The Impact of Intellectual Capital on Firm Performance A Study of Firms in Saudi Arabia

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ABSTRACT

This study investigates the changes that occur between intellectual capital (IC) and firm performance (FP) and the relationship between them. The research involved the collection of data from different sources and analysing the same using ordinary least squares (OLS) statistics. Data was collected from thirty companies from Saudi Arabia for the period between 2017 and 2021. The aims and objectives of this research are to investigate the changes that occur between IC and FP and the relationship between them, to explore using a step-by-step process, whether a dynamic as well as a unidirectional relationship exists between IC and FP, and to consider the relationship between IC and FP by analysing OLS statistics collected from thirty companies in Saudi Arabia between 2017 and 2021.

The analysis showed that IC efficiency is significant albeit positively with return on assets (ROA) and return on equity (ROE). These are variables that endorses resource–based theory. When the data obtained was subjected to further investigation, it reveals the relationship between human capital, structural capital, and physical capital displaying their significance and further confirm the resource dependency theory. The results from this study will be very useful to companies and firms as they are going to give an insight on the importance of IC for FP. Policy setters for government, government or organisations and institutions can also use the results to make policies which put in consideration of IC for FP. The policies can be used to develop a framework for IC disclosure. Finally, this research has opened an avenue for scholars to do further studies on the same and bring out more information about the interrelationship between IC and FP.

Keywords: Firms' Performance, Intellectual Capital, VAIC

1. INTRODUCTION

Over the past twenty years, intellectual capital (IC) has been a popular subject in accounting and finance research. Some academics believe that this restricted IC disclosure and/or fluctuations in managers' recognition of the role of IC in the context of firm performance (FP) and has caused conflicting evidence as to its significance (Brüggen et al., 2009; Nimtrakoon and Chase. 2015). For instance, as shown in table 1, the research problem is demonstrated by the results of the empirical studies that highlight the relationship between IC and FP have been inconsistent, leading to indecision on the part of managers regarding the significance of IC and strategic decision-making for investment in IC resources (Inkinen and Chase, 2015; Bontis et al., 2007). Some researchers, such as Tan et al. (2007) and Clarke et al. (2011), have identified a significant positive correlation between IC and FP, whereas others, including Firer and Williams (2003) and Chan (2009), have not. Generally, these conflicting results are due to either the methodology employed to assess IC efficiency (e.g., the value-added intellectual coefficient (VAIC) model) or the economic status of the nation in question (i.e., developed or developing country).

However, this research proposes that there is a gap in the existing literature as the studies to date have only examined this relationship as unidirectional, whereby IC efficiency impacts FP. Hence, this current study investigates whether there is a dynamic relationship between the two. This is indicated by the presence of endogeneity, primarily due to simultaneity. It is accepted that IC impacts FP, but this econometric issue points toward a new area of research: examining whether FP can illuminate future IC resources' investments and thus be a driver of IC efficiency. This phenomenon is discussed in detail below.

Although the term "intellectual capital" has been criticised, it does explain why and how firms make investments (Gowthorpe, 2009). There are three primary elements of IC. These are: (i) human capital, (ii) structural capital, and (iii) relational capital (Subramaniam and Youndt, 2005; Bontis, 2001; Bollen et al., 2005). Each element needs adequate levels of investment to enable the accumulation of IC resources (Rastogi, 2003). Investments in these resources are led by the firms' objectives, meaning that the reason for making such investments is to accomplish specific aims. For instance,

investments in human capital are made to enhance employees' level of motivation or ability to create fresh concepts (Frederickson et al., 2010). Likewise, structural capital investments (which are investments in Research and Development accounting (R&D)) aim to revolutionise the firms' current products or produce new goods for the marketplace (Mouritsen et al., 2005). Regarding what the source of these objective-driven IC resources' investment is, one perspective suggests that firms generate their funds via a step-by-step process which first prioritises the use of funds generated internally (the key source of which is the accumulated profits) and subsequently they consider taking out loans or increasing equity (Myers and Majluf, 1984).

The above scenario assumes that investments made by firms are dictated by their profitability. Furthermore, as profits increase it is a typical and sensible practice to invest in employees of the firm (for instance, salary increases or bonuses). Likewise, in the context of R&D, greater profitability or cash flows typically lead to higher investments by management (Becker, 2013; Mulkay et al., 2001). A US-based study of R&D expenditures in mature high-tech firms established that there is a significant correlation between current cash flows and future R&D investments (Brown et al., 2009). This indicates that there is indeed a bidirectional relationship between IC and FP. Accordingly, current, and future IC efficiency is also impacted by sluggish FP. This is in line with the assertion that FP is the basis for a firms' decisions regarding IC resources investments (Murthy and Mouritsen, 2011).

