

**The Impact of Intellectual Capital on Financial
Performance and Market Value: A Study of
Egyptian firms listed on the Stock Exchange**

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1. Introduction

The topic of Intellectual Capital (IC) has gained great importance among academics and practitioners since, in a knowledge-based economy, companies compete and rely more on intangible resources such as innovations and technologies in operations and organization, employee capabilities, creativity, relationships with internal and external partners (Ginesti, Caldarelli et al., 2018). IC's importance has emerged in a wide range of academic research to explain its impact on financial performance (FP) (Ozkan, 2016; Albertini & Berger-Remy, 2019), organizational value (Yudawisastra, Manurung et al., 2018; Hamdan, 2018), innovation (Bayraktaroglu, Calisir et al., 2019) and reputation (Ginesti, Caldarelli et al., 2018). Despite the controversy surrounding the concept of IC; the literature

shows a consensus about the ability of intangible factors to improve FP and Market Value (MV).

Many researchers believe that companies will depend on IC performance for growth and value conservation (Sardo, 2017), thus, IC is an important source of sustainable performance and competitive advantage (Yudawisastra, Manurung et al., 2018). By recognizing the importance of IC, a company may improve its performance either through cost leadership strategy or differentiation strategy (Harris, 2000). IC provides not only differentiation but, also, a competitive advantage for business and, ultimately, this leads to better FP reflected in the company's value (Amin et al., 2018; Yudawisastra et al., 2018).

This study aims to expand the IC literature by analyzing the impact of the modified value-added Intellectual efficiency (MVAIC) on both FP and MV. Moreover, this study aims to make a set of recommendations that benefit corporate managers in improving the company's FP and MV through IC. To achieve this objective, the researchers used a sample of non-financial companies listed on the Egyptian stock market during the period from 2013 to 2019. Using the timeseries and bipolar data method, the researchers collected Panel Data about these firms.

The rest of this paper is organized as follows: Section 2, explains the theoretical framework, section 3, is the literature review, section 4, details the research questions used in this study. Section 5, elaborates the objectives of the study, followed

by section 6, demonstrating the study hypotheses. Section 7, explains the importance of this study. Section 8 presents the method used in this study. Section 9, sets out the field study results and, finally, section 10, emphasizes the conclusion and recommendations of the study.

2. Theoretical Framework

2.1. Definition and Categorization of Intellectual Capital (IC)

IC represents an essential "hidden value" in the variance between a firm's MV and its book value which is not presented in traditional financial reports (Forte et al., 2017 and Sardo, 2017). Many researchers describe IC as an intangible asset that generates a sustainable competitive advantage for the firm by linking it with its resources (Joshi et al., 2010). IC is defined as the sum of all the knowledge and knowledge capabilities available within the firm that helps it to obtain or maintain a sustainable competitive advantage (Wang et al., 2014). Sardo and Serrasqueiro (2017) defined IC as a value-to-value knowledge (Sardo and Serrasqueiro, 2017). Sullivan (2000) considered that IC represents a firm's knowledge that can be converted into a tangible profit. This definition explains IC as potential performance, depending on whether the firm's managers are able to achieve this potential (Dženopoljac, Janošević et al., 2016).

In order to identify IC assets, scientists have proposed several frameworks (Guthrie et al., 2012; Dženopoljac et al., 2016). Goebel (2015) identified three approaches based on the

sources of information used by researchers. First, the investment-based approach, based on the accounting information contained in the financial statements, which identifies some of the costs associated with employees as investments (Goebel, 2015). The most important example of this approach is Pulic's 2000 VAIC model which is designed to determine the IC's capacity to contribute to the creation of the firm's value (Iazzolino and Laise, 2013; Joshi et al., 2010). Second, the component based approach, which is based on the estimation of individual IC components, aiming to determine the total value of IC (Forte et al., 2017). Finally, by examining MV, the holistic market-based approach seeks to integrate the market to anticipate the value of IC (Ruckdeschel, 1998).

Moreover, there are many trends in the division of IC into components and elements; these include what is common and what is modern. One of the oldest bilateral rankings, proposed by Hall (1992), ranked IC in two groups; this depends on his ability to view it in isolation from human resources to human capital (Dzenopoljac, Yaacoub et al., 2017). Different forms of knowledge can be classified either as general or specific. On the other hand, there are types of IC that are separate from human resources. They include regulatory capital, technological capital, and relational capital (RC). Another important bilateral classification, presented through Petty and Guthrie (2000), is where IC consists of two components: namely, organizational

(structural) capital (OC) and human capital (HC) (Buenechea-Elberdin, 2017). There are, also, those who have divided IC components into three main components: HC, SC and RC (Dženopoljac, Janošević et al., 2016), Although we can find different frameworks for IC conceptualization, the four widely accepted components among researchers are HC, SC, RC and Capital Empowering (CE) (Nimtrakoon, 2015; Dženopoljac et al., 2016). The components of IC, covered by research, can be explained as follows.

