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Article

The Relationship between Changes in Corporate Governance Characteristics and Intellectual Capital

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Abstract: The primary goal of this study was to investigate the effects of changes in corporate governance elements on a company's valuable resources (such as intellectual capital and its components). Previous studies have examined the impacts of some corporate governance characteristics on intellectual capital performance as a whole and they have produced inconclusive and different results. This paper examines the effects of some corporate governance characteristics (i.e., the change in CEO, the evolution of auditor, the change in board independence, and the change in institutional ownership) on intellectual capital and its components (i.e., capital employed, human capital, and structural capital). This research is based on a quantitative study and the selected sample contains 1170 observations from 220 companies listed on the Middle East Stock Exchange from 2011 to 2018. The research findings show a positive and significant relationship between an increase in institutional ownership and intellectual capital and its two components (human capital and structural capital). The results support the relationship between a change in auditor and intellectual capital and human capital efficiency. Further, a positive and significant association was found between an increase in board independence and human capital. However, no relationship was found between a change of CEO and intellectual capital or any of its components. This study extends the research field of corporate governance by studying the effects of *changes* in corporate governance characteristics on intellectual capital for the first time. Given the significant role of intellectual capital in the performance of firms, this study provides essential information to organisations' decision makers.

Keywords: changes of CEO; changes of auditor; institutional investors; board independence; intellectual capital



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1. Introduction

This paper expands upon previous work on the impact of corporate governance characteristics on intellectual capital performance by Kamath (2019). Kamath (2019) examined the effect of some corporate governance (C.G.) characteristics (i.e., the board size, independence of directors, frequency of board meetings, remuneration of directors, and composition of the board) on intellectual capital performance (as a whole). Kamath's (2019) findings suggest that size, as one of the characteristics of C.G., significantly influences intellectual capital performance. This paper examines the impact of changes in corporate governance characteristics (i.e., the change in CEO, the change of auditor, the increase in the board independence, and the increase in institutional ownership) on intellectual capital and its components (i.e., capital employed, human capital, and structural capital). Due to the emergence of the knowledge-based economy and changes in the nature of corporate activity at the global level, intellectual capital has become one of the basic foundations for the success of companies in gaining competitive advantage. Since knowledge is considered the driving force of development in companies, successful companies are constantly updating themselves and creating innovation by relying on the understanding of individuals.

Resultantly, the value of such companies could be higher than their book value. The basis for such a difference is mainly intellectual capital, an intangible asset probably not reflected in financial statements (Petty and Guthrie 2000).

In today's competitive business environment, a significant part of the companies' value can be attributed to their intangible assets. Identifying and estimating the resources that create value for companies is critical to their sustainability and growth (Sitar and Vasić 2005).

In various definitions of "intellectual capital" offered by some researchers, it is emphasised that the concept of intellectual capital is related to value creation. For example, Edvinsson and Malone (1997) defined intellectual capital as information and knowledge used in work to create value. Bontis (1998) also defined intellectual capital as intangible assets (internal resources, capabilities, and competitive advantages) that are the firm's valuable resources obtained by creating value.

Okpala and Chidi (2010) emphasised the importance of intellectual capital disclosure and suggested that accurate and appropriate voluntary reporting is impossible without proper corporate governance mechanisms. Tayib and Salman (2011) also argue that if a firm discloses its intellectual resources, it can gain a competitive advantage and maintain the trust of investors and creditors. Corporate governance mechanisms are often used by companies to reduce irregularities and asymmetries in disclosed information (Ebrahim et al. 2014). Corporate governance is a common issue around the voluntary disclosure of information that plays an essential role in increasing the company's value and attracting investors (Oba et al. 2013).

The concept of corporate governance refers to the control procedures used in the company to ensure the alignment of management activities and interests with the interests of shareholders, which are applied in the form of a set of mechanisms designed to reduce agency problems and information asymmetry between shareholders and directors (Butt 2020; Al Okaily et al. 2019; Al-Jaifi et al. 2017). Corporate governance has become more attractive for many researchers since it can increase the investors' trust and enhance and develop the economic health of companies (Tamer Mohamed and Ahmed Mohamed 2020; Cotei et al. 2022; Leardi 2022; Mun 2022).

Most of the studies done in developed and developing countries (Oba et al. 2013; Li et al. 2008) have focused on the function and characteristics of corporate governance in companies, and fewer have paid attention to changes in these characteristics. Therefore, this study focuses on the relationship between changes in corporate governance characteristics and intellectual capital and its components. The findings of this study can help boards of directors to understand the importance of the relationship between intellectual capital and the changes in corporate governance, which, ultimately, will lead them to make appropriate economic decisions.

Hidalgo et al. (2011) examined the influence of corporate governance and intellectual capital disclosure and found a strong relationship. In this study, we investigate the relationship between changes in corporate governance characteristics (i.e., the change of CEO, the change of auditor, the increase of board independence, and the increase of institutional ownership) and intellectual capital and its components (i.e., human capital, structural capital, and capital employed) in companies listed on the stock exchange market.

One of the reasons for paying more attention to corporate governance is the growing role of private sector companies in the world economy. Moreover, the research conducted during the past few decades has shown that companies are the engines of economic growth and development and are essential for financial stability; thus, good corporate governance has become a priority for almost all countries (Temirbayev and Abakanov 2019). Studies show that since corporate governance is related to firms' socio-political power, changes in companies' corporate governance characteristics affect this power. Thus, a change in the current corporate governance characteristics or the adoption of a new mechanism as an alternative to existing features occurs only when there are changes in the company's senior management team or other board members (Zajac and Westphal 1996).

