




“Intellectual capital and industrial firms’ growth: Evidence from Jordanian manufacturing listed firms”

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ARTICLE INFO	Mohammad Fawzi Shubita (2022). Intellectual capital and industrial firms’ growth: Evidence from Jordanian manufacturing listed firms. <i>Problems and Perspectives in Management</i> , 20(3), 325-334. doi: 10.21511/ppm.20(3).2022.26
DOI	http://dx.doi.org/10.21511/ppm.20(3).2022.26
RELEASED ON	Monday, 12 September 2022
RECEIVED ON	Wednesday, 15 December 2021
ACCEPTED ON	Thursday, 19 May 2022
LICENSE	 This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

42



NUMBER OF FIGURES

0



NUMBER OF TABLES

12

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BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

Received on: 15th of December, 2021

Accepted on: 19th of May, 2022

Published on: 12th of September, 2022

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INTELLECTUAL CAPITAL AND INDUSTRIAL FIRMS' GROWTH: EVIDENCE FROM JORDANIAN MANUFACTURING LISTED FIRMS

Abstract

This paper deals with the link between intellectual capital and the Jordanian industrial listed companies' growth. This relationship is meaningful for the companies to enhance their interest in intangible assets. The study employed a regression analysis; independent variables are intellectual capital and intellectual capital components (human capital, structural capital, and capital employed). The current ratio is used as a control variable. The study sample, which contains 785 observations, is divided into the firms that generate positive ROE and those that generate negative ROE. The study sample included 77 Jordanian industrial listed firms during the period 2006–2020. The paper found that intellectual capital does not have a significant effect on industrial firm growth and its components do not have a significant effect on industrial firm growth. The main conclusions drawn from these results are that the return on equity do not affect the link between intellectual capital and industrial firms' growth. The paper recommended applying the study models to other sectors like banks and service sectors and including other control variables like leverage and company size in these models.

Keywords

capital employed, structural capital, company growth, current ratio, human capital, profitability, industry, Jordan

JEL Classification

M10, M40, O15

INTRODUCTION

Intellectual capital (IC) is information, experience, intellectual property, and knowledge that can be utilized to initiate value (Ulum, 2017). Firms investing in information technology and resources will tend to last and excel. Using intangible assets can improve the potential of firm performance so that it attracts the attention of investors (Soetanto & Liem, 2019). Jordanian manufacturing companies are examples of firms that optimize intellectual capital, so they have excellent performance values in the eyes of investors to get much investment. Therefore, IC has an essential impact on company's performance and value.

Intellectual capital includes three main components. First, capital employed (CEE) includes the accumulated skills, experience, and the ability to create and innovate. Second, structural capital (SCE) includes the knowledge resources maintained within the entity. Last, human capital (HCE) is created by the people or entity and used in the market (Shubita, 2019).

This study contributes to the previous studies as follows. First, the paper gave evidence of the link between IC and company growth of manufacturing listed firms in Jordan. Most previous research has concentrated on specific sectors in the European countries and the United



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Conflict of interest statement:

Author(s) reported no conflict of interest

States. The results of this paper extend the understanding of IC in the process of firm performance in emerging markets. Then, the study investigated the role of profitability in this important relationship.

IC is also the result of transforming tacit knowledge for entities (Al Sharawi, 2021). It is considered an intangible asset which value is like goodwill; the regulators and government have not formulated the regulations for the entity and its measurement (Ahmed et al., 2021).

The study's problem is understanding the role of intellectual capital in enhancing manufacturing firms' growth, which can help managers to utilize and manage intellectual capital investment in their firms.