2.1.1. Human Capital Efficiency (HCE)

HC is a key component of IC. This is the knowledge, competence, innovation, commitment, and wisdom of an employee (Morris, 2015). This is the knowledge of an individual who is not a corporate member and is what employees take them with them when they leave the firm. Bae and Patterson (2013) define HC as the skills, degree of knowledge and other characteristics of employees such as training and academic backgrounds (Bae & Patterson, 2013). Albertini & Berger, 2019 sees it as the knowledge, skills, innovative ideas and common capacity of employees. HC is a key strategic resource. It is supportive and necessary for success because employee knowledge and skills are essential in a rapidly linear and rapidly changing competitive climate (Albertini & Berger-Remy, 2019). Human Capital Efficiency (HCE) leads directly and indirectly to greater organizational performance through superior production

and improved innovation to ensure better customer satisfaction (Cabrita et al., 2007). The researchers believe that HC is the knowledge that is preserved in the worker's mind and, rather than being owned by the organization, relates to the individual personally and is, namely, skills, creativity, accumulated experience, creativity and problem solving capabilities, and the individual's ability to perform in certain situations.

2.1.2. Structural Capital Efficiency (SCE)

SC includes the tools to allow employees to perform their jobs. Such tools include knowledge, established in the firm's systems, and results in knowledge transfer (Scafarto et al., 2016; Inkinen, 2015). Luthy (1998) defines SC as everything leaders use to support employees (human capital) in their work. It is the supportive infrastructure that enables HC to operate (Luthy, 1998). SC facilitates greater productivity, improved workplace practices, internal networks, knowledge sharing and market direction (Janošević et al., 2013; Mention and Bontis, 2013). SC can be classified into two types. The first involves cognitive innovation such as databases and intellectual assets. Type two infrastructure resources include participation in organizational activities. Therefore, SC reflects innovations in products and services in response to market requirements (Nadeem et al., 2017). The researchers believe that SC includes the firm's organizational capabilities that regulate and meet customer requirements and contribute to the transfer and enhancement of

knowledge through the structural intellectual assets of information systems, patents, copyrights, and authorship.

2.1.3. Relational Capital Efficiency (RCE)

RC refers to all intellectual assets involved in the management and organization of the firm's external relationships. These include regulatory relationships with suppliers, customers, stakeholders, and marketing and knowledge channels governing these associations (Meles et al., 2016). RC can be defined as the firm's efficiency in responding to market intelligence (Cabrita et al., 2007). Luthy (1998) defined RC, also, as the power of customer relationship loyalty. RC includes supplier and customer relationships. The idea that RC is a separate component from HC and SC indicates the importance of customer capital to the firm. RC differs from other IC components because it arises from either within or outside the firm (Luthy, 1998). RC is the knowledge obtained by establishing relationships with external stakeholders (Yu, Wang et al., 2015). RC is reflected often in the commitment and trust of stakeholders. This leads to the firm's reputation and customer loyalty to the brand and, in turn, affects the firm's financial and operational results (Mention & Bontis, 2013). The researchers believe that RC reflects the nature of the relationships between the firm and its customers, suppliers and competitors, alliances, partners, compensations, market share, contracts of trade, agreements of excellence, quality standards and all related to excellence and reputation

2.1.4. Capital Employed Efficiency (CEE)

CE is the net book value of the firm's assets. In financial statements, often they are referred to as total property rights (Nadeem et al., 2017). By including a measurement of physical and financial capital in the VAIC methodology, the value-added portion of these assets can be measured separately (Ozkan, 2016).

2.2. Measurement models

Measuring IC as a means of valuing the firm's intangible assets is well accepted practice in academia (Pulic, 2004; Pal and Soriya, 2012; Amin et al., 2014). The literature review refers to an increasing number of studies on the measurement of IC (Jordão, 2017). However, the measurement of IC is still at an exploratory stage. There is no consensus on either a general measurement approach or a coherent measurement theory of IC (Svanadze and Kowalewska, 2015). The participation of researchers from different disciplines, such as accounting, economics, finance, strategy, human resources, and psychology, has led to a multiplicity of dimensions that use different theories to ascertain how IC is measured (Bayraktaroglu, et al., 2019). Studies, which focus on measuring IC, differ in their reasons as to why firms measure their IC (Joshi et al., 2013).

The IC field is one of the most recent management disciplines and, to date, its measurement has been documented in accounting standards (Sardo and Serrasqueiro, 2017). Consequently, the responsibility for measuring IC remains with

researchers. In addressing the measures developed to measure IC, there are many which researchers have been using and they are still making a lot of efforts to develop models to measure IC (Hooper, 2016). By reviewing the literature about IC, researchers have identified five main portals for measuring IC. These are: market capitalization approach; direct IC measurement approach; balanced scorecard approach; economic value-added approach; and VAIC Methodology (Joshi et al., 2013; Hooper, 2016; Nguyen, 2016).

Despite the difficulties of measuring IC, the VAIC Methodology overcomes them by applying the concept of efficiency when measuring the components of IC, and Pulic's 2000 VAIC model is a suitable and well-entered method that measures IC and its components based on the firm's accounting information (Al-Musali and Ku Ismail, 2014; Svanadze & Kowalewska, 2015). Since the VAIC portal is based on the idea that IC cannot play its role without relying on physical capital, this model points to the efficiency of the total value added as a result of IC processes (Yudawisastra et al., 2018).