Assuming that the above is correct, that there is in fact a bidirectional dynamic relationship between IC and FP, it is argued that the use of static estimators (e.g., OLS) and fixed effects (FE) will cause bias in the results, which has occurred in existing studies (Baltagi, 2008; Gujarati, 2012). Therefore, this current study concentrates on this significant methodological component, and conducts a step-by-step analysis to determine whether this is truly a dynamic relationship. A range of tests including dynamic OLS and Wooldridge's (2002) test of strict exogeneity are applied to establish whether exogeneity is present. Differing from other studies, dynamic panel data (DPD) estimation is employed to examine the IC-FP relationship in Australian listed firms, following consideration of econometric issues

including heteroskedasticity, endogeneity (primarily due to simultaneity) and autocorrelation. The outcomes of this current study are in accordance with other resource-based, resource-dependency, and organisational-learning theories which maintain that a certain IC mix is pivotal in FP and in creating a competitive advantage via the effective usage of human and structural capitals. These findings are significant in different ways for the various stakeholders of a firm. For instance, management can use the findings of this study for strategic decision-making purposes in terms of IC resources investments to enhance FP. Likewise, the findings may make shareholders more aware of the role played by human resources in creating value which can convince them to look at expenditure on employees as an investment rather than simply an expense. The empirical finding of this study (i.e., prior FP also impacts future IC) are potentially beneficial to management in forecasting future IC resources' investments. Lastly, and of greatest significance, the broad outcomes of this current study highlight IC disclosure because of the role it plays in the creation of wealth and the provision of fresh verification for establishing accounting standards to improve the prioritisation of IC information (Frederickson et al., 2010; Guthrie et al., 2012).

As such, the aims and objectives of this research are as follows:

- To investigate the changes that occur between IC and FP and the relationship between them.
- To explore using a step-by-step process, whether a dynamic as well as a unidirectional relationship exists between IC and FP.
- To consider the relationship between IC and FP by analysing OLS statistics collected from thirty companies in Saudi Arabia between 2017 and 2021.

Table 1: Empirical Studies on the Relationship between IC and FP Encompassed in This Study

Researchers	D. Variables	I. Variables	Methodology	Relationship	Country
Gigante (2013)	ROA, ROE, M/B	VAIC, HC, CE, SC	OLS	Positive	Czech Republic, Denmark, Finland, Germany, Italy, Norway, Poland, Spain, and Sweden
Joshi et al. (2013)	ROA	VAIC, HC, CE, SC	OLS	Mixed	Australia
Clarke et al. (2011)	ROA, ROE, RG, EP	HC, SC, CE	OLS	Positive	Australia
Stahle et al. (2011)	MV, ROE, ROA	VAIC, HC, CE, SC	OLS	None	Finland
Zeghal and Maaloul (2010)	OI/S, ROA, M/B	VAIC, CE, HC, SC	OLS	Positive	UK
Ting and Lean (2009)	ROA	VAIC, HCE, CE, SC	OLS	Positive	Malaysia
Chen et al. (2005)	ROA, ROE, RG, EP	VAIC, HC, SC, CE	OLS	Positive	Taiwan
Tan et al. (2007)	ROE, EPS, ASR	VAIC, HC, CE, SC	PLS	Positive	Singapore
Firer and Williams (2003)	ROA, ATO, M/B	VAIC, HC, CE, SC	OLS	None	South Africa

2.LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Over the last three decades, the global economy has made a dramatic shift from an industrial-based to a knowledge economy (Guthrie et al., 2012; Lentjusˇenkova et al., 2016). In an economy directed by knowledge, knowledge-based resources including employee knowledge and skills have replaced the traditional components of production such as buildings, land, and machinery (Stewart and Ruckdeschel, 1998; Petty and Guthrie, 2000). Resource-based (RB) theory concentrates on securing a long-standing competitive advantage by fostering strategic resources including skills and knowledge that subsequently generate profits for the firm that are above average levels (Peteraf, 1993). These value-creating knowledge-based resources are typically referred to as intellectual capital (Stewart and Ruckdeschel, 1998; Dumay, 2016). A firm should strive to develop valuable, unique, and matchless resources in order to generate sustainable competitive advantage (Barney, 1991; Asiaei and Jusoh, 2015), which is

the marker of the profitability of a firm (Amit and Schoemaker, 1993). Knowledge is a key component of any firm, and it can be cultivated, shared and utilised for gaining and sustaining competitive advantage in the field (Grant, 1996; Inkinen and Chase, 2015).