Changes in corporate governance patterns and practices are aligned with pattern convergence. For example, in Japan, the corporate governance model is bank oriented (Aoki and Patrick 1995), which gradually evolves into a market-oriented system (the U.S. corporate governance model) due to the convergence of corporate governance patterns (Aoki and Patrick 1995). Changes in corporate governance patterns and characteristics make firms replace structures, and strengthen and improve their performance (Shiller et al. 1984). In the case of the present study, understanding the relationship between changes in corporate governance characteristics and intellectual capital and its components requires extensive research. Furthermore, the relationship between these factors and the components of intellectual capital (i.e., capital employed, human capital, and structural capital) has not been investigated enough. This study contributes to the literature on corporate governance characteristics by providing empirical evidence to support the relationship between corporate governance and intellectual capital and increasing the awareness of accountants, managers, investors, etc.

This paper is structured as follows: Section 2 presents the literature and develops the theoretical framework and hypotheses. Section 3 describes the research method, and Section 4 presents the findings. Section 5 focuses on the discussion and conclusion and provides recommendations for future studies.

2. Theoretical Framework and Hypotheses Development

Previous studies have examined the impact of some corporate governance characteristics on intellectual capital performance as a whole, however, they have produced inconclusive and differing results (Kamath 2019; Li et al. 2008; Taliyang and Jusop 2011; Bendig et al. 2018). This paper examines the impact of changes in corporate governance characteristics (such as the change in CEO, the change of auditor, the change in the board independence, and the change in institutional ownership) on intellectual capital and its components separately.

Today, the separation of ownership and control has been raised by the expansion of firms and the growth of their business activities. According to agency theory, every two groups, i.e., ownership and control, seek to maximise their interests, which could lead to conflict (Fama and Jensen 1983). A conflict of interest between ownership and control causes agency problems such as information asymmetry. Corporate governance is usually designed to reduce agency problems between shareholders and managers (Armstrong et al. 2010).

Tricker and Tricker and Tricker (2015) define corporate governance as a system that manages and controls firms. Using appropriate corporate governance mechanisms can reduce the likelihood that managers seek to maximise their interests with information asymmetry and limited information disclosure. Thus, these mechanisms can make managers disclose more information, such as revealing information related to intellectual capital (Oba et al. 2013). The more voluntary information is disclosed, the fewer investors' ambiguities exist, which leads to improved decision making (Oba et al. 2013).

The disclosure of intellectual capital information is essential for investors to make better decisions (Li et al. 2008). In the agency field, Jensen and Meckling (1976) showed that the more information about intellectual capital is disclosed, the fewer uncertainties investors will face, indirectly reducing capital costs. According to Clarke (1994), corporate governance sets the rules for the relationship between management and employees and value creation and sharing activities and provides guidelines for the proper allocation and organisation of resources management. Despite the different types of organisational resources, whether financial or capital resources, it can be said that intellectual resources are the product of thought in any organisation. This resource is considered a strategic asset and an essential component for organisations, leading to their growth and development. So, effective management is a crucial driver for organisations to be successful.

Since the beginning of the industrial revolution, physical and financial capital have been introduced as symbols of power. However, given the development of companies and significant technological advances, economic and physical capital have lost their importance

in maintaining and promoting the status of companies. In other words, the economy has changed its nature from a financial and physical capital-based economy to a knowledge-based economy. In a knowledge-based economy, one of the most important ways to achieve sustainable competitive advantage and proper organisational performance is to focus on intellectual capital. Intellectual capital can create a competitive advantage in the market and better financial performance for companies through controlling and managing intellectual capital, organisational techniques, professional skills, customer relationships, and experiences (Wang 2008). Hence, the emergence of a knowledge-based economy has increased the importance of intellectual capital as an intangible resource and asset (Heine Thorsgaard et al. 1999). Intellectual capital can be the most powerful asset of a firm to promote its value and competitive advantage. Improving a firm's performance depends on optimal organisational resources to increase shareholder wealth. The economic age has passed from an industrial economy to a knowledge-based economy. A knowledge-based economy is the type of economy in which the production and utilisation of knowledge play a central role in wealth creation. The massive investment in human capital and information and communication technology (ICT) is a distinctive feature of the knowledge-based economy.

Some factors have changed the rules of business and competition, including the entrance of knowledge into the area of products and services, the emphasis on quality rather than quantity, consideration of a different position for the workforce as thoughtful workers rather than physical ones, restructuring expenditures, and reducing the importance of production costs compared with other expenses (Pulic 2000). Intellectual capital plays a vital role in creating and sustaining the growth of organisations. This issue is addressed in the framework of the "Resource-based View" (RBV), which argues that intellectual capital is the source of value creation and competitive advantage for the company (Barney 1991). Based on RBV, creating a sustainable competitive advantage is closely related to the company's ability to provide valuable, scarce, and irreplaceable human capital assets and use them effectively (Barney 1991). Grant (1996) also argues that intellectual capital cannot create a competitive advantage by itself and, in the absence of proper structuring in the organisation, which shows the connection between intellectual capital (I.C.) and corporate governance (C.G.). In fact, according to Keenan and Aggestam (2001), corporate governance is responsible for creating, developing, and establishing the intellectual capital that dominates an organisation's people, structures, and processes.