1. LITERATURE REVIEW AND HYPOTHESES

Alqadi and Olimat (2018) identified the intellectual capital impact on the Jordanian industrial shareholding firms' accounting disclosure by examining the intellectual capital efficiency. They recommended executing a sound strategy for intellectual capital development to achieve firms' objectives. On the other hand, El-Bannany (2008) examined the determinants of intellectual capital performance in UK banks. It was found that bank efficiency, investment in information technology systems, and efficiency in IC investment have critical effects on IC performance. Singh and van der Zahn (2008) described IC differently. They investigated the link between disclosure levels and IC of 444 listed firms in Singapore. As a result, they found that corporate governance structure, proprietary costs, and ownership retention are the main determinants of IC disclosure.

Edvinsson and Malone (1997) reached that IC is the possession of firm experience, professional skills, client relationships, and organizational technology that give firms a competitive advantage in the economy. Next, Lynn (1998) found that IC is the knowledge linked to several parts of the entity value. Lastly, Hsu and Fang (2009) and Bose and Thomas (2007) described intellectual capital as a firm's total culture and capabilities that create competitive advantages.

In summary, the intellectual capital concept came as a result of the rather complex and dynamic acceleration in the change of the business environment in all its aspects, as operating institutions are subject to highly competitive conditions and are constantly exposed to economic, social, and political changes. As a result, money, buildings,

and inventory are vital. However, the primary and most important capital for institutions is intellectual capital (Allameh, 2018). Therefore, it has become imperative for institutions to invest in their human resources and to search for ways to enable them to survive in the face of high competition. This way, they obtain natural, sustainable, and highly effective wealth called intellectual capital, enabling them to confront and respond to urgent changes (Tamunomiebi & Kalio, 2019).

The second topic related to the purpose of this study is intellectual capital and firm performance. In this crucial topic, several studies investigated this relationship, like Lu et al. (2021). They examined the association between IC and firm performance measured by productivity, sales growth, corporate return earnings, market value, and profitability. The study sample included 204 Chinese pharmaceutical firms during 2013–2018. The study concluded that IC does not influence sales growth and has a negative influence on value. However, the findings also indicated that IC positively influenced companies' corporate earnings, productivity, and profitability. Finally, Battagello et al. (2019) appraised and analyzed the strategic resources prioritization and suggested a framework that helps company management have clear decisions about such entities. This method returns quantitative and rational findings and allows for a ranking of the examined assets.

In the same field, Chen et al. (2005), Feimianti and Anantadjaya (2014), Latif et al. (2012), and Chu et al. (2011) found a positive association between IC and firm performance and market value. On the other hand, Firer and Williams (2003) failed to discover such a relationship between IC, firm performance, and market value in South Africa. The study recommended improving its intellec-

tual capital resources. Lastly, Nawaz and Haniffa (2017) investigated 64 Islamic banks operating in 18 countries for 2007–2011, employing the Value Added Intellectual Capital method. Their results showed a statistically positive relationship between Return on Assets (ROA) and value-added intellectual coefficient (VAIC). In addition, ROA has a positive critical link with HCE and CEE; and there is no strong association with SCE.

Therefore, as discussed in the literature review, the trend now is toward evaluating IC as one of the critical assets in a firm. It is necessary to determine the level of its contribution to explaining and analyzing the level of variation in its profitability. When a firm knows the extent of its contribution, it can achieve competitive advantage and sound financial performance. It was also concluded that accounting standards are no longer sufficient to estimate the actual value of a company, which focuses in essence on measuring the value of tangible assets without looking at intangible assets, and the critical impact they add on its financial performance (De Luca et al., 2020). Thus, IC is considered the intangible fuel to achieve an adequate performance of firms. In addition, it helps achieve its objectives of increasing profits, providing the necessary liquidity to cover its needs, and increasing its market share. As a result, a firm enters new markets to market its products through its ability to transform intellectual capital into profits through human capital with skill, ability, and high commitment. This leads to enhanced individual and collective effectiveness, ultimately increasing profits (Meles et al., 2016).