Resource-based (RB) theory is one of the highlighters of the significant role played by intangible assets in firms (Barney, 1991). This theory's fundamental premise is that for contemporary firms, competitive advantage can be gained through both tangible and intangible assets. A firms' intangible assets should be distinctive, irreplicable, and capable of generating a viable competitive advantage. Furthermore, RB theory states that a firm is comprised of an amalgamation of interdependent tangible and intangible resources, indicating that the tangible assets' functionality is reliant on that of the intangible assets, and likewise the performance of intangible assets relies on the performance of the tangible assets of the firm. This paper connects RB theory with the view that IC is pivotal in all firms, regardless of size or economic status of the country (Kolachi and Shah, 2013) to illuminate the correlation between general IC efficiency and FP. By effectively employing their strategic resources, which include IC assets, firms can construct competitive advantages (Ze´ghal and Maaloul, 2010). Another academic viewpoint is that IC can yield above average returns when a firm establishes a strong correlation between IC and FP (Joshi et al., 2013; Can˜ibano et al., 2000). Based on this, and supported by RB theory, this paper proposes the following hypothesis:

H1: There is a positive significant effect of general IC efficiency and FP of companies.

According to supporters of the resource dependency (RD) theory such as Pfeffer and Salancik (2003), all firms rely on various stakeholders which include other organisations that possess the strategic resources required for the firm to operate. According to RD theory, it is impossible for every firm to possess all necessary strategic resources and therefore, firms must cultivate long-term relationships with stakeholders who are key to the supply of these resources. Consequently, firms are motivated to actively connect with the external environment, thereby laying the foundations of social and relational capital. Firms must endeavour to ensure that they are capable of addressing any issues or challenging interdependencies in the

external environment, which may entail developing a range of strategies that can be employed as necessary (Oliver, 1991). Connecting RD theory with human resources, a firm can only effectively engage with the external environment if the internal resources (such as human resources and learning environment) are adequate (Abeysekera, 2010). This supports the view that firms should capitalise on their available resources to optimise their value creation in all possible and legal aspects (Williams, 2000).

It is possible to analyse RD theory from two different perspectives. Firstly, it concentrates on the significance of forging long-standing relationships with diverse stakeholders, thereby ensuring that any issues that arise can be addressed with the support of the stakeholders in relation to the various resources required. Secondly, this theory acknowledges the pivotal role of effective human resources in helping the firm to accomplish the objective of forging relationships with stakeholders. The first element of this theory, relational capital, is outside of the focus of this study as this research employs the VAIC model, which does not distinguish relational capital. Conversely, the second element, human capital, is within the bounds of this study. Therefore, this theory can be applied to analyse the efficiency of human capital, and in particular, its role in the financial performance of a firm. It is anticipated that the firms' human capital resource will make an important contribution to the process of value creation, which is in accordance with existing studies (Williams, 2000). Accordingly, the second hypothesis is proposed:

H2: There is a significant, positive correlation between human capital efficiency and FP.

Organisational learning (OL) theory addresses a firms' abilities and process for obtaining new knowledge and subsequently transfers it into innovation, with consideration for their protection via distinct procedures, frameworks, and copyrights (Hsu and Wang, 2012; Njuguna, 2009). This is a critical undertaking for the firm to fully comprehend the dynamic requirements of their consumers. One view is that strong firm performance and competitive advantage rely on the firms' capacity to acquire knowledge about and adjust to the continuously evolving environment by taking advantage of IC (generally-speaking) and structural capital (specifically), which is in line with OL theory (Hsu and Wang, 2012). In

this context, a firm should engage in a process of continual learning so as to forge a sustainable competitive advantage (Njuguna, 2009). This is essential for numerous reasons. For instance, firms can become better acquainted with the requirements, demands, and preferences of their customers in relation to the products. Furthermore, it can bring in innovations in a firms' product and services to meet market demands (Goh, 2003). It is vital that a firm invests in its resources, including R&D, human resources, and distinct production processes, as this also facilitates product innovation (Han and Li, 2015). OL has been described as a process through which a firm obtains new knowledge that can be subsequently transformed into innovation (Njuguna, 2009).

These resources (including distinct production processes, copyrights, and software) are key channels of competitive advantage. Therefore, engaging in continual learning to further develop and enhance these resources is the correct action for the firm to take (Njuguna, 2009). Accordingly, OL theory can facilitate the exploration of the part that structural capital plays in the firms' value creation process. Considering existing research existing research by Hsu and Wang (2012) and Handzic et al. (2016), this study holds the position that efficient and effective structural capital creates an environment that supports employee performance and learning, which results in the improvement of FP. Hence, the third hypothesis is proposed:

H3: There is a significant, positive correlation between structural capital and FP.

According to Anti Pulic, founder of the VAIC model, it is impossible for IC resources to perform in the absence of physical capital (Pulic, 1998). For this reason, the VAIC model is a combined gauge of IC and physical capital resources. Physical capital is the firms' financial capital manifesting as plant machinery and other physical assets. It is also known as capital employed (CE). This is in line with RB theory, which emphasises gaining a competitive advantage by utilising both tangible and intangible resources. Furthermore, most existing studies concur that there is a positive and significant correlation between physical capital and FP (Firer and Williams, 2003; Vishnu and Gupta, 2014; Dzˇenopoljac et al., 2016). Hence, the fourth hypothesis proposed by this current study is as follows:

H4: There is a significant, positive correlation between CE and FP.

