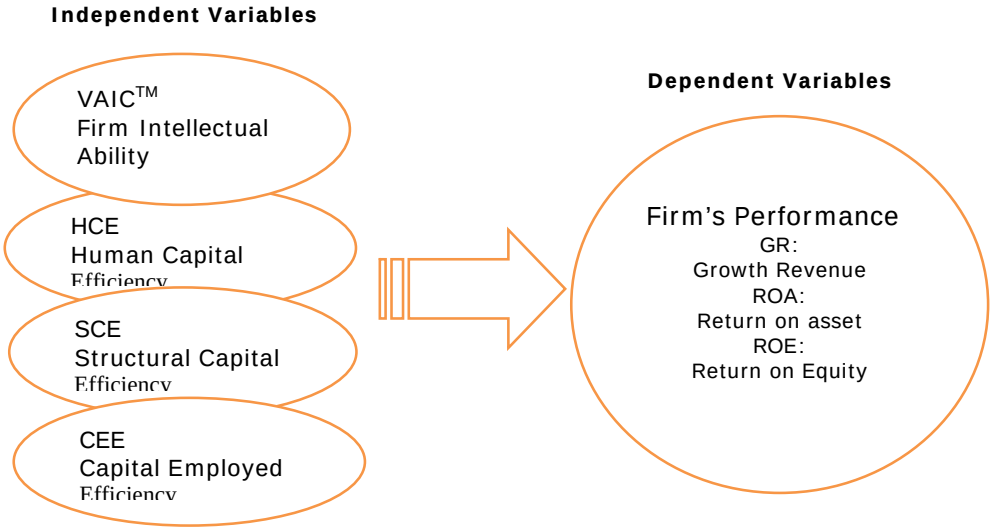

Figure 2. A conceptual model of IC

The paper practices (Pulic, 2000) outlines have a focus on Pakistan's KSE-30 index listed companies. It is an empirical examination using VAIC method for the statistics measure. There is no generally recognized IC evaluation technique existing among the 34 established approaches in suitable works (Andriessen, 2004). As examined by (Sveiby, 2001) to classify these changes of procedures into four methods, those are the Market capitalization method, Direct IC measurement method, Scorecard tactic, and Economic value-added slant. Nevertheless, this classification did not include into one model, such as identified by Austrian approach VAIC methodology which had been developed by the Austrian Research Centre (AICRS) under the supervision of (Pulic, 2000). As distinct, the company IC is characterized by the VAIC as the summation of Structural Capital Efficiency (SCE), Human Capital Efficiency (HCE), and Capital Employed Efficiency (CEE). For the measurement equation as follow:

$$VAIC = HCE + SCE + CEE$$

The calculation of VAIC further involves the following ladders (Pulic, 2000). Initially, it is essential to calculate a firm's VA which is the major sign of VAIC. Its simplified statistical appearance is represented as follows:

$$VA = Output - Input = OP + EC + D + A$$

Wherever, VA represents Value Added, Output represents entire Revenue, Input represents the price of bought in material, mechanisms, and services, OP denotes Operating Profits, EC represents total worker expenses observed as an investment, D denotes depreciation, and A signifies amortization.

Furthermore, HCE got by giving total expenses to the workforce as an investment that apprehensions the entire human determination in the firm for value formation. This is a main hypothesis of the VAIC methodology. (Pulic, 2000), HC may be considered as "payroll costs". Hence, HCE may be uttered as the quantity of value-added produced per money unit invested in workers:

$$HCE = \frac{VA}{HC}$$

SC may be regarded as the input to the value of making the process for a given period, which may be gained by deducting the human assets from the amount of value added as mentioned below:

$$SC = VA - HC$$

SCE is replicated by the portion of SC in the total value created, that is equated as follows:

$$SCE = \frac{SC}{VA}$$

The final step in calculating VAIC includes manipulative the CEE. According to the method, IC may not function autonomously and want to function the best performance along with financial and physical capital in a directive to make a value for a firm. CEE can be gained by:

$$CEE = \frac{VA}{CE}$$

The VAIC is calculated as the summation of higher than three mechanisms and generally represents the value creation efficiency:

$$VAIC = HCE + SCE + CEE$$

Moreover, the organization growth develops apparently when the managers are skilled, intelligent to utilize the resources proficiently and effectively against assets to earn more profits. Hence, it is analyzed that the performance gives the expressions of IC and the financial performance was measured by the following variables:

$$ROE = \frac{Net\ Income}{Shareholder's\ Equity}$$

$$ROA = \frac{Net\ Income}{Total\ Assets}$$

$$Growth\ Revenue = \frac{Current\ Year\ Revenue - Last\ Year\ revenue}{Current\ Year\ revenue}$$

Each ratio relating to IC and financial performance has utilized for the validation against the research question generated for this study. Subsequent analytical procedures are applied to achieve the objectives of the study.