The concept of the VAIC portal is that it combines the efficiency of IC with its components along with the efficiency of physical capital (Zulkifli et al., 2018). The index is calculated by the formulation of collected data that help to measure the value of key elements. The next step is the calculation phase of the competency indicators for each component of the IP-added

parameter. So that the value of the IP value-added coefficient can be reached, these stages represent Pulic's model of the IP-added coefficient scale (Hooper, 2016).

Regardless of the advantages of VAIC, it has received much criticism, not about its failure to produce quantitative value for IC but rather to reflect its impact on performance. The scale ignores the measurement of the efficiency of RC and focuses only on HCE and SCE (Ulum et al., 2014). Consequently, the VAIC account becomes useless for facilities with a negative book value of capital. Analysis is not valuable if the firm's expenses are greater than its revenues.

Sirinuch has added the efficiency of RC to the added IP coefficient and has called the scale the Modified Value Added Intellectual Efficiency (MVAIC) (Nimtrakoon, 2015). The MVAIC is the result of adding the Intellectual Capital Efficiency (ICE) to the efficiency of tangible capital (CEE) where the ICE consists of the output of three components, namely HCE, SCE, and RCE (Ulum et al., 2014; Ozkan, 2016). The addition of the capital efficiency of relationships within the components of the measurement of IC efficiency is the adjustment made to Pulic's measure of the IP added factor (Hooper, 2016). The researchers consider this adjustment to be a more comprehensive measure because it involves the three components of IC that are of key importance when determining either the value or impact of IC.

3. Literature Review

The accounting literature emphasizes the potential of IC to improve FP and value creation (Dženopoljac et al., 2016; Yudawisastra et al., 2018; Hamdan, 2018). It demonstrates the important benefits of overcoming corporate vulnerabilities (Verbano and Crema, 2016; Jordão and Novas, 2017). From investigating 2090 nonfinancial firms from 14 countries between 2004 and 2015 to examine the relationship between HC and FP and MV, Sardo's (2017) findings proves that (Sardo and Serrasqueiro, 2017). Applying IC is an important factor for creating firm's value although the effects of IC components on MV may not be immediate for firms. Nimtrakoon's (2015) results indicate a positive relationship between IC and MV, and that larger IC firms tend to have greater MV, CEE, HCE, SCE and RCE which explains about 90.2% of the change in MV (Nimtrakoon, 2015). (Rashid et al., 2018) findings show that IC has no impact on the firm's MV. From investigating the situation in Serbia, (Dženopoljac et al., 2016) findings show no support for the hypothesis that there is a relationship between IC and MV or between IC and FP.

From examining the dynamic relationship between IC and corporate performance in 571 Australian listed firms during the period from 2005 to 2014, (Nadeem et al., 2018) findings reveal that IC has a positive impact on performance and that HCE, SCE and CEE influence ROA, ROE, and ATO and support the

theories of resource dependence and organization learning. These findings are consistent with those of several other studies (Nimtrakoon, 2015; Smriti and Das, 2018; Rashid et al., 2018).

Current researches of economic theory assert that to maximize production and services, a combination of labor, land, and organizational resources must occur (Dumitrescu, 2015). Studies demonstrate that HC is the most important dimension of maximizing FP. In this respect, skills and training are brought together with goods and tools to improve service management and performance (Ozkan, 2016). These findings are consistent with those of several other studies (Hooper, 2016; Ozkan, 2016; Sardo and Serrasqueiro, 2017; YILMAZ & ACAR, 2018). Moreover, Akanbi's (2016) findings show that there is a significant relationship between structural capital and regulatory performance. Research has revealed that firms should make efforts to implement a strong intellectual platform that increases superior performance and competitive advantage (Akanbi, 2016). In addition, research has shown that there is a statistically significant relationship between the associated capital and asset return, operational cash flow and capital expenditures (Martini et al., 2016). Yilmaz and Acar's (2018) findings show an inverse relationship between SCE, RCE and NPM (YILMAZ & ACAR, 2018).

The results of Dzenopoljac's (2017) study shows that CEE's mental impact on ROE and R^2 reached 52.4% (Dzenopoljac et al., 2017). Bayraktaroglu's (2019) findings demonstrate, also,

that there is a strong relationship between CEE and ATO (Bayraktaroglu et al., 2019). Dzenopoljac's (2017) findings confirm these results and also show that CEE's mental impact on ATO and R^2 was 48.4%. Similarly, Chowdhury's (2018) findings show that the relationship between CEE and ATO explains 66.8% of the change in ATO. The mental impact of HCE, SCE and SEE on NPM and R^2 was 19.7% (Chowdhury et al., 2018).

After discussing the most important findings of the literature review, the following conclusions are made:

- Foreign studies have shown the importance of IC and its impact on many variables such as FP, innovative ideas and the firm's MV market value and organizational performance.
- Arab researchers have not paid sufficient attention to IC both in terms of intellectual rooting and in terms of putting IC into practice.
- Many studies have examined the relationship between the firm's FP and MV and have used certain variables either as a subsidiary variable or as an independent variable. However, few studies have made use of firms' financial data in dealing with the relationship between IC, FP and MV.
- There is recognition of the effect of IC on a firm's FP and MV. However, with very few studies in this area. There is a need for researchers to pay greater attention to using the Panel Data series methodology when examining the effect of IC on a firm's FP and MV. Studies are very rare in this area.