3.METHODOLOGY AND DATA

The method is to measure the efficiency of IC (Ho and Williams, 2003; Lu et al., 2014; Purohit and Tandon, 2015; Bontis et al., 2015). In line with the existing literature, this current study also utilised the VAIC model to calculate IC efficiency. The calculations are detailed below.

3.1 VAIC Calculations

Calculating VAIC entails two steps (Pulic, 2004).

- Step 1: The basis of VAIC is value added (VA), which is calculated as follows:

$$VA = OUT - IN \quad (1)$$

Where:

VA represents the value added

OUT represents the output (total revenues)

IN represents the input (all expenses)

The staff costs were not considered expenses in Pulic's (1998) model; instead, they were considered investments as the view was that expenditure related to employees is a component of the process of value creation. Other academics have agreed with this stance (Frederickson et al., 2010). The replacement of OUT and IN with their individual variables means that the equation is rewritten as:

$$VA = R - C \quad (2)$$

or

$$VA = NI + LC + I + T + DP \quad (3)$$

Where:

R represents the revenues

C represents the cost

NI represents the net income

LC represents the labor cost

I represents the interest

T represents the taxes

DP represents the depreciation and amortisation

- Step 2: VAIC is calculated as the total of human capital, structural capital, and CE efficiencies.

VAIC = ICE + CEE (4)

Pulic's (1998) VAIC model is one of the most prevalent finance-based IC efficiency measurements. It calculates the value added by a firm with the separate inputs of human capital, structural capital, and CE into value creation.

ICE = HCE + SCE (5)

Where:

ICE represents the intellectual capital efficiency

CEE represents the capital employed efficiency

Other assessment-based calculations cannot calculate a firms' IC asset value. In contrast, the VAIC model employs data from financial reports to calculate the asset value and efficiency of IC and is a beneficial tool that managers can employ when making decisions. Some academics (for instance, Stahle et al., (2011); Iazzolino and Laise, 2013) have criticised the VAIC model, particularly in relation to the measurement of structural capital. Nevertheless, many researchers and commercial organisations have embraced its employment.

In equation (4) above, CEE is given by VA/CE, whilst in equation (5), HCE is calculated as VA/HC and SCE is calculated as SC/VA.

The dynamic panel regression model shown below was utilised to measure the correlation between IC efficiency and FP:

$$FP_{it} = \hat{a}_i + \hat{\beta} \cdot FP_{it-1} + \delta \cdot z_{it} + \partial_{it} + T_t \cdot \hat{\lambda} + \hat{u}_{it} \qquad (6)$$

Where:

FP_{it-1} represents the lagged dependent variable

Z_{it} represents the independent variables (*VAIC*, *HCE*, *SCE*, *CEE*)

δ represents K∗1 vector of the parameters to be estimated

∂_{it} represents the vector of the control variables

$T_t.\lambda$ represents the vector of thetime dummies T

μ_t represents the error term.

Table 2: Variables' Definition and Measurements

Variables	**Measurement**
Independent Variables	
HCE (Human Capital Efficiency)	Total salaries and wages/VA
SCE (Structural Capital Efficiency)	(VA–HC)/VA
CEE (Capital Employed Efficiency)	Total book value of firm/VA
VAIC (Value Added Intellectual Coefficient)	HCE + SCE + CEE
Dependent Variables	
ROA (Return on Assets)	Net Income/Total Assets
ROE (Return on Equity)	Net Income/Total Equity Control Variables
Assets Turnover (assets utilisation) ATO	Total Sales/Total Assets
Price to Book Ratio (Investment opportunities) P/B	Market Price/Book Value

3.2 Data & Sample

According to previous research, IC is a core aspect of all firms in all industries, and therefore its study has been widely promoted (Firer and Williams, 2003; Ze´ghal and Maaloul, 2010). In addition, intellectual resources are considered essential to all firms, of all types and sizes.

For this reason, thirty Saudi Arabian publicly listed firms are examined in this study. The firms have all been listed on the Saudi Stock Exchange for a minimum of ten years. The firms' data was acquired through their annual financial reports and statements for a five-year period from 2017 to 2021. This time-period was chosen to facilitate the critical analysis of the accrual of IC and its contribution to the firms' processes of creating value. Additionally, this study scrutinised all publicly listed firms on the Saudi Stock Exchange for the same five-year period (2017-2021). The GMM model was deemed most appropriate for this study due to the risk of biassing the results with the use of smaller datasets (for instance, encompassing a shorter timescale) (Wintoki et al., 2012).

4. RESULTS & DISCUSSION

The following eight variables were determined using the values acquired from the annual reports: (i) HCE, (ii) SCE, (iii) CEE, (iv) VAIC, (v) ROA, (vi) ROE, (vii) ATO, and (viii) P/B. The results were tabulated and entered into Excel (the link to this spreadsheet is supplied below).