Cluster analysis

Cluster examination is divided data into clusters that are expressive useful for both. If the evocative sets are objective than the cluster should capture the usual structure of the statistics. In some cases, cluster investigation is a valuable opening point for an additional purpose for the data summarization.

K-Mean Algorithm:

- K point as initial centroids
- Repeat
- From k cluster by assigning each point to its closest centroid
- Recomputed the centroid of each cluster

Correlation analysis

Pearson's coefficient of correlation denoted by "r" was utilized to primarily uncover the relationship among profitability as well as liquidity. It enlightens the connection (if any) relating to the profitability indicators with that of the Liquidity. The coefficient of correlation introduced by the Karl Pearson seems to be the commonly utilized instrument that helps in calculating the relationship among any 2 variables. It demonstrates the level of dependency of linear nature linking the two series. It provides a number starting from −1 to +1 (both included), where a number of equals to exactly −1 represents a perfectly negative relationship, which means one series is a scalar mul-

tiple of the other with a proportional decrease. Whereas, a number of equals to exactly +1 represents a strong positive correlation, which means the linear equation depicts the linking between the two series perfectly in the same direction. A number of 0 represents that there is no linear relationship between the variables. The other values nearest to 0 show the weakest relationship; whereas, the values nearest to ±1 show the strongest relationship between the variables.

F-test for fixed effect model verses between effects model

As we have multiple entities (i.e. 20 firms) which are measured at multiple periods of time (i.e. 2010-2014) so, as a panel data model was anticipated in order to deal with the secondary objective. It suggests focussing on two techniques used to analyze panel data that are fixed effects and between effect. The equation for the Fixed Effects Model (FEM) became:

$$Y_{it} = \alpha_i + \beta_t + XX_{it} + \epsilon_{it} \quad for\ i = 1, 2, 3, \ldots\ldots, 30\ and\ t = 1, 2, 3, 4, 5$$

Whereas, the equation representing the Between Effects Model (BEM) became:

$$Y_i = \beta_0 + \beta_1 X_i + \epsilon_i \quad for\ i = 1, 2, 3, \ldots\ldots, 30$$

F-test for the combined significance of the fixed effects dummies was employed to decide either FEM or BEM may be utilized as the best panel data regression. Initially, a fixed effect model was estimated with time dummies for each of the years. By jointly testing the significance of coefficient of time dummies using F-test, the null hypothesis formulated here is that all the fixed effect intercepts are equal to zero:

$$H_\alpha: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

Similarly, the alternative hypothesis will be considered minimum one coefficient of time dummy is not equivalent to zero.

$$H_\alpha: \beta_1 = \beta_2 = \beta_3 = \beta_4 \neq 0$$

If the null hypothesis will be accepted then utilizing a BEM will be appropriately the efficient estimator otherwise in case of acceptance of the alternative assumption, the FEM will be appropriate. Thus, the more proficient estimator of beta (β) will be obtained in this manner.

Regression analysis

In statistical modeling regression investigation is a numerical procedure for evaluating the associations among variables. It contains different procedures for demonstrating and analyzing numerous variables when the concentration on the association between a dependent variable and independent variables. Moreover, financial performance is considered as the function of IC (VAIC) here and its representation is as follows:

Financial Performance = f (VAIC)

In continuation of the above representation, regression equations to analyse the effect of IC on the monetary performance measures been run as follows:

$$ROE = \beta_0 + \beta_1 VAIC_i + \epsilon_i \quad (1)$$

$$ROA = \beta_0 + \beta_1 VAIC_i + \epsilon_i \quad (2)$$

$$GR = \beta_0 + \beta_1 VAIC_i + \epsilon_i \quad (3)$$

Where, β_0 is constant / intercept of the dependent variable (the value of the dependent variable, when the independent variable is equal to zero), the β_1 is the regression coefficient (slope), represents the rate of change in financial performance indicators with respect to VAIC and ε is Error term of the model.

Homoscedasticity test

Finally, homoscedasticity test conducted to evaluate the unstable variances in residuals of the model used, as (F.hair et al., 2010) mentioned that the homoscedasticity was required for the reason that the change of the dependent variable being describes in the dependence association ought not to be focused in a variety of the autonomous values. They explained homoscedasticity as the assumption, states that the dependent variable (s) display equal stages of modification across

the series of the independent variable. The normal errors of the estimators will be inflated if heteroscedasticity exists.