4. The Research Questions

The research is trying to answer the following question:

What is the Impact of IC on the FP and MV of the Egyptian firms listed on the Stock Exchange?

This question raises the following sub-questions:

- What is the effect of IC on FP?
- What is the effect of IC on MV?

5. The Research Objectives

This study seeks to achieve the following objectives:

- To examine the significance of the relationship between IC and the dimensions of FP (ROA, ROE, ATO, NPM).
- To examine the significance of the relationship between IC and MV.
- Determine which dimensions of IC have more influence on the dimensions of FP.
- To determine which of the IC dimensions have more influence on the firm's MV.
- In addition to the above, this study aims to make a set of recommendations that benefit those in charge of the firm's decision-making by activating the role of IC in the firm to improve its FP and MV.

6. The Research Hypotheses

H1: IC has a significant effect on FP

The following sub-assumptions emerge from this hypothesis:

H1.1: IC has a significant effect on Return on Assets (ROA).

H1.2: IC has a significant effect on Return on Equity (ROE).

H1.3: IC has a significant effect on the Assets Turnover Ratio (ATO).

H1.4: IC has a significant effect on Net Profit Margin (NPM).

H2: The second hypothesis is that IC has a significant effect on the firm's Market Value (MV).

7. Importance of the research

The importance of this research study is due to its investigation of IC in the Arab environment by attempting to determine IC's impact on FP and MV through using the methodology of time series and sector data for companies in the Egyptian stock market. Accordingly, the findings of this research are important to both academics and the firms listed on the Egyptian stock market in terms of:

(1) Scientific Importance

- To shed light on IC in terms of concept, dimensions and measurement tools, and to contribute to the completion of the theoretical framework of this pattern and its rooting

especially, in light of the scarcity of Arabic writings in this field.

- Revealing the nature of the relationship between the variables. This study contributes to enriching the knowledge balance in the management and accounting literature generally and organizational behavior in particular.

(2) Practical Importance

The practical importance of this study is as follows:

- Determining the dimensions of IC and its effect on the dimensions of FP.
- Determining the dimensions of IC and its effect on MV.
- Supporting IC and the resulting discovery in attracting, training and strengthening the capabilities achieved for the competitive advantage facility and their contributions to improving FP and maximizing the MV of the firm in question.

8. Research Method

In this part of the study, the researchers cover the research variables and the method used to measure the population and the study sample, sources of data and the methods of statistical analysis. The researchers explain, in this section also, the research limitations.

8.1. Measurement of the Variables

According to the research objective, which is mainly, the impact of IC on FP and MV, and what has been addressed

previously in the theoretical framework, the variables are classified into dependent and independent variables:

8.1.1. Dependent variables

The dependent variables used in the regression models, consist of FP and MV. These variables are described as follows:

- Financial Performance (FP)

FP, which is derived from accounting information, representing past performance of the firm. This study's uses ROA, ROE, ATO and NPM as the four measures of the traditional performance. These are described as follows:

- Return on Assets (ROA)

This is the firm's ability to use its assets regardless of the corporate financing policy. It is widely used in many IC studies as an alternative to FP (Nimtrakoon, 2015). It is represented by $ROA = \text{Net Income} / \text{Total Assets}$.

- Return on Equity (ROE)

This ratio measures the return on investment by the firm's owners. It is calculated usually only for ordinary shareholders (Nimtrakoon, 2015). It is represented by $ROE = \text{Net Income} / \text{Total Equity}$.

- Assets Turnover Ratio (ATO)

This measures the project's efficiency in investing funding sources for uses (Pal and Soriya, 2012). If the turnover rates are high, it indicates good investment in the assets. It indicates,

also, the firm's ability to invest in various assets to achieve the sales figures. It measures the ability of every Egyptian pound invested in assets to achieve sales. As such, it is considered to be an indicator of the efficient use of assets in achieving revenues. Generally, the increase in the rate of asset turnover is an indication of an improvement in the firm's efficient use of assets and the improvement in profitability (Nadeem, Gan et al., 2017).

- **Net Profit Margin (NPM)**

This expresses the efficiency of the firm's management in dealing with the elements of cost of sales, and the extent of its ability to control them by following this percentage over time periods (Jordão, 2017). The percentage of gross profit reflects the firm's efficiency in dealing with elements of the cost of goods sold and the extent of management's ability to control them by following this ratio over successive time periods.