4.1 Descriptive Statistics

Table 3. Summary Statistics of Dependent and Independent Variables

	HCE	SCE	CEE	VAIC	ROA	ROE	ATO	P/B
MEAN	7.65	0.62	0.65	9.38	12.8	27.26	1.70	2.34
MEDIAN	1.80	0.38	0.34	2.70	8.11	18.90	1.41	1.348
MIN	1.31	0.12	0.16	1.35	0.37	1.43	0.14	1.205
MAX	58.83	1.32	4.43	65.12	45.07	1880	5.31	1.624

As presented in table 3, the Saudi firms have mean, minimum, and maximum VAIC scores of 9.38, 1.35, and 57.12, respectively. The mean IC efficiency scores are in line with those of the Australian financial sector (8.82) (Joshi et al., 2013), but are higher than those in Taiwan (5.49) (Chen et al., 2005). The SCE mean score is 0.62, whilst the mean HCE score is 7.65, which is minimally lower than that of Australia (7.77) (Joshi et al., 2013). Most European nations have efficiency scores that are lower than these (Gigante, 2013). For Saudi firms, the mean ROA is 12.8%. The mean ROEs for Saudi firms and reported in European nations are 23.34% and 18% (Gigante, 2013), respectively, so Saudi firms surpass European firms in this area. Also, Saudi firms' general IC performance exceeds the firms operating in the markets in Europe. These findings, therefore, suggest that Saudi firms are outperforming European ones in this area.

4.2 Empirical Results

This study conducted several basic diagnostic tests. Pearson pairwise correlation analysis was carried out and the outcomes identified that in every arrangement, the correlations are under 0.90. Once the correlation is less than 0.80, no multicollinearity issues will arise (Gujarati, 2012). The Breusch-Pagan test for heteroskedasticity and the Woolridge test for autocorrelation were also conducted. Their results rejected the null hypothesis, indicating the presence of both heteroskedasticity and

autocorrelation in the data. Prior to undertaking corrective action, the possible presence of R^2 was investigated. One method of ascertaining whether the econometric model is static or dynamic in nature is to check if the lagged dependent variable is additionally a regressor (Gujarati, 2012). In such a case, the lagged dependent variable can be included as a regressor, which indicates that is a dynamic model if it is significant, and therefore, dynamic panel estimators should be employed. Subsequently, static and dynamic OLS were run individually to document any alterations, particularly in R^2, and the coefficients' significance. To be more specific, the static and dynamic models run were as follows:

$$FP_{it} = \alpha + \beta X_{it} + \partial + \eta_i + e_{it}$$

$$FP_{it} = \alpha + FP_{it-1} + \beta X_{it} + \partial + \eta_i + e_{it}$$

Where:

FP represents firm performance,

FP_{it-1} represents lagged FP,

X represents IC and its components,

η_i represents the unobserved firm-specific impacts,

e represents the error term for firm i at time t.

Table 4 presents the outcomes of the application of this calculation. In Model 1 (in which the independent variable is VAIC), a substantial increase is observed (from static to dynamic OLS) from 0.85 to 0.40 in R^2. Similarly, in Model 2 (in which HCE, SCE, and CEE are the independent variables) R^2 goes from 0.50 to 0.45. This is the initial distinct indication of a dynamic relationship (Wintoki et al., 2012). In addition to the R^2 rise, in both models, the lagged dependent variables' coefficients are statistically significant at the 0.01 level. These findings prove the dynamic nature of this relationship, thus indicating that OLS can generate results that are biased (Gujarati, 2012).

Table 4: The IC-FP Relationship: Static vs Dynamic OLS

Dependent Variable ROA	Static OLS	Dynamic OLS
HCE	0.606*	0.217 *
SCE	0.404 *	0.122
CEE	0.738*	0.592*
VAIC	0.333	0.656*
LAGGED ROA (Model 1)		0.572*
LAGGED ROA (Model 2)		0.332*
R^2 (Model 1)	0. 85	0.40
R^2 (Model 2)	0.50	0.45

*Table 4 presents the static and dynamic OLS estimation outcomes in the IC-FP relationship. Lagged ROA is one year lag firm performance. All specifications encompassed year dummies and control variable. Significance at the 0.01 and 0.05 levels are denoted by * and **, respectively*

A fundamental position of this study is that future IC efficiency is impacted by past FP, thereby indicating the endogenous nature (primarily due to simultaneity) of this relationship. A noteworthy point is that a strict exogeneity assumption is a condition of successfully applying a fixed-effects estimator. Therefore, this study applied Woolridge's (2002: 285) strict exogeneity test via the model below:

$FPit = \alpha + \beta Xit + \gamma Zit + 1 + \partial + \eta i + eit$

Where:

γZ_{it+1} represents the vector of future IC values and its components.