Heteroscedasticity confuses analysis for the reason that many procedures in regression analysis assume of equal variance. Heteroscedasticity does not reason ordinary least squares coefficients estimates to be biased, while ordinary least square estimates can cause a variance of the coefficients "SE(β)" to be biased. Therefore, regression analysis using heteroscedasticity information will give an impartial estimation of the affiliation between the forecaster variable and the consequence. Nonetheless, the standard errors will be partially leading to the unfair inference which refers to the unreliable hypothesis testing. In order to test against heteroscedasticity, Breusch-Pagan test is one of the most common tests for heteroscedasticity was utilized to examine the existence of any linear form of heteroscedasticity. It starts by letting the heteroscedasticity procedure to be a purpose of one or more independent variables, and it's generally applied by presumptuous that heteroscedasticity might be a linear function for rest of independent variables in the model. It is; therefore, Breusch-Pagan test was applied with the help of regression equation as shown below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \epsilon$$

Then, a regression equation was estimated by least squares and obtained the least squares residuals ($\hat{e}$) and run a regression as:

$$\hat{e}^2 = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \cdots + \alpha_k Z_k + v$$

When $\alpha_1 = \alpha_2 = \ldots = \alpha_k = 0$ the equation errors are Homoscedastic and the test of interest was:

$$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_k = 0 \qquad (Homoscedasticity)$$
$$H_a: At\ least\ one\ \alpha_i \neq 0 \qquad (Heteroscedasticity)$$

This statistic followed chi-square (X^2) distribution with $k-1$ degrees of freedom that is:

$$nR^2 \sim X^2_{k-1}$$

Where, nR^2 is asymptotically distributed as X^2_{k-1} under the null hypothesis of homoscedasticity.

Wilcoxon signed-rank test

The Wilcoxon signed rank test involves the variances are roughly symmetric and the statistics are calculating on an ordinal, interval, or ratio scale. When the hypothesis for the Wilcoxon signed rank, the test is met nonetheless the assumptions of the t-test are dishonored, the Wilcoxon signed rank test is generally extra powerful in detecting change between the dual populations. In this study, we have used the Wilcoxon signed-ranked test, because this test is very helpful to understand the relationship between two variables. This is a non-parametric test, in which two independent variables are used from a population with a random distribution.

Results and discussion

Cluster analysis

Cluster analysis technique used in this research to make useful information with good understanding and sort out the complexity of data. Table 1 shows the clusters arrangement of the data:

Correlation analysis

Table 2 holds the Karl Pearson's correlation coefficient between the variables for firms studied in the sample.

Table 1. Cluster analysis of the companies

Group-I	Group-II
DG Khan Cement Factory	Engro Foods
Lucky Cement	Honda Atlas Cars
Maple leaf Cement Factory limited	JS company Ltd
Pioneer Cement Limited	Nishat Mills
HBL Pakistan	Mari Petroleum ltd
MCB Pakistan	Ogdcl
NBP	Pakistan Oilfields Limited
UBL	Pakistan Petroleum Limited
Engro Corporation	PSO
Engro Fertilizer	Pak Elektron Limited
Fouji Fertilizer Bin Qasim Ltd	Hub Power Company Limited
Fouji fertilizer Company Ltd	Karachi Electric Supply Company Ltd

Table 2. Correlation analysis

	CEE	HCE	SCE	VAIC	GR	ROA	ROE
CEE	1.0000						
HCE	0.9851	1.0000					
	0.0000						
SCE	-0.4484	-0.3739	1.0000				
	0.0280	0.0719					
VAIC	-0.0275	-0.0525	0.2641	1.0000			
	0.8984	0.8077	0.2123				
GR	-0.1446	-0.0754	0.3020	-0.5270	1.0000		
	0.5001	0.7262	0.1515	0.0081			
ROA	-0.1289	-0.1403	-0.0391	0.1865	-0.3720	1.0000	
	0.5484	0.5132	0.8560	0.3830	0.0735		
ROE	-0.0567	-0.1011	0.3116	0.1937	-0.1891	0.4057	1.0000
	0.7923	0.6384	0.1383	0.3645	0.3761	0.0492	

The above table shows the potential as well as direction relating to the linear correlation among all independent and dependent variables that have been utilized to conclude the results of this study. Its according to the observation that affixed above; the values representing the correlation coefficient found negative and positive among all the indicators. The CEE and HCE have a negative correlation with GR, ROA, and ROE. Whereas, the SCE and VAIC are negatively correlated only with ROA, and GR respectively. On the other hand, all the indicators of financial performance are receipt of insignificant correlation with the CEE, HCE, SCE, and VAIC except the GR, which is significant with VAIC at all levels of significance.