- **Market Value (MV)**

MV explains the investor's view of the business. Specifically, this ratio indicates the value that the market adds to the common stock compared to what is recorded as the book value of that stock in the firm's records (Zulkifli et al., 2018). MV is an index of market expectations of the firm's future performance compared to the book value. $MB = \text{market value} / \text{book value}$, where the market value is the

number of outstanding shares x share price at the end of the year; Book value = Book value of shareholders' equity x Share capital paid

8.1.2. Independent variables

The study depends on the Modified Value-Added Intellectual Coefficient (MVAIC) scale and its four components, namely, HCE, RCE, SCE and CEE - as independent variables in regression models. The MVAIC account is summarized as follows (Svanadze and Kowalewska, 2015; Hooper, 2015):

$$CEE=VA/CE$$

$$HCE=VA/HC$$

$$SCE=SC/VA$$

$$RCE=RC/VA$$

$$ICE=HCE+SCE+RCE$$

$$MVAIC=ICE+CEE$$

Table 1: Research Variables and Methods for Measuring Them

Variable Type	Concept	Measure	REFERENCES
Dependent	Return on Asset (ROA)	Net Income/Total Assets	(Nimtrakoon,2015; Dzenopoljac, Yaacoub et al., 2017)
Dependent	Return on Equity (ROE)	Net Income/Total Equity	(Nimtrakoon,2015; Dzenopoljac, Yaacoub et al., 2017)
Dependent	asset turnover ratio (ATO)	Total revenue/total assets	(Pal & Soriya, 2012; Nadeem, Gan et al., 2018; Bayraktaroglu, Calisir et al., 2019)
Dependent	Net Profit Margin (NPM)	Gross profit / Net Sales	(Jordão, 2017; ženopoljac, Janošević et al., 2016)

Dependent	Market to Book value (MB)	The ratio of MV of firm to book value firm	(Dzenopoljac, Yaacoub et al., 2017; Zulkifli, Shukor et al., 2018)
Independent	Human capital coefficient (HCE)	Value add / Total wages and Salary for the firm	(Amin, Aslam et al., 2014; (Ulum, Ghozali et al., 2014;
Independent Independent Independent	Structural Capital Efficiency (SCE) Relational Capital Efficiency (RCE) Capital employed efficiency (CEE)	Structural Capital / Value add Value add / Retional Capital. (RC= Advertising expense) Total assets (excluding goodwill and intangibles) / capital used of the firm	Al-Musali & Ku Ismail, 2014; Svanadze & Kowalewska, 2015; Hooper, 2016; Hamdan, 2018; Amin, Usman et al., 2018)

8.2. The Research Sample

The population of the study is the joint stock companies listed on the Egyptian stock market. The researchers selected a sample from these companies from the period 2016 to 2019. The sample items included twenty companies listed on the Egyptian stock market operating in different sectors in Egypt's business environment. The researchers chose the sample based on the following characteristics:

- 1- Firms are listed on the Egyptian Stock Exchange and its stock is traded.
- 2- Availability of the annual financial statements and the complementary notes from 2013 to 2019.
- 3- The researchers chose the sample arbitrarily from among the 30 companies listed on the Egyptian stock market in terms of trading according to the Egyptian Stock Exchange index EGX30.

Table 2 below shows the participating companies, the sample of this study and the type of sector to which each company belong.

Table 2: Study sample companies

No.	Company	Sector
1	Commercial International Bank - Egypt	Banks
2	Credit Agricole – Egypt	Banks
3	Egyptian Chemical Industries	Basic Resources
4	Ezz Steel SAE	Basic Resources
5	Sidi Kerir Petrochemicals	Basic Resources
6	Alexandria Mineral Oils Co	Energy & Support Services
7	Eastern Co SAE	Food, Beverages and Tobacco
8	Juhayna Food Industries SAE	Food, Beverages and Tobacco
9	Elsewedy Electric Co SAE	Industrial Goods , Services and Automobiles
10	Ghabbour Auto SAE	Industrial Goods , Services and Automobiles
11	Telecom Egypt	IT , Media & Communication Services
12	Pioneers Holding Company for Financial Investment SAE	Non-bank financial services
13	Citadel Capital SAE	Non-bank financial services
14	Egypt Kuwait Holding	Non-bank financial services
15	Orascom Development Egypt	Non-bank financial services
16	Madinet Nasr Housing and Development	Real Estate
17	Palm Hills Development Co SAE	Real Estate
18	Six of October Development and Investment	Real Estate
19	Talaat Moustafa Group Holding	Real Estate
20	Egyptian Resorts Co SAE	Travel & Leisure

Source: Prepared by the researchers.

8.3. Source of Data

The researcher used the following two methods to collect data: The researchers obtained the information necessary to formulate the theoretical framework; define the research problem; formulate the hypotheses; and determine the importance of this study and its goals from the previous literature. The researcher collected the data necessary to test and analyze the assumptions. These data are represented in the annual financial reports and disclosures. These were obtained from within the Egyptian companies listed in the Egyptian stock exchange.

8.4. Methods of Statistical Analysis

To achieve the research objectives, the researchers used a set of statistical methods and the E-views (10) statistical program. These methods include the following:

- Measurements of central tendency and dispersion: mean, standard deviation.
- Stepwise Regression Analysis, and the regression model was analyzed by using Panel Data and Cross sectional Data.
- Progressive regression analysis with fixed and random effect.

8.5. This Study's Limitations

The limitations are:

- This research is limited to the companies in the EGX30 index that have published trading data.

- This study is limited to using ROA, ROE, ATO, NPM as the indicators of FP.
- This study is limited to the period from 2013 to 2019.

9. Research Results

The researchers explained the research results and testing the validity of the assumptions in this section as follows.