As shown below in table 5, there appears to be a correlation between VAIC's future values and separate components and present FP, which signifies that endogeneity is present (due to simultaneity). This indicates that current and/or past FP drives future IC efficiency in this sample.

Table 5: Wooldridge Test for Strict Exogeneity

Dependent Variable ROA	t = 0	t + 1
Value Added Intellectual Coefficient (VAIC)	0.665*	0.215*
	(0.000)	(0.000)
Human Capital Efficient (HCE)	-0.040*	-0.008*
	(0.000)	(0.000)
Structural Capital Efficiency (SCE)	1.543	0.524*
	(0.000)	(0.000)
Capital Employed (CEE)	0.654*	0.177*
	(0.000)	(0.000)

Table 5 shows the outcomes of the Wooldridge test for strict exogeneity. *T* = 0 is current year IC capital efficacy, whilst *t*+1 is future IC efficacy (one year lead) *T* = 0 and *t*+1 are current year IC capital efficacy and future IC efficacy (one year lead), respectively. Significance at the 0.01 level is denoted by *.

4.3 Dynamic Panel Data Estimation -Two-Step Robust System GMM

An established and effective general measurement model (GMM) estimator (such as that by Arellano and Bond, 1991) can generate steady and reliable outcomes by resolving any econometric issues. These could include allowances for heteroskedasticity and using differencing to solve autocorrelation (Baltagi, 2008). In comparison to conventional OLS or FE, the GMM estimator has a minimum of three advantages:

1. The GMM estimator can encompass firm fixed-effects thereby allowing for undetected heterogeneity, whereas OLS cannot.
2. The GMM estimator accounts for the impact of past FP on present IC, whereas FE does not.
3. The GMM estimator can utilise the history of a firm as a legitimate tool to account for endogeneity, whilst FE cannot.

Conventionally designed for small *T* and large *N*, the system GMM estimator optimises the dynamic relationship through the utilisation of tools to generate results that are consistent, reliable, and unbiased (Roodman, 2006). Accordingly, it is deemed a suitable estimator for this study.

The system GMM estimation results for equation (6) are presented in table 7 below. In order to facilitate comparisons, OLS, fixed-effects, and dynamic OLS estimations were also performed. As per table 7, there is a positive significant correlation between IC efficiency (VAIC) and FP (ROA) in

system GMM, which indicates that IC makes a substantial contribution to FP. These results are in accordance with resource-based theory. They also reinforce hypothesis 1 that intangible resources contribute substantially to wealth generation and create a competitive advantage for firms in contemporary knowledge-driven economies. Firms' strategic resources (including IC) assets can yield additional returns and generate competitive advantage (Ze´ghal and Maaloul, 2010). The findings of this study concur with past research which found that in the UK, IC efficiency has a substantial influence on FP (Ze´ghal and Maaloul, 2010). Following analysis of the separate components, it was determined that there are also positive significant correlations between FP and human capital, structural capital, and physical capital. This indicates that the individual IC resources contribute significantly to FP and competitive advantage. In addition to supporting hypotheses 2, 3, and 4, the findings of this study also corroborate RD and OL theories. The test of robustness carried out with ROE as FP also generated steady and reliable outcomes (not tabulated), in which VAIC, SCE, and CEE were found to be significant. These outcomes are in line with existing research (Vishnu and Gupta, 2014; Clarke et al., 2011) in which VAIC, SCE, and CEE are found to positively and significantly correlate to FP in regard to ROE. However, static measures (OLS and FE) were the basis of these studies. Nevertheless, these outcomes further confirm the RB and RD theories that IC resources make significant contributions to the FP.

Table 7: IC Efficiency's Impact on FP

	Static Model				Dynamic Model		
Dependent Variable ROA	OLS		Fixed Effects		OLS		System GMM
VAIC	**0.419***		**0.655***		**0.210***		**0.330***
	(0.000)		(0.000)		(0.000)		(0.000)
HCE	0.036		**0.114***		0.133		**0.565****
	(0.000)		(0.000)		(0.000)		(0.000)
SCE	**0.854***		**0.887***		**0.649***		**0.818***
	(0.000)		(0.000)		(0.000)		(0.000)
CEE	**0.754***		**0.663***		**0.558***		**0.712***
	(0.000)		(0.000)		(0.000)		(0.000)
ROA (t - 1)					**0.609***		**0.375***
					(0.000)		(0.000)
ROA (t - 2)					**0.180***		0.254
					(0.000)		(0.000)
ROA (t - 3)					**0.153***		0.366
					(0.000)		(0.000)
Adj. R2	0.32		0.51		0.41		0.172
AR1 test (p-value)							(0.000)
AR2 test (p-value)							(0.327)
Hansen J. Over-identification (p-value)							(0.513)
Diff-in-Hansen test for Exogeneity (p-value)							(0.534)

In system GMM, AR1 and AR2 tests are for first and second order autocorrelations. The Hansen J. test is for over-identification limitations or soundness of instruments. The Difference-in-Hansen test is for instruments' exogeneity. All specifications encompassed year dummies and control variables. Significance at the 0.01 and 0.05 levels is denoted by ∗ and ∗∗, respectively.