F-test for fixed effect model versus between effects model

It is a standard test uses for the panel data; wherein FEM, it is assumed firm-specific intercepts and capture effects of those variables which are specific to each firm and constant over time. In BEM, there is a single common intercept average over time for each firm. Regression coeffi-

cients had estimated by both fixed and between effects to determine either these two models are appropriate.

Table 3. F-test for growth revenue

No. of Obs.	R^2	Adjusted R^2	RMSE	F (4,107)	Prob>F
112	0.0255	-0.0109	0.6567	0.70	0.82261
Source	SS	Df	MS		
Model	1.2080216	4	0.302005364		
Residual	46.143594	107	0.431248542		
Total	47.3516155	111	0.42659113		
GR	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	-0.0021208	0.0083085	-0.26	0.799	-0.018591 – 0.143498
t1	0	(Omitted)			
t2	0.1735684	0.1775991	0.98	0.331	-0.178501 – 0.525638
t3	0.1695482	0.175641	0.97	0.337	-0.178640 – 0.5177361
t4	-0.0539532	0.1756865	-0.31	0.759	-0.402231 – 0.2943248
_cons	0.1826356	0.1242875	1.47	0.145	-0.063750 – 0.4290212
Test b[t1] = _b[t2] = _b[t3] = 0 0.t1 – t2 = 0 0.t1 – t3 = 0 0.t1 = 0			Constraint 3 dropped F (2, 107) = 0.63 Prob > F = 0.5350		

Table 4. F-test for return on asset

No. of Obs.	R^2	Adjusted R^2	RMSE	F (4,107)	Prob>F
112	0.0106	0.0264	.37469	0.29	0.8865
Source	SS	Df	MS		
Model	0.014912937	4	0.003728234		
Residual	1.39504104	107	0.013037767		
Total	1.40995398	111	0.012702288		
GR	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0012993	0.0014446	0.9	0.370	-.0015645 – 0.0041631
t1	0	(omitted)			
t2	-0.0051446	0.0308801	-0.17	0.868	-.0663608 – 0.0560716
t3	0.0067427	0.0305396	0.22	0.826	-0.537986 – 0.0672839
t4	0.0073055	0.0305475	0.24	0.811	-0.0532515 – 0.0678624
_cons	0.1078719	0.0216105	4.99	0.000	0.0650316 – 0.1507123
Test b[t1] = _b[t2] = _b[t3] = 0 0.t1 – t2 = 0 0.t1 – t3 = 0 0.t1 = 0			Constraint 3 dropped F (2, 107) = 0.08 Prob > F = 0.9274		

Table 5. F-test for return on equity

No. of Obs.	R^2	Adjusted R^2	RMSE	F (4,107)	Prob>F
112	0.0188	-0.0179	0.11418	0.51	0.7262
Source	SS	Df	MS		
Model	0.288188693	4	0.072047173		
Residual	15.0223566	107	0.140395856		
Total	15.3105453	111	0.137932841		
GR	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0034142	0.0047406	0.72	0.473	-0.0059835 – 0.0128119
t1	0	(omitted)			
t2	-0.0816939	0.1013338	-0.81	0.422	-0.2825762 – 0.1191885
t3	-0.1027395	0.1002165	-1.03	0.308	-0.3014071 – 0.095928
t4	-0.1003288	0.1002424	-1.00	0.319	-0.2990477 – 0.0983902
_cons	0.3649377	0.0709154	5.15	0.000	0.2243561 – 0.5055193

Test b[t1] = _b[t2] = _b[t3] = 0 0.t1 – t2 = 0 0.t1 – t3 = 0 0.t1 = 0	Constraint 3 dropped F (2, 107) = 0.58 Prob > F = 0.5599

The results of F-test conducted against GR, ROA, and ROE exhibit the F-value 0.63, 0.08 and 0.58 along with its probability i.e. 0.5350, 0.9274 and 0.5599 respectively which are greater than the level of significance i.e. 5%. It means there is no evidence found to reject the null hypothesis; it is, therefore, concluded that the between effect model is appropriate for this study to test the relationship between the VAIC and the indicators of financial performance of the organizations.

Between effect model

In this regression analysis, the VAIC is regressed against the GR, ROA, and ROE. The overall three regressions were run for examining the indicators of financial performance. The outcomes against all regression equation analyses are mentioned in the forthcoming tables and interpreted in the next lines.