Table 3 below shows the descriptive analysis and the correlation matrix of the model variables. The average value of MB is 2.338. This indicates that the average MB of companies listed on the Egyptian stock market is 2 times greater than their book value. The standard deviation of MB indicates significant differences in market prices when compared to the companies' book values. The ROA and ROE ratio provide relatively low average scores of 0.061 and 0.139 respectively when compared to the average scores for ATO and NPM of 0.608 and 0.300 respectively. Table 3 presents, also, descriptive analysis of the independent variables, namely MVAIC and its four components of HCE, CEE, RCE and SCE. The average MVAIC score is 8,317. This indicates that this study's companies have created 8,317 pounds for every one pound that was used during the study period. In addition, when compared to SCE, RCE, CEE with average scores of 0.842, 0.231 and 0.162 respectively, HCE is the most influential component of wealth creation with the highest average value of 7.080. This is consistent with previous results that, when compared to structural and physical capital and

financial (Ozkan et al., 2017; Hamdan, 2018), HC is the most effective engine for creating value.

The correlation results are explained by Pearson correlation. MVAIC shows a positive correlation with ROE, NPM, MB while HCE capital efficiency shows positive correlation with ROE, NPM, MB. On the other hand, SCE shows positive correlation with NPM. CEE shows, also, a positive and significant correlation with all the dependent variables other than NPM. However, RCE shows no correlation with the dependent variables.

Table 3: Descriptive statistics and correlation matrix of variables

Variables	Mean	S.D.	ROA	ROE	ATO	NPM	MB	MVAIC	HCE	SCE	RCE	CEE
1. ROA	0.061	0.087										
2. ROE	0.139	0.346	0.602**									
3. ATO	0.609	0.726	0.391**	0.100								
4. NPM	0.300	0.243	0.088	0.216*	0.291**							
5. MB	2.339	1.358	0.191*	0.165	0.194*	0.018						
6. MVAIC	8.317	6.106	0.084	0.190*	0.042	0.358**	0.171*					
7. HCE	7.080	5.929	0.057	0.167*	0.047	0.395**	0.177*	0.960**				
8. SCE	0.843	0.577	0.10	0.034	0.09	0.197*	0.092	0.031	0.033			
9. RCE	0.232	1.800	0.070	0.079	0.013	0.028	0.015	0.228**	0.0370	0.306**		
10. CEE	0.163	0.184	0.583**	0.258**	0.522**	0.055	0.452**	0.088	0.0900	0.163	0.050	

Note. * $p < 0.05$; ** $p < 0.01$.

The results in Table 4 confirm the significance of the regression models where the value of the “F” test; this confirms its statistical significance at the 1% level of significance. As for the sequence correlation test (Durban-Watson), by calculating the value of the DW test calculated at the level of all regression

models with the DW tables at the sample size ($n = 140$), the results show that the value of the RDPI tests achieved $O < DW < dL$. This reflects that the models suffer from a chain link problem that can influence parameters and their tests. This reflects the model's failure and the need to address this problem.

Table 4: The test of the effects of IC on FP and MB

Variables	ROA	ROE	ATO	NPM	MB
	$\beta(\text{sig.})$	$\beta(\text{sig.})$	$\beta(\text{sig.})$	$\beta(\text{sig.})$	$\beta(\text{sig.})$
C	0.016	-0.024	0.137	0.258	1.797
HCE	0.111	0.011*	0.010	0.016**	-0.137
SCE	-0.005	0.005	0.073	0.088**	-0.019
RCE	0.099	0.100	0.041*	0.086	0.007
CEE	0.276**	0.516**	2.017**	0.060	3.333**
n	140	140	140	140	140
F-value	71.197	7.866	18.985	17.136	35.485
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000
R^2	0.340	0.103	0.833	0.200	0.205
Durbin-Watson	0.908	1.437	1.312	1.049	0.926

Note. * $p < 0.05$; ** $p < 0.01$.

Table 4 shows regression models, after addressing the problem of serial linking, where the researcher added an explanatory variable (independent), which is represented in the dependent variable, but with a delay period of ROA_1, ROE_1, ATO_1, NPM_1, MB_1, and by performing the regression analysis again, the researchers reached the results of Regression Analysis is as follows:

Table 5: The test of the effects of IC on FP and MB

Variables	ROA	ROE	ATO	NPM	MB
	$\beta(\text{sig.})$	$\beta(\text{sig.})$	$\beta(\text{sig.})$	$\beta(\text{sig.})$	$\beta(\text{sig.})$
C	-0.005	0.027	0.092	0.094	0.010
HCE	0.002*	0.005	0.001	0.012**	-0.008
SCE	0.032	0.016	0.032	0.044	-0.120
RCE	0.006*	0.017	0.029	0.019*	-0.037
CEE	0.242**	0.706**	1.550**	0.07	5.307**
ROA_1	0.047				
ROE_1		0.303**			
ATO_1			0.304**		
NPM_1				0.497**	
MB_1					-0.366**
DF	(3,116)	(2,117)	(2,117)	(3,116)	(2,117)
F-value	70.241	20.891	19.493	12.205	23.838
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000
R ²	0.645	0.309	0.860	0.485	0.260
Durbin-Watson	1.933	2.138	2.348	1.884	1.828

Note. * $p < 0.05$; ** $p < 0.01$.