Meanwhile, managers may decide to change the governance pattern of their companies. Changes in corporate governance patterns or different parts of this pattern could show a company's deep procedures and control methods (Fligstein 2018). Given the globalisation of financial markets and the discussion over convergence among different patterns, some issues such as national corporate governance, trends, and content, and the effects of such changes are considered essential topics in corporate governance literature (Jonnergård et al. 2004). As mentioned before, intellectual capital and an appropriate corporate governance system can create a competitive advantage. With its various mechanisms, corporate governance is responsible for developing and using intellectual capital in the organisation. Thus, a change in the corporate governance pattern or its characteristics is expected to affect intellectual capital and its components. Accordingly, in this study, we aimed to investigate the relationship between changes in four indicators of corporate governance, namely change in CEO, change in auditor, increase in board independence, and increase in institutional ownership and intellectual capital as well as its components (i.e., capital employed efficiency, human capital efficiency, and structural capital efficiency).

2.1. Intellectual Capital

The concept of intellectual capital has been proposed since the 1990s with the advent of information and communication technology (ICT). In simple concept, intellectual capital means knowledge, organisational technology, professional skills, and customer relations (customer orientation) that create a competitive advantage in the capital market for the company (Oba et al. 2013). This concept was first proposed by Kenneth Galbraith (1969),

who believed that intellectual capital is something beyond thought and knowledge and is related to intelligent function (Bontis 1998). Riahi-Belkaoui (2003) showed that intellectual capital has a positive and significant relationship with the financial performance of companies. Chen et al. (2005) also found that intellectual capital has a positive and significant effect on the value and profitability of companies.

A literature review on intellectual capital shows that in most models, the three components, i.e., capital employed, human capital, and structural capital, are the fundamental factors of intellectual capital. The concepts of the component are detailed below.

2.1.1. Capital Employed

Some experts in this field have defined capital employed (customer) as the capability to build high-quality relationships with stakeholders, customers, suppliers, investors, government and society in general (Komnenic and Pokrajčić 2012). The capital employed entails the present value of the organisation and the potential future value of the organisational relationships. It includes items such as trademarks, market share, customer information, and customer relations. In other words, the remaining part of the intellectual capital is the communication capital relevant to individual and organisational levels that is not limited to specific communications and includes relationships with customers, suppliers, shareholders, and other people related to the organisation. Capital employed can also be defined as the knowledge used in the organisation's marketing channels and customer relations while doing business. There is an apparent relationship between human capital, structural capital, and capital employed in all definitions. Many studies of intellectual capital have also taken this classification into account. The relationship between these components shows that they are all based on intellectual capital. Studies show that human capital, structural capital, and capital employed positively affect company performance (Nadeem et al. 2017).

2.1.2. Human Capital

There is a notion that human capital is the first and essential component of intellectual capital. Although different classifications of intellectual capital have been proposed, all of them focus on human capital as the central component (Bontis 1998). Human capital includes the employees' competence, skills, experience, and intellectual capability. Researchers such as Seleim et al. (2007) and Campbell et al. (2012) believe that human capital is one of the strategic resources of the organisation that is necessary to achieve a competitive advantage for the organisation in today's changing and unstable business environment. Human capital includes the employees' explicit and implicit knowledge, competencies, and capabilities in the form of a structure of knowledge and skills required to perform specific activities (Komnenic and Pokrajčić 2012). Wang et al. (2014) define human capital as competence, knowledge, skills, innovation, attitude, commitment, wisdom, and experience.

2.1.3. Structural Capital

Structural capital includes processes, systems, intellectual property, and other intangible assets at a company's disposal, however, it has not been shown on its balance sheet. Structural capital is related to the mechanism and structure of the firm and helps employees in optimal intellectual performance, which in turn enables the organisation to improve its performance. Structural capital can include anything in an organisation that supports the implementation of employees (as the human capital of that organisation). This type of capital, with its support, enables human capital to perform its duties. Structural capital belongs to the organisation and remains even when employees leave. Structural capital includes databases, organisational charts, strategies, process guidelines, and anything more valuable for the company. Moreover, structural or organisational capital is the development of human capital in the form of specified knowledge, innovation, organisational structure and culture, business processes, and the financial and physical structure of the company (Komnenic and Pokrajčić 2012).

Following Pulic (1998) and Firer and Williams (2003), we measured intellectual capital in this study based on three factors: capital employed, human capital, and structural capital.

2.2. The Change in Corporate Governance Characteristics and Intellectual Capital

According to Tricker and Tricker and Tricker (2015), corporate governance can be defined as a system by which companies are managed and controlled. It can be considered a critical factor in attracting intellectual capital (Pulic 2000). Edvinsson and Malone (1997) said that intellectual capital is knowledge that can be turned into value. Corporate governance increases the quality of intellectual capital information disclosure and is also considered a factor in attracting and keeping intellectual capital (Abor and Biekpe 2007; Sakakibara et al. 2010). Hence, the concept of intellectual capital and its types are discussed as follows.