Table 6. Between effect model growth revenue

No. of Obs.	R^2	RMSE	F (1,22)	Prob>F
24	0.2777	.0801	72.46	0.0000

GR	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	-0.0115771	0.00136	-8.51	0.000	-0.0143976 - -0.0087566
_cons	0.1663217	0.0166411	9.99	0.000	0.1318101 – 0.2008332

***, **, * significant at the 1%, 5% and 10% levels respectively.

As shown in above table, the R-Squared (R^2) was calculated; which is the coefficient of determination that tells us about the variation of independent variable has explained by dependent variable and measures goodness of fit for the model. The R-Squared value suggests that 27.77% of the observed variability was explained by the independent variable. The R-Squared value shows

that there may be a number of other variables which are not taken into consideration in this study and may comprise any relationship with the profitability. It requires further study as this area is an indication of having a capacity for further studies.

Furthermore, the negative sign of beta (β) coefficient for regression (valued -0.0115771) indicates a negative relationship between VAIC and GR, which means if VAIC increases by one unit than GR decreases by 0.0115771.

Whereas, the relationship between both variables as per the regression model shows a statistically significant association with a p-value of 0.000 at all the levels of significance, the p-value ≤ 0.01, exhibits that the concerned variable is having a significant impact on the dependent variable and it rejects the null hypothesis that the slope associated with VAIC is equal to zero (β = 0).

Table 7. Between effect model return on asset

No. of Obs.	R^2	RMSE	F (1,22)	Prob>F
24	0.0348	.11386	10.80	0.0034

ROA	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0050374	0.0015329	3.29	0.003	0.0018584 - 0.0082165
_cons	0.1205509	0.0237521	5.08	0.000	0.0712921 – 0.1698096

***, **, * significant at the 1%, 5% and 10% levels respectively.

As shown in the table above, the R-Squared value suggests that 3.48% of the observed variability was explained by the independent variables.

Furthermore, the positive sign of beta (β) coefficient for regression (valued 0.0050374) indicates a positive relationship between VAIC and ROA, which also refers to the increase of VAIC by one unit will increase the ROA by 0.0050374. Whereas, the relationship among both the variables as per the regression model shows a statistically significant association with a p-value of 0.003 at all level of significance. It means, the concerned variable is having a significant impact on the dependent variable and it rejects the null hypothesis that the slope associated with VAIC is equal to zero (β = 0).

Table 8. Between effect model return on equity

No. of Obs.	R^2	RMSE	F (1,22)	Prob>F
24	0.0307	.2589	5.33	0.0307

ROE	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0119139	0.00516	2.31	0.031	0.0012128 - 0.022615
_cons	0.3163003	0.054732	5.78	0.000	0.2027931 – 0.4298075

***, **, * significant at the 1%, 5% and 10% levels respectively.

As shown in the table above, the R-Squared value suggests that 3.75% of the observed variability was explained by the independent variables.

Furthermore, the positive sign of beta (β) coefficient for regression (valued 0.0119139) indicates a positive relationship between VAIC and ROE, which also refers to the increase of VAIC by one unit will increase the ROE by 0.0119139.

Whereas, the relationship between both variables, as per the regression model shows a statistically significant association with a p-value of 0.031 at a significant level of 5%. It means, the concerned variable is having a significant impact on the dependent variable and it rejects the null hypothesis that the slope associated with VAIC is equal to zero ($\beta = 0$).

Homoscedasticity Test

A test against homoscedasticity was conducted to test the unstable variances in residuals in the model with a null hypothesis for this test indicating the presence of homoscedasticity (i.e. constant error variance) or heteroscedasticity not present.

Table 9. Homoscedasticity test against growth revenue (GR. II VAIC)

No. of Obs.	R^2	Adjusted R^2	RMSE	F (1,22)	Prob>F
24	0.0065	-0.0387	.00961	0.14	0.7083
Source	SS	Df	MS		
Model	0.000013271	1	0.000013271		
Residual	0.002033047	22	0.000092411		
Total	0.002046318	23	0.00008897		

GR-II	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0001811	0.0004778	0.38	0.708	-.0008098 - 0.0011719
_cons	0.0059806	0.0019798	3.02	0.006	0.0018748 – 0.0100863

Table 10. Homoscedasticity test against return on asset (ROA.II VAIC)

No. of Obs.	R^2	Adjusted R^2	RMSE	F (1,22)	Prob>F
24	0.0106	-0.0391	.02551	0.13	0.7171
Source	SS	Df	MS		
Model	0.000087699	1	0.000087699		
Residual	0.014319185	22	0.000650872		
Total	0.014406884	23	0.000626386		

ROA-II	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0004654	0.0012679	0.37	0.717	-.0021641 - 0.003095
_cons	0.01214	0.0052541	2.31	0.031	0.0012437 – 0.0230364

Table 11: Homoscedasticity test against return on equity (ROE.II VAIC)