Table 5 illustrated results confirm the significance of the Panel Data Balanced Model since the value of the F-statistical test is 70.241 ($p < 0.01$). The R² is 0.645. This indicates that 64.5% of the possible variation in the ROA is explained by CEE, HCE and RCE. When compared to RCE and HCE, CEE makes the greater and more significant contribution to the model. The findings suggest that every additional generated CEE is associated with an extra 0.242 in ROA; every added unit of RCE

is related to an increase of 0.006 in ROA; and every increased unit of HCE is linked to an increase of 0.002 in ROA. With regard to the results of the Autocorrelation test, the value of the Durban-Watson is ($D-W = 1.933$), which is an ideal value when it achieves ($du < DW < 2$). This means that the model does not have Autocorrelation problem.

Further, Table 5 illustrated results confirm the significance of the Panel Data Balanced Model since the value of the F-statistical test is 20.891 ($p < 0.01$). The R^2 is 0.309. This indicates that 30.9% of the possible variation in the ROE is explained by CEE, ROE_1. The findings suggest that every additional generated CEE is associated with an extra 0.242 in ROE. Turning to the results of the Autocorrelation test, the value of the Durban-Watson is ($D-W = 2.138$). This is an ideal value when it achieves ($2 < DW < 4 - du$) and means that the model does not have an Autocorrelation problem.

Moreover, Table 5 illustrated results confirm the significance of the Panel Data Balanced Model since the value of the F-statistical test is 19.493 ($p < 0.01$). The R^2 is 0.304. This indicates that 86% of the possible variation in the ATO is explained by CEE, ROE_1. The findings suggest that every additional generated CEE is associated with an extra 1.550 in ATO. Turning to the results of the Autocorrelation test, the value of the Durban-Watson is ($D-W = 2.348$). This is an

ideal value when it achieves ($2 < DW < 4$ -du) and means that the model does not have an Autocorrelation problem.

Table 5 illustrated results confirm the significance of the Panel Data Balanced Model since the value of the F-statistical test is 12.205 ($p < 0.01$). The R² is 48.5. This indicates that 48.5% of the possible variation in the NPM is explained by NPM₁, RCH. When compared to NPM and RCH, HCE makes the greater significant contribution to the model. The findings suggest that every additional generated RCE is associated with an extra 0.012 in NPM and every added unit of HCE is related to an increase of 0.019 in NPM. Turning to the results of the Autocorrelation test, the value of the Durban-Watson is (D-W =1.884). This is an ideal value when it achieves ($du < DW < 2$) and means that the model does not have a Autocorrelation problem.

Table 5 illustrated results confirm the significance of the Panel Data Balanced Model since the value of the F-statistical test is 23.838 ($p < 0.01$). The R² is 0.260. This indicates that 26% of the possible variation in the MB is explained by CEE, MB₁. The findings suggest that every additional generated CEE is associated with an extra 5.307 in MB. Turning to the results of the Autocorrelation test, the value of the Durban-Watson is (D-W =1. 828). This is an ideal value when it achieves ($du < DW < 2$) and means that the model does not have an Autocorrelation problem.

10. Conclusions

This research study aimed to discover the influence of IC on the FP and MB of the firms listed on the Egyptian Stock Exchange. The results show the following:

The first hypothesis states that "IC has a significant effect on the FP of the firms listed on the Egyptian Stock Exchange." Four sub-hypotheses were derived from this main hypothesis to show the effect of IC on FP. Using the Panel Data Balanced Model, the results of the statistical analysis are as follows:

Sub-hypothesis (1/1) states that "there is a significant effect of IC on ROA of the firms listed on the Egyptian Stock Exchange. This study's results show that there is a positive and significant effect for the IC variables of CEE, HCE, RCE on ROA. These variables explain 64.5% of the changes occurring on ROA and that 35.5% refer to other variables which are not covered by this study. Also, there is no statistically significant effect for (SCE) on the ROA. The researcher believes that the positive and significant effect for the CEE is due to the companies being able to manage and use resources in the form of well employed Capital. Consequently, the company can use CEE to improve its performance, while HCE is working to assess the strengths and weaknesses of the organization's resources. When it has been decided to choose an achievable strategy, HC is one of the strategic resources and important for business success. The results are broadly in line with (Nadeem et al., 2018; Ginesti et

al., 2018; Bayraktaroglu et al., 2019). The results are not in line with (Hamdan, 2018; Yudawisastra et al., 2018).

Sub-hypothesis (1/2) states that "IC has a significant effect on the ROE of the firms listed on the Egyptian Stock Exchange. As per the findings, there is a positive significant effect for the following IC variables of CEE, ROE_1 on ROE. These variables explain 30.9% of the changes occurring on ROE and that 69.1% refer to other variables which are not covered by this study. As per the findings, HCE, SCE, RCE have no statistically significant effect on the ROE. The researcher believes that the CEE's positive and significant effect is due to the companies being able to manage and use resources in the form of well employed Capital. Consequently, the company is able to use CEE to improve its performance. While the ROE_1 has a continuing impact on the future, it is determined that those responsible for managing the organization need to take account of ROE_1 when carrying out an evaluation of ROE. The results are broadly in line with (Nimtrakoon, 2015; Nadeem et al., 2018; Smriti and Das, 2018; Rashid et al., 2018; Yudawisastra et al., 2018).