System GMM specification tests including AR1 and AR2 meet the provision that there is first order autocorrelation only, which is necessary in GMM (Arellano and Bond, 1991). Moreover, consideration must be given to both the Hansen J. test null hypothesis that all tools are sound and the Difference-in-Hansen test with the hypothesis that all tools are exogenous (*p*-values of 0.383 and 0.314, respectively). This suggests the exogeneity of the instruments utilised in GMM. Furthermore, when the lagged-dependent variables' coefficient is lower than that of OLS but exceeds FE, it indicates the validity of the GMM results (Bond, 2002). This study corroborates this, as the lagged dependent variables' coefficient in system GMM is 0.51, which is less than OLS and exceeds the fixed-effects at 0.61 and 0.16, respectively (see table 7). A noteworthy point here is that the GMM estimator makes the assumption that this study's model encompasses all of the variables that potentially impact dependent and independent variables; thus, unanticipated changes that arise in the independent variable are considered to be errors in expectation (Hansen and Singleton, 1982). In empirical research, this supposition is limited due to the usage of proxies and/or excluded variables (Wintoki et

al., 2012). Therefore, care must be taken in the execution of the GMM estimator.

The application of system GMM, as demonstrated in table 7 allows for a comprehensive analysis of the IC-FP relationship in Saudi Arabia. The results corroborate the significance of IC for FP and are in accordance with most available IC literature. These findings indicate that the relationship between IC efficiency and FP is significant and positive, and supports the RB, RD, and OL theories. This suggests that FP is improved when IC efficiency increases.

These findings corroborate Alturiqi and Halioui's (2020) conclusion that there is a positive association between overall IC efficiency as well as each of its three components (human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE)) and the financial performance of firms. Table 7 records similar findings in the HCE, SCE, and CEE for this study. However, when studying the impact of IC on the FP of Saudi Arabian banks, Berzkalne and Zelgalve (2014) found that whilst the IC performance of Saudi banks was low, it was positively associated

with indicators of bank FP. This could suggest that stable IC improves FP or, alternatively, that dependence on VAIC fails to acknowledge that in some instances, companies are more dependent on physical capital than IC and its elements (Pereira-Rodrigues and Santos-Rodrigues, 2017). This may be the case in the instance of the Saudi banks explored by Berzkalne and Zelgalve (2014).

5.CONCLUSION, LIMITATIONS, & FUTURE DIRECTION

5.1 Conclusion

In the accounting and finance fields for the last twenty years, IC and FP have been prominent areas of study. Contemporary firms endeavour to build competitive advantage through a range of sources, which encompass efficient production factors, and additionally, there have been dramatic shifts from physical to intangible assets. Several studies of this topic have established that IC resources play a pivotal role in firms' processes of value creation. However, as discussed earlier, the disparate results of the existing literature have created a sense of ambiguity amongst managers as to the role IC plays in FP. The majority of IC-FP empirical research has been conducted based on static OLS or FE estimators; thus, this relationship has only been examined unidirectionally. This study marks the initial attempt to establish the bi-directionality of the IC-FP relationship.

To account for endogeneity (primarily due to simultaneity), this study employs system GMM. This facilitates a comprehensive analysis of the IC-FP relationship in Saudi Arabia that addresses the aims and objectives of this research, which are to evaluate the changes that occur between IC and FP and the relationship between them, and to explore whether a dynamic as well as a unidirectional relationship exists between IC and FP using OLS statistics collected from thirty companies in Saudi Arabia. The results corroborate the significance of IC for FP and are in accordance with the majority of the prevailing IC literature. The relationship between IC efficiency and FP is significant and positive, and it supports the RB, RD, and OL theories. This suggests that FP is improved when IC efficiency increases. These findings are especially relevant for firms' managers as they will be better equipped to assess and increase investments in intangibles, thereby creating a viable competitive advantage and enhancing FP (Asiaei

and Jusoh, 2015). Furthermore, owners (i.e., shareholders) will become more aware of the significance of human and structural capital and consequently, they can tailor investments in these resources so as to generate product innovation and capitalise on employees' skills and knowledge. The outcomes of this research also aid managers in emphasising IC disclosure (currently this remains extremely constrained). In addition, these outcomes can be translated into IC disclosure, which can aid in attracting investors to firms, as in addition to scrutinising financial performance, contemporary investors will also examine the performance of intangible resources (Sakakibara et al., 2010).