2.2.1. The Relationship between the Change in CEO and Intellectual Capital

The capital market is sensitive to a company's management. A change in leadership may indicate that the directors are not successful in doing their duties well and increasing shareholders' wealth. The change process in control can be considered a strategy by owners to harmonise the company with environmental changes. Researchers such as Dechow and Sloan (1991) and Kalyta (2009) show that CEOs, in the last year of their performance, try to maximise their earnings to increase their salaries and bonuses. On the other hand, the CEO's maximisation of the revenues increases the audit risk, the scope and volume of audit operations, and ultimately the audit fees. Bradbury et al. (2007) also believe that if the CEO also plays the role of board chair, there will be a lack of independence that may disrupt the company's monitoring system. Helwege et al. (2012) also argue that CEOs are either fired or forced to resign when a firm's performance level is lower than its board of directors expected. Crossland and Chen (2013) found a direct relationship between a firm's poor performance and CEO changes. Then, a change in CEO, as a shock, may lead to some changes in a firm's operations. In this case, Tang et al. (2020) assumed that a CEO change might affect the relationship between sticky cost and crash risk. They designed a test and used a CEO change as an external shock. They showed a negative association between crash risk and sticky cost in firms with a younger CEO and a high level of product market competition.

The literature suggests that national corporate governance patterns are typically determined by the customs and culture of each country (Aguilera and Jackson 2003). Thus, the role and various characteristics of corporate governance are institutionalised at the national level. However, some studies show that corporate governance patterns are changing to converge with each other (Oxelheim and Randøy 2003). The variations in these patterns, and their convergence, can cause fundamental changes, such as changes in the underlying ideas of the patterns (Aguilera and Jackson 2003). These changes can occur in various parts, such as the board of directors and the ownership structure of companies (Jonnergård et al. 2004). Corporate governance characteristics can affect the relationship between corporate governance systems and various organisational factors (intellectual capital).

Studies that have examined the relationship between corporate governance and intellectual capital show that good corporate governance improves the quality of disclosed financial information related to intellectual capital. In contrast, the lack of proper corporate governance creates an inability to attract and keep such capital (Abor and Biekpe 2007; Li et al. 2008; Abidin et al. 2009; Appuhami and Bhuyan 2015). Many studies have examined the relationship between corporate governance mechanisms and intellectual capital. However, the findings are inconclusive. For example, Li et al. (2008) and Taliyang and Jusop (2011) show that CEO/chair duality is not significantly related to the disclosure of information on intellectual capital, while Bendig et al. (2018) argue that the characteristics of the CEO affect all three components of intellectual capital, means capital employed, human capital, and structural capital. They report a positive and significant relationship between the characteristics of the CEO and three components of intellectual capital.

As corporate governance systems change toward converging different patterns, the CEO mechanism may also vary. Regarding CEO change, researchers like Ishak et al. (2012)

concluded that companies with poor performance and older CEOs are more likely to change their CEO. In contrast, they are less likely to change CEO when there is a CEO/chair duality. The CEO change can significantly affect the relationship between the CEO and the intellectual capital. Given the above, we examine the relationship between CEO change and intellectual capital's components. We propose our first hypothesis as follows:

H1. *There is a significant relationship between a change in CEO and intellectual capital change.*

2.2.2. The Relationship between the Change of Auditor and Intellectual Capital

It is essential to understand the conditions of the audit services market and the competition in the audit profession. A change of auditor can prevent the preparation of desirable auditor's reports based on specific results desired by the client and the use of unique accounting methods by the accounting system (Cameran et al. 2008). According to the studies that have been done in this field, the main reasons for the change of auditor include audit opinion, audit fees, audit quality, the change of management, earnings manipulation opportunities, the company's growth, financial leverage, and revising financial statements and financial conditions of the firm. Given the costs and benefits of audits, clients are looking for institutions that charge lower fees to improve their performance. However, if auditors reduce their performance in the audit process due to lower fees, this will damage their performance in the long run. Firth et al. (2012) examined the effect of different types of auditor change (mandatory vs. voluntary and auditor change at the level of audit partner vs. audit firm) on audit quality. Their findings show that firms required to change their audit partner mandatorily present audit reports with higher quality versus firms with no change of audit partner. However, there was no significant relationship between the change of auditor, including the audit firm's mandatory change and the voluntary change of the audit partner with the audit quality.

Cameran et al. (2015) examined auditor change and the costs and benefits of such a change. They report that auditor change could improve audit quality and cost savings. Lin and Liu (2010) argue that firms with weak governance foundations and mechanisms are likelier to seek small audit firms. Safieddine et al. (2009) discuss that managers would not attract intellectual capital without proper corporate governance. Thus, a weak corporate governance system may lead to an auditor change for cost saving rather than improved audit quality. Given the above, we want to examine whether a relationship exists between auditor change and intellectual capital. So, we propose our second hypothesis as follows:

H2. *There is a significant relationship between auditor change and intellectual capital.*

2.2.3. The Relationship between the Change (Increase) in Board Independence and Intellectual Capital

Although managers may use the owners' wealth to maximise their benefits, the presence of nonexecutive directors will improve the monitoring process of management performance and reduce agency costs (Fama and Jensen 1983). The board of directors is at the head of the monitoring and controlling system and plays an essential role in controlling agency costs. To have effective monitoring, the board may need to employ some external members expected to act independently (Cornett et al. 2008). Yeo et al. (2002) argue that the presence of external directors in the board composition leads to more careful monitoring, which reduces the possibility of managing accruals or earnings manipulation. Matolcsy et al. (2004) believe that the board's nonexecutive directors (external members) may lead to more robust monitoring, more expertise, and the creation of new business communications. These benefits can lead to the company's development, reduce agency costs, maximise the company's value, and increase the quality of financial reporting. Accordingly, Jonnergård et al. (2004) examined the effect of board changes and found that these changes would significantly affect board decision measures and their actions.