Sub-hypothesis (1/3) states that "IC has a significant effect on the ATO of the firms listed on the Egyptian Stock Exchange. As per the findings, there is a positive and significant effect for the following IC variables CEE, ATO_1 on ATO. These variables explain 86% of the changes occurring on ATO and that 14% refer to other variables which are not covered by this study.

As per the findings, HCE, SCE and RCE have no statistically significant effect) on the ATO. The researcher believes that the CEE's positive and significant effect is due to the companies being able to manage and use resources in the form of well employed Capital. Consequently, the company is able to use CEE to improve its performance, While the ATO_1 has a continuing impact on the future, it is determined that those responsible for managing the organization need to take into account ATO_1 when carrying out an evaluation of ATO. The results are broadly in line with (Pal and Soriya, 2012; Nimtrakoon, 2015; Nadeem et al., 2017; Dzenopoljac et al., 2017; Chowdhury et al., 2018; Rashid et al., 2018; Smriti and Das, 2018).

Sub-hypothesis (1/4) states that " IC has a significant effect on NPM of the firms listed on the Egyptian Stock Exchange. As per the findings, there is a positive and significant effect for the following IC variables NPM_1, CEE, HCE on NPM. These variables explain 48.5% of the changes occurring on NPM and that 51.5% refer to other variables which are not covered by this study. As per the findings, SCE has no statistically significant effect on the NPM. The researcher believes that positive significant effect for the NPM_1 is due to it having a continuing impact on the future. It is determined that those responsible for managing the organization need to consider NPM_1 when carrying out an evaluation of NPM. While CEE is due to the companies being to manage and to use resources in the form of

well employed Capital so that the company can use CEE to improve its performance. While the HCE effect is due to the creation of new services and products through innovation, creativity, continuing education processes and a high level of performance due to the accumulated experience which is reflected by NPM. The results are broadly in line with (Jordão, 2017; Chowdhury et al., 2018).

Based on the previous results, it is evident that the first main hypothesis is accepted in all its branches (partially). This means the acceptance of the alternative hypothesis that IC has a moral impact on the FP of companies listed on the Egyptian stock market.

The second hypothesis states that "IC has a significant effect on the MB of the firms listed on the Egyptian Stock Exchange." As per the findings, there is a positive and significant effect for the following IC variables CEE, MB_1 on MB. These variables explain 26% of the changes occurring on MB and that 74% refer to other variables which are not covered by this study. As per the findings, HCE, SCE and RCE have no statistically significant effect) on the MB. The researcher believes that the CEE's positive and significant effect is due to the companies being able to manage and use resources in the form of well employed Capital employed so that the company is able to use CEE to improve its performance . While the MB_1 has a continuing impact on the

future, it is determined that those responsible for managing the organization need to take account of MB_1 when carrying out an evaluation of MV. The results are broadly in line with (Verbano and Crema, 2016; Jordão and Novas, 2017; Sardo and Serrasqueiro, 2017; Nadeem et al., 2018; Zulkifli et al., 2018; Rashid et al., 2018; YILMAZ & ACAR, 2018).

Recommendations

Regarding this research findings, the researchers make the following recommendations:

- 1- The importance of IC as the valuable and important inventory to enable firms to improve their FP and MV needs to be addressed as follows:
 - Promoting the administrative and material support of the employees to carry out their duties and motivate them.
 - Encouraging and rewarding employees for their creativity.
 - Holding training courses to raise the employees' abilities, skills and experience with the aim of improving FP.
 - The establishment and equipping of all the facilities and tangible resources to support the research and development process.
 - Ensuring that the firm's system encourages efforts to achieve the required innovation and continuous improvement.
 - Ensuring that employees with high competencies and abilities are attracted.

- 2- The researchers recommend, also, that the firms' decision-makers do the following:
- Adopt a clear strategy for developing IC and its components.
 - Intensify efforts and investments to increase reliance on IC as an important strategic asset.
 - Provide a sophisticated work environment that improves and develops IC by supporting patents; developing new ideas and products according to market needs; and constantly updating regulatory structures, systems and procedures that serve the firm's objectives.
 - Use this study's results as guideline for further building of longterm strategies.
- 3- The researchers recommend, also, that regulators do the following:
- Provide accounting information to all users about IC and its components and the costs spent on its development.
 - Present administrative expenses in more detail in the income statement; this is to rely on many methods of measuring IC in these details.
 - Oblige companies to measure and disclose their IC for their financial statements so that they express their true market values.

Having considered this study's results, the researchers make the following recommendations for future studies:

- a. The sample of the study was not large enough and was selected from 9 sectors of the Egyptian Stock Exchange. Due to the small sample size, the results cannot be generalized to all sectors and all companies. Therefore, it is recommended that further research be conducted on IC at the sector level along with a comparative study of other markets.
- b. Other Scales (e.g., Tobin Q ratio, balanced scorecard) be used to measure FP and MV
- c. A future study should have a larger sample of companies and be conducted over a longer period.
- d. Future studies should be conducted on the relationship analysis between IC, innovative ideas and reputation along with an analysis of the relationship between corporate governance variables and IC.

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