No. of Obs.	R^2	Adjusted R^2	RMSE	F (1,22)	Prob>F
24	0.0237	-0.0207	.10717	0.53	0.4726
Source	SS	Df	MS		
Model	0.006134526	1	0.006134526		
Residual	0.252660996	22	0.011484591		
Total	0.258795522	23	0.011251979		

ROE-II	Coefficient	Std. Err.	t-value	p>|t|	|95% Conf. Interval|
VAIC	0.0038926	0.0053261	0.73	0.473	-0.007153 - 0.0149383
_cons	0.0635857	0.0220703	2.88	0.009	0.0178146 – 0.1093568

For the purpose, Breusch-Pagan test was applied and the results revealed a p-value considerably less than 0.05 for all the three dependent variables, it reveals that there is evidence for the possible presence of heteroscedasticity in all the models. The issue was resolved by applying heteroscedasticity–corrected standard error (also known as a robust standard error) to adjust the estimation of SE (β) for heteroscedasticity. The logic behind that to use an improved estimation of SE (β) based on the fact that heteroscedasticity does not affect (β)s. Consequently, the results were regenerated with the p-value of 0.708, 0.717 and 0.473 for GR, ROA and ROE respectively, which is greater than the level of significance stated above, so it fails to reject the null hypothesis and conclude that the homoscedasticity assumption is satisfied which was also cross verified with the help of nR^2 calculated value for GR (24 x 0.0065 = 0.156), for ROA (24 x 0.0061 = 0.1464) and for ROE (24 x 0.0065 = 0.5688), which are also less than the critical value (5.91).

Wilcoxon signed-rank test

The Wilcoxon signed-rank test is a nonparametric statistical assumption test which is used when comparing two related samples, matched samples or repeated measurements on a single sample to assess whether their population mean ranks differ (i.e. it is a paired difference test). It can be used as an alternative to the paired Student's t-test, t-test for matched pairs, or the t-test for dependent samples when the population cannot be assumed to be normally distributed.

Table 12. Wilcoxon rank-sum Growth revenue cluster. III

Two-sample Wilcoxon rank-sum (Mann-Whitney) test			
_clus_3	Obs.	Rank-Sum	Expected
1	20	276	250
2	4	24	50
Total	24	300	300
Unadjusted variance: 166.67 Adjusted for ties: 0 H_o: Gr (_clus_3==1) = gr (_clus_3==2)		z = 1.627 Prob > [z] = 0.10	

In above table, the p-value is 0.10 which is significant at a 10% level of significance and it rejects the H_0 and concluded that the average of GR for both the companies (having low and high VIAC) is not equal.

Table 13. Wilcoxon rank-sum return on asset cluster. III

Two-sample Wilcoxon rank-sum (Mann-Whitney) test			
_clus_3	Obs.	Rank-Sum	Expected
1	20	276	250
2	4	24	50
Total	24	300	300
Unadjusted variance: 166.67 Adjusted for ties: 0 H_o: Roa (_clus_3==1) = roa (_clus_3==2)		z = 1.782 Prob > [z] = 0.0748	

In above table, the p-value is 0.0748 which is significant at a 10% level of significance and it rejects the H_0 and concluded that the average of ROA for both the companies (having low and high VIAC) is not equal.

Table 14. Wilcoxon rank-sum Return on equity cluster. III

Two-sample Wilcoxon rank-sum (Mann-Whitney) test			
_clus_3	Obs.	Rank-Sum	Expected
1	20	276	250
2	4	24	50
Total	24	300	300
Unadjusted variance: 166.67 Adjusted for ties: 0 H_o: Roe (_clus_3==1) = roe (_clus_3==2)		z = 2.014 Prob > [z] = 0.0440	

In above table, the p-value is 0.0440 which is significant at a 5% level of significance and it rejects the H_0 and concluded that the average of ROE for both the companies (having low and high VIAC) is not equal.

Conclusion

The economists show the idea of IC as the important building block in the organization's development. IC is a reasonably recent theory that is rapidly adopted for the reason that the organizations progressively more tend to build up models based on knowledge and information, where the human factor plays an important role. The worth of any corporation or organization's employee information, business training, and any proprietary are in order to provide the company with a competitive advantage. IC is measured as an asset and can generally be distinguished as the collection of every informational asset. A business has at its clearance that can be used to take profits, increases new consumers, create new goods, or if not to improve the business. Taking into mind, the theories of different authors about the IC, the objective of this research was set to empirically examine the impact of IC on the financial performance of the organization based on the data retrieved from the KSE-30 index registered companies for the period from 2010 to 2014 (05 years). In this research study, IC is measured with the help of VAIC, whereas the firm performance is measured with Return on Asset (ROA), Return on Equity (ROE) and Revenue Growth (RG) to find out the relationship between both variables i.e. Intellectual capital and financial performance. The VAIC was further measured by the sum of CEE, HCE, and SCE.