The last topic related to the purpose of this study is the link between intellectual capital and firm growth. In this field, Ionita and Dinu (2021) investigated the influence of intellectual capital on company value and growth using the linear regression model to evaluate the association between the variables. The study found that IC did not positively influence growth rate and value for the firms listed on the Bucharest Stock Exchange. In addition, Xu et al. (2021) aimed to employ the modified VAIC model to investigate intellectual capital efficiency, capital employed efficiency, and its components' role in firm growth. They found that these factors have a significant positive influence on firm growth.

On the other hand, Lotfi et al. (2021) aimed to evaluate the influence of IC on fraud in listed companies' financial statements in Iran. The study found a negative association between IC and its components and financial statements' fraud, which means that high investments in intangible assets like intellectual capital will decrease the fraud inside the firms. Lastly, Shubita (2019) aimed to examine the impact of intellectual capital on Jordanian industrial firms' market value during 2005–2017 by using the VAIC model. 73 Jordanian manufacturing shareholders companies represented the study sample. The findings showed no association between IC and firm value in the market. However, HCE had a relationship with the firm value, and CEE and SCE were not related to firm value.

Therefore, this link between intellectual capital and firm growth is essential to the clients or customers of a company that guarantees its continuity and success. Thus, evaluating this relationship is very important in forming necessary knowledge capital. This is the source of the services provided, the method of persuasion, and urge loyalty to it. Relational capital is complete as any part or component of the organization's external environment that contributes to creating added value (Mukherjee & Sen, 2019). The preceding research found that IC is an essential asset for creating market value (Ozkan et al., 2017). In addition, firms with high intellectual capital will be characterized by high-performance levels, as it enhances the level of novelty of the services or products they provide (Rosikah et al., 2018).

Table 1 summarizes the main results of some of the previous studies.

There are several unsolved issues in the previous studies, which need to continue in this study by covering the link between intelligible assets and the industrial firm growth in resources in Jordan. The aim of this study, along with the previous theoretical literature, is to evaluate the link between IC and its components (capital employed, structural capital, and human capital) and firm growth. Hence, the following hypotheses are formulated:

H_{01} : *IC does not significantly affect industrial firms' growth.*

Table 1. Literature review summary

Study	Main results
Firer and Williams (2003)	No relationship between intellectual capital, firm performance, and market value.
El-Bannany (2008)	Bank efficiency, the investment in information technology systems, and efficiency in intellectual capital investment variables have significant effects on intellectual capital performance.
Singh and van der Zahn (2008)	Corporate governance structure, proprietary costs, and ownership retention are the main determinants of intellectual capital disclosure.
Feimianti and Anantadjaya (2014)	Positive link between intellectual capital and market value.
Nawaz and Haniffa (2017)	Positive relationship between Return on Assets (ROA) and intellectual capital.
Shubita (2019)	No relationship between intellectual capital and the firm market value.
Lotfi et al. (2021)	Negative relationship between intellectual capital and its components and financial statements' fraud.
Lu et al. (2021)	Intellectual capital does not influence sales growth and has a negative influence on value.
Ionita and Dinu (2021)	Intellectual capital did not have a positive influence on the firm growth rate and firm value.
Xu et al. (2021)	Intellectual capital efficiency, capital employed efficiency, and its components have a significant positive influence on firm growth.

H_{02} : *IC components do not significantly affect industrial firms' growth.*

H_{03} : *Return on equity does not affect the relationship between IC and industrial firms' growth.*

model and divides the sample into two sub-samples (positive and negative firms based on return on equity) to study the firm profitability effect.

2. METHODOLOGY

Based on the literature review and for achieving the study goal and testing the study hypotheses, the paper used these two models:

$$G = \alpha + \beta_1 IC + \beta_2 CR + \varepsilon, \tag{1}$$

$$G = \alpha + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 CR + \varepsilon, \tag{2}$$

where G : Firm growth ((total asset year t – total asset year $t-1$) / total asset year $t-1$); IC : Intellectual capital; SCE : Structural capital efficiency; HCE : Human capital efficiency; CEE : Capital employed efficiency; CR : Current ratio; ε : error (residual value).