This study, through its employment of dynamic measurements, makes two key contributions to the existing literature. Firstly, future research can prioritise examination of the dynamic relationship between IC and FP to ascertain the real effect IC has on FP. Secondly, the outcome of this study that FP also impacts IC suggests that managers and/or policymakers should view IC accrual as a continuous progression, and accordingly, consider ongoing investment in IC resources to be a necessity. Moreover, enhanced FP can also indicate a growing trend in investments in IC. Additional research into the top performing classification of IC and the related conditions can illuminate this area and facilitate improved IC management.

5.2 Limitations

A weakness of the VAIC model is that it is unable to distinguish relational capital; this should be addressed in future research to update the model. This is relevant to this research as some of the findings indicate that VAIC may fail to identify whether Saudi firms are more dependent on physical capital than IC and whether the former or the latter has more bearing on firms' performance.

The GMM estimator employed herein resolves numerous econometric issues including serial correlation and endogeneity, however this too has certain weaknesses. For instance, GMM employs internally produced instruments (lags of dependent and independent variables), hence there is a risk of ineffectual tools, particularly when there is an increased number of lags (Wintoki et al., 2012). One solution to this problem is suggested by Blundell and Bond (1998), who advise using a system GMM estimator with

first-differentiated instruments for the equation in levels and instrument in levels for the first differentiated equation. Accordingly, care should be taken when applying the dynamic panel GMM in IC-FP research.

However, when a GMM estimator is applied in the way Blundell and Bond (1998) advise, research suggests that there is a positive association between corporate social responsibility (CSR) disclosure and earnings management practices in Saudi Arabian firms (Garfatta, 2021). These findings indicate that such a GMM estimator would have identified similar findings regarding IC and FP in this study.

5.3 Future Directions

Although there is growing recognition of the significance of IC resources, its disclosure remains limited on firms' annual reports. This means that additional studies are required to emphasise the import of IC and create a systematic framework for its reporting disclosure (Carvalho et al., 2016). This study proposes that future research should firstly comprehensively examine the dynamic relationship to accumulate more substantiation from diverse areas around the globe as a means of improving management. Second, it is proposed, as an academic implication, that the VAIC model should be thoroughly scrutinised to determine its reliability in measuring IC efficiency. The VAIC model is widely deemed the most legitimate and straightforward numerical gauge, so adding new elements like social capital can broaden its scope.

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أثر رأس المال الفكري على الأداء المؤسسي

دراسة تطبيقية على المؤسسات في المملكة العربية السعودية

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المستخلص بالعربي:

تبحث هذه الدراسة التغيرات التي تحدث بين رأس المال الفكري وأداء الشركة والعلاقة بينهما، حيث تضمن البحث جمع البيانات من مصادر مختلفة وتحليلها باستخدام إحصائيات المربعات الصغرى العادية (OLS) ، وقد تم جمع بيانات ٣٠ شركة سعودية مسجلة في سوق الأوراق المالية السعودي (تداول) خلال الفترة ما بين ٢٠١٧م الى ٢٠٢١م ، وتمثلت أهداف البحث في التحقق من التغييرات التي تحدث بين راس المال الفكري وأداء الشركات والعلاقة بينهما، سواء كانت هذه العلاقة ديناميكية او علاقة أحادية الاتجاه بين راس المال الفكري وأداء الشركة، والنظر في هذه العلاقة من خلال تحليل إحصائيات (OLS) التي تم جمعها .

وقد أظهر التحليل أن كفاءة راس المال الفكري مهمة وإن كانت إيجابية مع العائد على الأصول (ROA) والعائد على حقوق الملكية (ROE). وان هذه المتغيرات تؤيد النظرية القائمة على الموارد، وعندما خضعت هذه البيانات التي تم الحصول عليها لمزيد من التحليل ، فإنها تكشف عن العلاقة بين رأس المال البشري ورأس المال الهيكلي ورأس المال المادي مما يدل على أهمية هذه النظرية وسوف تكون نتائج هذه الدراسة مفيدة جدًا للشركات لأنها ستقدم نظرة ثاقبة على أهمية راس المال الفكري على أداء الشركة ، وتمكّن واضعي السياسات الحكومية أو المنظمات والمؤسسات الخاصة أيضًا لاستخدام هذه النتائج في وضع السياسات التي تضع في الاعتبار راس المال الفكري من أجل أداء افضل لشركاتها ، وتمكّن ايضاً في استخدام السياسات لتطوير إطار عمل للكشف عن راس المال الفكري.

واخيراً تفتح هذه الدراسة طريق للباحثين لإجراء العديد من الدراسات حول هذا الموضوع والحصول على مزيد من النتائج حول العلاقة المتبادلة بين راس المال الفكري وأداء الشركات.

الكلمات المفتاحية: أداء الشركات، رأس المال الفكري، المعامل الفكري للقيمة المضافة (VAIC)