Many studies have examined the relationship between board independence and intellectual capital. However, the findings are inconsistent and inconclusive. For example, Abidin et al. (2009) found a significant relationship between the percentage of nonexecutive

board members and intellectual capital. Nevertheless, [Oba et al. \(2013\)](#) reported no association between board independence, audit committee independence, and intellectual capital disclosure quality. At the same time, the board size had a positive and significant effect on the quality of intellectual capital disclosure. [Nkundabanyanga \(2016\)](#) suggested that board governance and intellectual capital play a substantial role in a firm's performance and have positive and significant correlations. The interaction between them has a considerable effect on improving the performance of service companies. [Cheng and Courtenay \(2006\)](#) report a positive and meaningful relationship between a board with a high percentage of nonexecutive members and voluntary information disclosure. Given the above, we want to examine whether there is a relationship between the change in board independence and intellectual capital. So, we propose our second hypothesis as follows:

H3. *There is a significant relationship between the change (increase) of board independence and intellectual capital.*

2.2.4. The Relationship between the Change (Increase) in Institutional Ownership and Intellectual Capital

Institutional investors are large investors such as banks, insurance companies, investment firms, and retirement institutions ([Bushee 2001](#)). [Al-Najjar and Taylor \(2008\)](#) argue that institutional investors are the main factors in the financial markets. Since privatisation and the influence of institutional investors are increasingly growing in most countries, it can be concluded that this type of investor has significant importance in many corporate governance systems and mechanisms. It is commonly thought that institutional investors' presence and monitoring activities may change corporate behaviour and performance ([Velury and Jenkins 2006](#)). [Tsai and Gu \(2007\)](#) found that institutional investors may help other investors reduce agency problems arising from the separation of ownership and control.

Moreover, in their study, [Bhattacharya and Graham \(2009\)](#) examined the relationship between institutional ownership and firm performance. They divided institutional owners into two distinct categories: insurance companies, banks, nonbank financial institutions, and pension funds, mutual funds, and endowment institutions. Their findings show that the equal distribution of voting rights among institutional owners positively affects firm performance. [Elyasiani and Jia \(2010\)](#) investigated the relationship between institutional ownership and firm performance using structural equation modelling. They showed a positive relationship between institutional ownership and firm performance. They argue that institutional investors play a more effective monitoring role, which improves firm performance. [Pirzada et al. \(2015\)](#) used traditional criteria to measure firm performance and concluded that there was a significant relationship between institutional shareholders and firm performance.

[Velury and Jenkins \(2006\)](#) suggested that institutional ownership is considered one of the essential characteristics of corporate governance and argue that institutional ownership (given its monitoring roles) could lead to changes in corporate behaviour and decisions that affect the value-creating activities of the firms. Therefore, institutional ownership is expected to be associated with intellectual capital ([Salicru et al. 2007](#)). Some researchers have examined the relationship between institutional ownership and intellectual capital. For example, [Abor and Biekpe \(2007\)](#) argue that institutional shareholders can encourage a company to engage in value-creating activities with long-term competitive benefits. So, these activities could improve the performance of intellectual capital.

[Aggarwal et al. \(2011\)](#) suggest that corporate governance is associated with institutional investors, and institutional investors can change corporate governance mechanisms. Given the relationship between institutional ownership and intellectual capital, it is expected that changes in institutional ownership (an increase in the percentage of institutional ownership) have a significant relationship with intellectual capital. For this purpose, the fourth research hypothesis is proposed as follows:

H4. *There is a significant relationship between the change (increase) of institutional ownership percentage and intellectual capital.*

Given the above, we will examine the above four relationships based on intellectual capital. Hence, the above four hypotheses will be retested separately for the components of intellectual capital, namely the efficiency of capital employed, the efficiency of human capital, and the efficiency of structural capital. Thus, four statistical models will be used for the research hypotheses in this paper. Accordingly, there will be 16 hypotheses.

3. Methodology

We used archived data for this study. The statistical population of the present study includes all companies listed on the Middle East Stock Exchange market from 2011 to 2018. The population consists of all the companies listed on the Tehran Stock Exchange (TSE) from 2011 to 2020. Data are primarily based on the TSE’s audited financial statements and board reports, a reliable source of information (Nassirzadeh et al. 2022; Shandiz et al. 2022; and Daryaei et al. 2022). The selected firms needed to meet the following three conditions to be included in the current study:

- (1) They should not have changed their fiscal year during the studied period;
- (2) Their financial information should be available;
- (3) They should not be considered investment companies, leasing, credit and financial institutions, or banks.

Ultimately 220 companies (out of 331 listed firms) met the above conditions and were selected (containing 1170 observations from 2011 to 2018).

3.1. Research Variables

3.1.1. Intellectual Capital and Its Components

The primary dependent variable in this study is the efficiency of intellectual capital, which is calculated via the value-added intellectual coefficient (VAIC). The VAIC was proposed by Pulic (2000) as a measure of the intellectual capital efficiency related to the knowledge-based economy. According to Pulic’s model, VAIC is related to the efficiency of three types of capital in a company: capital employed efficiency (CEE), which is equal to the financial and physical capital in the company; human capital efficiency (HCE), which is measured and calculated using the cost of the company’s employees; and the structural capital efficiency (SCE), which is computed based on the difference between the value added created by the company and the value added created by human capital. According to Pulic (2000), the increase in VAIC indicates an improvement in the efficiency of the company’s resources in general and the knowledge of employees in particular, suggesting the company’s ability to create new economic value. Since Pulic’s model has simple calculations and there is a constant basis for measuring it, stakeholders can use it in their evaluations. Therefore, it is possible to compare the different industries with each other based on this model. Pulic’s model (Pulic 2000) is as follows:

$$VAIC = ICE + CEE \tag{1}$$

$$ICE = HCE + SCE \tag{2}$$

In these Formulas (1) and (2), VAIC is the value added of intellectual capital; ICE is the intellectual capital efficiency; CEE is the capital employed efficiency; HCE is the human capital efficiency; and SCE is the structural capital efficiency. All these variables are calculated as follows:

$$HCE = \frac{VA}{H.C.} \tag{3}$$

$$SCE = \frac{SC}{VA} \tag{4}$$

$$CEE = \frac{VA}{C.E.} \tag{5}$$

VA is a value-added, HC is human capital, SC is structural capital, CE is capital employed, OP is operating earnings, EC is employee costs, D is depreciation, and A is amortisation.

3.1.2. Changes in Corporate Governance Characteristics

Corporate governance characteristics include the change in CEO (CEOCH_{i,t}), the change in auditor (AUDCH_{i,t}), the change (increase) in board independence (INDCH_{i,t}), and the change (growth) of institutional ownership (OWNCH_{i,t}).

3.1.3. Control Variables

The control variables used in the research models are the firm size, the return on assets, the ratio of market value to book value, and the financial leverage, which are explained as follows:

SIZE_{i,t}: The logarithm of the sales;

ROA_{i,t}: The ratio of earnings before tax to the sum of assets;

MTB_{i,t}: The ratio of market value to book value;

LEV_{i,t}: The ratio of total liabilities to the sum of assets.

We have selected the above specified control variables as they have been suggested and used in the literature information (Nassirzadeh et al. 2022; Shandiz et al. 2022; and Daryaei et al. 2022).

3.2. The Definitions of Model Variables

CEOCH_{i,t} (change in CEO): If the CEO has changed compared with the previous year, it equals one. Otherwise, it equals zero.

AUDCH_{i,t} (change in auditor): If the independent auditor has changed during the research period, it equals one; it equals zero.

INDCH_{i,t} (change in board independence): To measure this variable, the ratio of the number of nonexecutive directors to the total number of board members has been used. So, if the board of directors' independence has improved or increased, then a one; otherwise a zero.

OWNCH_{i,t} (change in the percentage of institutional ownership): The percentage of institutional shareholders includes institutional ownership such as banks, insurance companies, holding companies, investment institutions, pension funds, etc. The percentage of institutional ownership is computed by dividing the number of shares held by institutional shareholders by the total share of that company. So, the change in the ownership percentage of institutional shareholders is compared with the previous year. So, if the change in the ownership percentage of institutional shareholders has improved or increased, then a one; otherwise a zero.

3.3. Adopted Models

The main goal of this study is to investigate the effects of changes in corporate governance elements on the company's valuable resources (such as intellectual capital and its components). So, we used Model 1 to test the relationship between changes in corporate governance characteristics and intellectual capital.

Models 2 to 4 are used to test the effects of changes in corporate governance characteristics on the components of intellectual capital Kamath (2019):

Model 1:

$$VAIC_{i,t} = \beta_0 + \beta_1 CEOCH_{i,t} + \beta_2 AUDCH_{i,t} + \beta_3 INDCH_{i,t} + \beta_4 OWNCH_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 MTB_{i,t} + \beta_8 LEV_{i,t} + e_{i,t}$$

Model 1 tests the relationship between changes in corporate governance characteristics and intellectual capital.

Model 2:

$$CEE_{i,t} = \beta_0 + \beta_1 CEOCH_{i,t} + \beta_2 AUDCH_{i,t} + \beta_3 INDCH_{i,t} + \beta_4 OWNCH_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 MTB_{i,t} + \beta_8 LEV_{i,t} + e_{i,t}$$

Model 3:

$$HCE_{i,t} = \beta_0 + \beta_1 CEOCH_{i,t} + \beta_2 AUDCH_{i,t} + \beta_3 INDCH_{i,t} + \beta_4 OWNCH_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 MTB_{i,t} + \beta_8 LEV_{i,t} + e_{i,t}$$

Model 4:

$$SCE_{i,t} = \beta_0 + \beta_1 CEOCH_{i,t} + \beta_2 AUDCH_{i,t} + \beta_3 INDCH_{i,t} + \beta_4 OWNCH_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 MTB_{i,t} + \beta_8 LEV_{i,t} + e_{i,t}$$

Models 2 to 4 are used to test the relationship between the changes in corporate governance characteristics and the components of intellectual capital.

4. Research Findings

We used multiple regressions to test the research hypotheses and analyse the results. First, we examined the classical assumptions of the regression model. Because the research models have intercepted, the error terms have a population mean of zero. Also, the error term is normally distributed because the number of observations is more than 30. To remove the variance heteroscedasticity, the robust white test is used. According to the research model estimation results, the variance inflation factor (VIF) values are less than 10, which shows that no independent variable is a perfect linear function of other explanatory variables.

4.1. Descriptive Statistics Results

Descriptive statistics are presented in Table 1. The distribution of the observations related to the research variables throughout the statistical sample is described by central tendency (mean and median). The mean is the main prominent tendency indicator that indicates the average total data for each variable among the sample observations. The mean value of intellectual capital as a dependent variable is 15.156, with the highest standard deviation of 27.211, while the capital employed efficiency has the lowest standard deviation among observations (1.125). The mean value of the change in CEO was 0.522.