The first model is used to investigate the impact of IC as an independent variable on firm growth, as a dependent variable, and the current ratio, as liquidity is used as a control variable. This model is run for the first hypothesis. The intellectual capital components are used in the second model to examine the incremental information content for intellectual capital components in evaluating the firm growth variance over intellectual capital. Finally, to test the third hypothesis, the study uses the first

2.1. Study variables and sample

The firm growth is measured using a change in total assets equal to total assets for the current year minus total assets for the previous year over total assets for the previous year (Kanakriyah, 2020; Senan, 2019). Intellectual capital is measured using the value-added intellectual coefficient (VAIC) model. In this model, three components are used to measure intellectual capital (Shubita, 2019):

$$VAIC = CEE + SCE + HCE, \tag{3}$$

where CEE is capital employed efficiency computed by dividing VA (the value-added) over the total assets. The VA is measured using (AlNajjar & Riahi-Belkaoui, 1999):

$$VA = T + I + D + DE + R + M, \tag{4}$$

where T is taxes; I is interest; D is depreciation; DE is dividends; R is retained earnings; M is non-controlling interest in the income statement

On the other hand (Lin, 2018):

$$SCE = SC / VA, \text{ and } HCE = VA / HC, \tag{5}$$

where HC is the personal expenses of the firm; $SC = VA - HC$.

The control variable is the current ratio, which equals the total current assets divided by total current liabilities.

The sample for this study is 77 Jordanian shareholders in manufacturing firms during the period 2006–2020. The sample employed consists of 788 firm-year observations.

3. RESULTS

Table 2 shows the descriptive measures after eliminating the outliers. The firms have a low growth rate. The current ratio is about three, so the Jordanian firms do not have any liquidity problems because the current assets can cover the current liabilities by three times. Therefore, for each JD paid to the Jordanian employees, more than two JD come from value-added.

Table 3 shows the correlation between the variables. Spearman correlation coefficients between intellectual capital firm growth are positive and

significant for the intellectual capital components. Firm growth has a positive and significant association with human capital and capital employed and a negative association with structural capital.

Table 4 shows the regression models (OLS) findings of the relationship between firm growth and intellectual capital. The independent variable factor is insignificant, which leads to accepting the first null hypothesis. The adj-R² and R² also have low values, meaning that IC does not significantly affect industrial company growth. This finding is not consistent with Feimianti and Anantadjaya (2014). This rejection of the first hypothesis can be illustrated by the fact that firms can finance their growth from another source of funds, like liabilities, instead of intellectual capital.

Table 5 indicates no significant difference in model 2 when breaking down the intellectual capital into components. The independent variables factor is insignificant, and the Adj-R² is -0.001%. Thus,

Table 2. Descriptive measures

Variable	N	Mean	Median	Standard deviation	Min	Max
HCE	788	1.558	1.299	4.733	-53.84	48.61
SCE	788	0.975	0.706	7.04	-125.5	84.1
CEE	788	-0.360	0.078	11.04	-309.37	9.27
VAIC	788	2.173	2.18	14.111	-314.55	84.09
Growth (G)	788	0.032	-0.014	0.63	-0.997	12.998
CR	788	2.933	1.874	4.015	0.02	47.45

Table 3. Correlation matrix (Spearman)

Variables	SCE	CEE	VAIC	G	CR
HCE	(-0.294)**	(0.754)**	(0.844)**	(0.362)**	(0.307)**
SCE	-	(-0.367)**	(0.137)**	(-0.179)**	(-0.092)**
CEE	-	-	(0.614)**	(0.298)**	(0.125)**
VAIC	-	-	-	(0.286)**	(0.244)**
G	-	-	-	-	(0.086)*

Note: * 0.05 level, ** 0.01 level.