The study measured the financial performance by taking into consideration the ROE, ROA, and GR to investigate the behavior of independent variable that is VAIC and is calculated by its three proportions i.e. CEE, HCE and SCE. F-test was conducted to decide either the Fixed Effects Model or Between Effects Model is appropriate for this study to run a regression as well as other statistical tests. The significant results were found in favor of Between Effects Model to proceed in the matter. Three models were designed to run the regression between dependent and independent variables. The coefficient of determination (R^2) revealed the values 0.2777, 0.0348, and 0.0375 for each model. It means GR is explained by 27.77%, ROA is explained 3.48%, and ROE is explained 3.75% by the VAIC.

Consequently, based on these figures, it was justified that the implemented models were in receipt of predicting power for determining the impacts of VAIC on financial performance. It is, therefore, all the models stood fit for this study. Furthermore, the beta (β) coefficient for all three regression models was also calculated to determine the magnitude and direction of the relationship. It exhibited the values of -0.0115771, 0.0050374, and 0.01191390 for GR, ROA, and ROE respectively. It indicates the negative relationship between the GR and VAIC, whereas, the ROA and ROE revealed the positive relationship with the predictor variable (VAIC). Subsequently, the t-test was also used to determine the significance of the predictor variable and found the significant p-

value of t-test for GR (0.000), ROA (0.003), and ROE (0.031) at 1%, 1%, and 5% respectively. Hence, statistical significance could be interpreted from the predictor variable. Also, the results of the Breusch-Pagan test show that there is homoscedasticity in all models.

These results provide an additional empirical confirmation of the contribution of IC to companies' financial performance. Thus, how well companies can use, acquire the knowledge and apply for creating a competitive environment. Especially managers those are working in knowledge-intense companies must know the importance of IC and that information is a critical factor affecting a company's ability to remain competitive in the new worldwide marketplace.

References

Ahangar, R.G. (2011), The relationship between intellectual capital and financial performance : An empirical investigation in an Iranian company, Vol. 5 No. 1, pp. 88–95.

Andreou, A.N. and Bontis, N. (2007), A model for resource allocation using operational knowledge assets, *The Learning Organization*, Vol. 14 No. 4, pp. 345–374.

Andriessen. (2004), Making Sense of Intellectual Capital.

Bassi, L.J. and McMurrer, D.P. (1999), Indicators of Human Capital Investment and Outcomes from the American Society for Training and Development, *Training & Development*, pp. 1–10.

Bontis, N. (1998), Intellectual capital: An exploratory study that develops measure and models, *Management Decision*, Vol. 2 No. 36, pp. 63–76.

Bornemann, M. (1999), Measuring and Reporting Intellectual Capital : Experience , Issues , and Prospects HOLISTIC MEASUREMENT OF INTELLECTUAL CAPITAL.

Brennan, N. (2001), Provided by the author(s) and University College Dublin Library in accordance with publisher policies. Please cite the published version when available, *Family Process*, Vol. 40 No. 1, pp. 67–77.

Carlucci, D., Marr, B. and Schiuma, G. (2004), The knowledge value chain: how intellectual capital impacts on business performance, *Int. J. Technology Management*, Vol. 277 No. 67, pp. 575–590.

Chen Goh, P. (2005), Intellectual capital performance of commercial banks in Malaysia, *Journal of Intellectual Capital*, Vol. 6 No. 3, pp. 385–396.

Clarke, M., Seng, D. and Whiting, R.H. (2011), Intellectual capital and firm performance in Australia, available at:https://doi.org/10.1108/14691931111181706.

Daum, J.H. (2005), Intangible Assets-Based Enterprise Management – A Practical Approach, pp. 1–19.

Edvinsson, L. and Sullivan, P. (1996), Developing a model for managing intellectual capital, *European Management Journal*, Vol. 14 No. 4, pp. 356–364.

F.hair, J., C.Black, W., J.Babin, B. and E.Andreson, R. (2010), Hair et al_2010.pdf.

Firer, S. and Mitchell Williams, S. (2003), Intellectual capital and traditional measures of corporate performance, *Journal of Intellectual Capital*, Vol. 4 No. 3, pp. 348–360.

Harvey, M.G. and Lusch, R.F. (1999), Balancing the intellectual capital books: Intangible liabilities, *European Management Journal*, Vol. 17 No. 1, pp. 85–92.

Huang, C.J. (2005), Exploration for the relationship between innovation , IT and performance, Vol. 6 No. 2, pp. 237–252.