Similarly, the mean value of the change of auditor variable was 0.417, indicating that this change occurred in about 42% of the companies in the sample. Also, the mean value of the change in board independence was 0.352, and the change in institutional ownership was 0.398. Among the control variables, the market-to-book (MTB) value has the highest standard deviation (4.511) among the observations.

Table 1. Descriptive statistics of the research variables.

Intellectual Capital Variables						
Variables	Index	Mean	Median	Min	Max	Std. Dev
Value-Added Intellectual Capital	VAIC	15.156	7.214	−3.512	195.324	27.211
Capital Employed Efficiency	CEE	0.323	0.285	−0.112	4.745	1.125
Human Capital Efficiency	HCE	14.628	6.135	−2.158	190.678	25.215
Structural Capital Efficiency	SCE	0.815	0.892	−0.217	4.789	3.128
Corporate Governance Variables						
Variables	Index	Mean	Number of the Value "1"	Number of the Value "0"		
The Change in CEO	CEOCH	0.522	387 *	783 *		
The Change of Auditor	AUDCH	0.417	381 *	789 *		
Change in board independence	INDCH	0.352	175 **	995 **		
The Change in the institutional ownership	OWNCH	0.398	295 **	875 **		

Table 1. Cont.

Variables	Controlling Variables					
	Index	Mean	Median	Min	Max	Std. Dev
Firm Size	Size	14.523	14.489	11.544	21.327	2.135
Return on Assets	ROA	0.534	0.357	−0.112	2.95	1.945
Market to Book	MTB	3.623	2.977	−10.18	118.155	4.511
Leverage	LEV	1.549	0.929	0.651	3.258	0.653

* If there is a change compared to the previous year, 1, otherwise 0; ** If there is an increase compared with last year, 1, otherwise 0.

4.2. The Results of Testing Hypotheses

4.2.1. The Relationships between the Change in Corporate Governance Characteristics and Intellectual Capital

For the four main hypotheses, we examined the relationships between the change in corporate governance characteristics (the change in CEO, the change of auditor, the change in board independence and the change in institutional ownership) and intellectual capital. We used Model 1 to test the mentioned relationships. The results are presented in Table 2.

Table 2. The results of the four main hypotheses.

Variables	Index	Constants	Std. Dev	T. Statistic	Sig.	VIF
Intercept	β	−24.116	4.192	−5.718	0.002	
The Change in CEO	CEOCH	−0.355	0.215	−1.623	0.098	1.12
The Change of Auditor	AUDCH	0.735	0.268	3.581	0.001	1.161
Change in Board Independence	INDCH	0.402	0.271	1.482	0.144	1.036
The Change in the Institutional Ownership	OWNCH	0.568	0.259	2.095	0.043	1.063
Firm Size	Size	2.162	0.325	6.74	0.001	1.125
Return on Assets	ROA	32.891	1.852	17.781	0.002	1.693
Market to Book	MTB	−0.085	0.043	−1.661	0.097	1.081
Leverage	LEV	3.216	0.761	4.18	0.001	1.526
Industry Effects				Controlled		
Year Effects				Controlled		
F-Statistic	F-Statistic	R-Square	Adj. R-Square	Number of Observations		
82.689	Sig. <0.001	0.964	0.952	957		

Before testing the hypotheses, we examined the model’s accuracy and used the F-statistic test to evaluate the significance of the model.

As shown in Table 2, the significance level of the F-statistic is 0.001, indicating that Model 1 is significant in testing the four hypotheses. The adjusted R² coefficient shows that about 95% of the dependent variable (intellectual capital) changes are explained by the model’s independent variables.

Testing the first hypothesis, the findings show no significant relationship (with a significance level of 0.098) between the change in CEO (as a corporate governance characteristic) and intellectual capital. Therefore, the study’s first hypothesis is not supported by the results. However, the findings support the second hypothesis and suggest a significant relationship between the change of the auditor/s of the firms and intellectual capital. The significance level reported for this relationship in Table 2 is 0.001. The findings provide no support for the third hypothesis. The reported significance level (0.144) indicates no meaningful relationship between the change (increase) in board independence and intellectual capital. The fourth hypothesis tests the relationship between the change in institutional ownership and intellectual capital and reports that the relationship is significant (0.043). So, the fourth hypothesis is supported.

4.2.2. The Relationships between the Change in Corporate Governance Characteristics and the Components of Intellectual Capital

In the following sections, we examine the relationships between the change in corporate governance characteristics and the component of intellectual capital as follows: employed efficiency (Table 3), human capital efficiency (Table 4), and structural capital efficiency (Table 5).

Table 3 shows the results of testing the relationships between the change in corporate governance characteristics and the capital employed efficiency (CEE).

Table 3. The results of the second hypothesis model.