Table 4. The first model

Variables	Factors	Error	t-statistic	Sig.
Constant	0.045	0.028	1.608	0.108
VAIC	0.001	0.002	0.596	0.551
CR	-0.005	0.006	-0.919	0.359
R ²	0.002		Adj R ²	-0.001
F	0.621		Sig	0.538
VIF	1.001		DW	2.060

Table 5. The second model

Variables	Factors	Error	t-statistic	Sig.
Constant	0.038	0.029	1.30	0.194
HCE	0.008	0.005	1.605	0.109
SCE	0.00	0.003	-0.155	0.877
CEE	0.00	0.002	0.077	0.939
CR	-0.006	0.006	-1.026	0.305
R ²	0.005		Adj R ²	-0.001
F	0.884		Sig.	0.473
VIF	1.019		DW	2.073

Table 6. The first model (companies with positive profits)

Variables	Factors	Error	t	Sig.
Constant	0.146	0.056	2.625	0.009
VAIC	-0.001	0.005	-0.149	0.881
CR	-0.018	0.013	-1.444	0.150
R ²	0.005		Adj R ²	0.00
F-Statistics	1.048		Sig.	0.352
VIF	1.001		DW	2.014

Table 7. The first model (companies with negative profits)

Variables	Factors	Error	t	Sig.
Constant	-0.031	0.035	-0.889	0.375
VAIC	0.00	0.002	0.189	0.850
CR	-0.003	0.006	-0.447	0.655
R ²	0.001		Adj R ²	-0.005
F	0.123		Sig.	0.885
VIF	1.003		DW	2.130

the second null hypothesis is accepted; intellectual capital components have an insignificant impact on industrial firm growth. This result indicates that the three elements of intellectual capital are not better than the aggregate intellectual capital in explaining the company growth.

To test the third hypothesis, the sample was divided into firms that generate profits and firms that generate losses (Dambra, 2018). There are no significant differences between the two sub-

samples, so the study accepts the third hypothesis (Tables 6 and 7). Thus, return on equity does not affect the relationship between intellectual capital and industrial firms' growth.

3.1. Balanced data analysis

3.1.1. Pooled OLS

Tables 8 and 9 refer to the pooled OLS findings for the study models.

Table 8. Model 1 coefficients

Variable	Coefficient	Std. error	t-Statistic	Prob.
VAIC	0.001495	0.001595	0.937174	0.3490
CR	-0.005449	0.005623	-0.969018	0.3328
Constant	0.045082	0.028109	1.603825	0.1092
R ²			0.002262	
Adjusted R ²			-0.000299	
F			0.883155	
Prob. (F-)			0.413890	
D-W			2.261766	

Table 9. Model 2 coefficients

Variable	Coefficient	Std. error	t-Statistic	Prob.
CEE	0.000883	0.002042	0.432538	0.6655
HCE	0.008480	0.004779	1.774512	0.0764
SCE	-0.000525	0.003196	-0.164382	0.8695
CR	-0.005862	0.005627	-1.041830	0.2978
Constant	0.037219	0.028950	1.285649	0.1989
R ²		0.005627		
Adjusted R ²		0.000508		
F		1.099178		
Prob. (F-)		0.355796		
D-W		2.275348		

Husman test helps in determining which method is better (random effect model or fixed effect model) (Ahmed et al., 2021). Table 10 indicates that the random effect model is better (Gujarati, 2021).