Jen Huang, C. and Ju Liu, C. (2005), Exploration for the relationship between innovation, IT and performance, *Journal of Intellectual Capital*, Vol. 6 No. 2, pp. 237–252.

Jin, C., Zhaohui, Z. and Hong Yuan, X. (2004), Measuring intellectual capital: a new model and empirical study, *Journal of Intellectual Capital*, Vol. 5 No. 1, pp. 195–212.

Kamath, G.B. (2007), The intellectual capital performance of Indian banking sector, available at:https://doi.org/10.1108/14691930710715088.

Kaufmann, L. and Schneider, Y. (2004), Intangibles: A synthesis of current research, *Journal of Intellectual Capital*, Vol. 5 No. 3, pp. 366–388.

Maditinos, D. (2011), The impact of intellectual capital on firms ' market value and financial performance, Vol. 12 No. 1, pp. 132–151.

Marr, B. (2004), Measuring and benchmarking intellectual capital, *Benchmarking: An International Journal*, Vol. 11 No. 6, pp. 559–570.

Mavridis, D. & Kyrmizoglou, G.P. (2005), Intellectual Capital Performance Drivers in the Greek Banking Sector.

Mavridis, D.G. (2004), The intellectual capital performance of the Japanese banking sector, No. June, available at:https://doi.org/10.1108/14691930410512941.

Nick Bontis, W.C.C.K. (2000), Intellectual capital and business performance in malaysian industries, *Journal of Intellectual Capital*, Vol. 1 No. 1, pp. 85–100.

Nonaka, T. (1995), The Knowledge Creating Company, *Harvard Business Review*, Vol. 69, pp. p96-104.

Petty, R. and Guthrie, J. (2000), Intellectual capital literature review Intellectual capital literature review Measurement, reporting and management, *Journal of Intellectual Capital*, Vol. 1 No. 2, pp. 155–176.

Poh, L.T., Kilicman, A. and Ibrahim, S.N.I. (2018), On intellectual capital and financial performances of banks in Malaysia, *Cogent Economics & Finance*, Cogent, Vol. 6 No. 1, pp. 1–15.

Pulic, A. (2000), VAIC^{TM} – An Accounting Tool For Intellectual Capital Management, *International Journal Technology Management*, Vol. 20 No. 5, pp. 149–155.

Rastogi, P.N. (2003), The nature and role of IC:Rethinking the process of value creation and sustained enterprise growth, *Journal of Intellectual Capital*, Vol. 4 No. 2, pp. 227–248.

Seng, H., Part, I. and Chan, K.H. (2009), Impact of intellectual capital on organisational performance An empirical study of companies in the, pp. 4–21.

Serenko, A. and Bontis, N. (2013), Investigating the current state and impact of the intellectual capital academic discipline, *Journal of Intellectual Capital*, Vol. 14 No. 4, pp. 476–500.

Serenko, A., Bontis, N., Booker, L., Sadeddin, K. and Hardie, T. (2010), A scientometric analysis of knowledge management and intellectual capital academic literature (1994-2008), available at:https://doi.org/10.1108/13673271011015534.

Sharabati, A.A., Jawad, S.N. and Bontis, N. (2010), Intellectual capital and business performance in the pharmaceutical sector of Jordan, Vol. 48 No. 1, pp. 105–131.

Stewart, T.A. (1997), Intellectual Capital: The Wealth of New Organisations, *Knowledge Management No*, Vol. 65.

Sveiby, K.E. (2001), Methods for measuring intangible assets, *Www.Sveiby.Com*, No. January, pp. 1–10.

Tan, H.P., Plowman, D. and Hancock, P. (2002), Intellectual capital and financial returns of companies, available at:https://doi.org/10.1108/14691930710715079.

Tan, H.P., Plowman, D. and Hancock, P. (2007), Intellectual capital and financial returns of companies, available at:https://doi.org/10.1108/14691930710715079.

Tunc Bozbura, F. (2004), Measurement and application of intellectual capital in Turkey, *The Learning Organization*, Vol. 11 No. 4, pp. 357–367.

Wiig, K.M. (1997), "wiig1997.pdf".

Yalama, A. (2007), Intellectual capital performance of quoted banks on the Istanbul stock exchange

market, No. 1997, available at:https://doi.org/10.1108/14691930710742835.
Zahid, A. (2011), INTELLECTUAL CAPITAL PERFORMANCE AND ITS IMPACT ON CORPORATE PERFORMANCE : AN EMPIRICAL EVIDENCE FROM MODARABA SECTOR OF PAKISTAN, Vol. 1 No. 5, pp. 8–16.