Table 10. Husman test

Model	Chi Sq.	Chi Sq. d.f.	Prob.	Preferred Method
Model (1)	0.400	2	0.819	Random
Model (2)	0.408	4	0.982	Random

3.1.2. Random effect models

Table 11. Random effects for model 1

Variable	Coefficient	Std. error	t-Statistic	Prob.
Constant	0.033066	0.039658	0.833776	0.4047
VAIC	0.001186	0.001714	0.691718	0.4893
CR	-0.001125	0.011094	-0.101397	0.9193
Cross-section fixed (dummy variables)				
R ²		0.102094		
Adjusted R ²		0.002468		
F		1.024776		
Prob. (F-)		0.424509		
D-W		2.512162		

Table 12. Random effects for model 2

Variable	Coefficient	Std. error	t-Statistic	Prob.
Constant	0.027242	0.040395	0.674386	0.5003
CEE	0.000779	0.002131	0.365602	0.7148
HCE	0.007778	0.006337	1.227371	0.2201
SCE	4.93E-06	0.003389	0.001453	0.9988
CR	-0.002279	0.011149	-0.204461	0.8381
Cross-section fixed (dummy variables)				
R ²		0.103680		
Adjusted R ²		0.001390		
F		1.013586		
Prob. (F-)		0.450191		
D-W		2.522869		

The study tests the multicollinearity using the Variance Inflation Factor. It was about one of the study models, which means there is no multicollinearity in this study (Gujarati, 2021).

4. DISCUSSION

The findings gave evidence about the association between intellectual capital and firm growth. The liquidity cannot help the Jordanian firms to increase their assets because the high current ratio means firm management did not make the sound investment decision to increase the long-term assets that generate more profits. First, model 1 indicated that IC does not influence firm growth, stating that intellectual capital cannot positively enhance a firm's financial growth and generate wealth in Jordan, an emerging market. Regarding intellectual capital components, model 2 indicates that the three components (CEE, SSE, and HCE) do not positively affect total assets growth, supporting the second hypothesis. In addition, the insignificant CEE coefficients also refer that tangible resources are the vital driving force behind the firm performance in Jordanian companies; several studies reached the same results.

The analysis in model 2 also describes that SCE has an insignificant and negative impact on firms. Jordanian firms tend to over-rely on management mechanisms and lack management competencies, leading to performance deficiencies. However, firms that can efficiently use SCE will own a vital advantage due to its rarity (Pattiruhu & Paais, 2020). In model 2, the negative association between SCE and firm growth asserts that structural capital cost does not help translate Jordanian companies' income in the short run. Amin and

Aslam (2017) confirmed a positive association between firm growth and intellectual capital on the London Stock Exchange.

Additionally, SCE has a vital influence and a negative association, different from Andreeva and Garanina (2016), who concluded that intellectual capital might be necessary for being a part of Russian firms. Findings from models 1 and 2 indicate that intellectual capital does not influence

firm performance. The study found these results to provide evidence for the first two hypotheses; this does not support Smriti and Das (2018) and Chen et al. (2005), who found that IC positively affects earnings growth.

The prospect from the results is to apply this critical topic to other sectors like banks and services using other variables (e.g., leverage and liquidity ratios).

CONCLUSION

This study investigated the link between IC and its components and firm growth of the Jordanian listed firms on the Amman Stock Exchange during 2006–2020. IC reflects the value associated with business entities created through the relationship between the entity and its constituents. Intellectual capital can be explained as the firm's ability to maintain associations between suppliers, customers, government, and shareholders. Relationship ability and quality to create new clients are vital factors for the firm success.

The study found that intellectual capital and intellectual capital components do not impact firm growth. Furthermore, profitability did not change these associations. Therefore, the study recommended using several control variables like profit margin and inventory turnover.

The study also found a significant and positive link between IC and intellectual capital components, the highest correlation is with human capital, and the lowest is with structural capital.

The conclusion drawn from the findings of this study is that these findings are not in accordance with the study hypotheses. It can be caused by internal factors such as the lack of optimal resources, the firm's low appreciation of employee skills, and the decrease in efficient human labor use in Jordanian industrial firms. In addition, human resources are replaced with new machines that use systems digitally. However, the findings of this paper are not under theoretical expectations.

AUTHOR CONTRIBUTIONS

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Formal analysis: Mohammad Fawzi Shubita.

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- [org/10.1108/K-05-2020-0325](https://doi.org/10.1108/K-05-2020-0325)
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