Variables	Index	Constants	Std. Dev	T. Statistic	Sig.	VIF
Intercept	β	-0.049	0.073	-0.619	0.548	
The Change in CEO	CEOCH	0.002	0.004	-0.139	0.896	1.112
The Change of Auditor	AUDCH	-0.004	0.003	-0.987	0.329	1.139
Change in Board Independence	INDCH	0.002	0.004	0.168	0.873	1.036
The Change in the Institutional Ownership	OWNCH	0.007	0.005	1.712	0.09	1.059
Firm Size	Size	0.008	0.005	1.539	0.128	1.461
Return on Assets	ROA	0.751	0.038	20.963	0.002	2.227
Market to Book	MTB	0.003	0.001	4.818	0.001	1.02
Leverage	LEV	0.073	0.018	4.41	0.002	1.667
Industry Effects				Controlled		
Year Effects				Controlled		
F-Statistic	F-Statistic	R-Square	Adj. R-Square	Number of Observations		
42.637	Sig. <0.001	0.916	0.895	1129		

The significance level of the F-statistic was 0.001, which indicates that the model used for this test is significant. The significance levels computed for the relationship between the change in CEO and capital employed (0.896), the change of auditor and capital employed (0.329), the change in the board independence and capital employed (0.873), and finally, the change in institutional ownership and capital employed (0.090) all indicate that there was no significant relationship between the mentioned variables and the capital employed. As a result, all four hypotheses about the relationship between the change in corporate governance characteristics and the capital employed are not supported.

Table 4 reports the results of testing the relationships between changes in governance characteristics and human capital efficiency (HCE) as a component of intellectual capital. The significance level of the F-statistic (0.001) indicates the significance of the model used to test these relationships.

Table 4. The results of the third hypothesis model.

Variables	Index	Constants	Std. Dev	T. Statistic	Sig.	VIF
Intercept	β	-22.981	4.069	-5.657	0.001	
The Change in CEO	CEOCH	-0.321	0.181	-1.798	0.076	1.089
The Change of Auditor	AUDCH	0.757	0.186	4.159	0.001	1.119
Change in Board Independence	INDCH	0.584	0.252	2.331	0.023	1.084
The Change in the Institutional Ownership	OWNCH	0.603	0.212	2.885	0.004	1.062
Firm Size	Size	1.925	0.298	6.459	0.002	1.149
Return on Assets	ROA	30.956	1.716	18.078	0.001	1.808
Market to Book	MTB	-0.032	0.031	-1.007	0.317	1.147
Leverage	LEV	2.95	0.738	4.005	0.001	1.619
Industry Effects				Controlled		
Year Effects				Controlled		

Table 4. Cont.

F-Statistic	F-Statistic Sig.	R-Square	Adj. R-Square	Number of Observations
100.839	<0.001	0.971	0.963	917

The findings show no significant (0.076) relationship between the change in CEO and human capital. However, the significant levels of relationship between the change of auditor and human capital (0.001), the change in the board independence and human capital (0.023), and the change in institutional ownership and human capital (0.004) show that the change of these three characteristics of corporate governance affects human capital. Therefore, the hypotheses of a significant relationship between the change of auditor, the change in board independence and the change in institutional ownership and human capital are supported.

The results of testing the relationship between the changes in corporate governance characteristics and structural capital efficiency (SCE) are presented in Table 5. The significance level of the F-statistic (0.001) indicates that Model 4 is appropriate for testing the mentioned relationships. However, the calculated levels of correlations between the change in CEO and structural capital (0.995), the change in auditor and structural capital (0.689), and the change in board independence and structural capital (0.578) are insignificant. So, the findings provide no support for a meaningful relationship between the changes in these three mentioned corporate governance characteristics and structural capital. Further, the significance level of the relationship between the change in institutional ownership and structural capital is 0.007, which indicates a meaningful relationship between the two variables.

Table 5. The results of the fourth hypothesis model.

Variables	Index	Constants	Std. Dev	T. Statistic	Sig.	VIF
Intercept	β	0.119	0.151	0.779	0.439	
The Change in CEO	CEOCH	0.002	0.005	0.008	0.995	1.095
The Change of Auditor	AUDCH	0.003	0.006	0.407	0.689	1.064
Change in Board Independence	INDCH	−0.004	0.007	−0.564	0.578	1.087
The Change in the Institutional Ownership	OWNCH	−0.018	0.005	−2.713	0.007	1.089
Firm Size	Size	0.047	0.017	4.097	0.002	1.39
Return on Assets	ROA	0.236	0.039	6.406	0.001	1.557
Market to Book	MTB	0.004	0.002	2.834	0.005	1.084
Leverage	LEV	0.069	0.019	3.877	0.001	1.356
Industry Effects				Controlled		
Year Effects				Controlled		
F-Statistic	F-Statistic Sig.	R-Square	Adj. R-Square	Number of Observations		
36.637	<0.001	0.918	0.896	914		

5. Discussion and Conclusions

Research on the impact of corporate governance characteristics on intellectual capital performance is inconclusive and mixed (Kamath 2019). Previous studies examined the effect of a few corporate governance (C.G.) factors on intellectual capital performance (as a whole). They reported mixed results (Kamath 2019; Li et al. 2008; Taliyang and Jusop 2011; and Bendig et al. 2018). The difference between this paper and the previous research is that this study focuses on the change in corporate governance characteristics (such as the change in CEO, the change of auditor, the change in the board independence, and the change in institutional ownership) and examines the impact of them on the components of intellectual capital separately (capital employed, human capital, and structural capital).

Our findings show no significant relationship between the change in CEO as one aspect of corporate governance characteristics and intellectual capital or any of its components. This result supports those researchers like [Li et al. \(2008\)](#) and [Taliyang and Jusop \(2011\)](#). [Li et al. \(2008\)](#), in their research on the relationship between intellectual capital disclosure and some corporate governance variables in U.K. firms, used word count as an indicator of the volume and the percentage of total word count in the annual report as an indicator of focus in the report. Their results showed that CEO role duality had no significant relationship with intellectual capital indicators. Also, [Taliyang and Jusop \(2011\)](#), in investigating the relationship between intellectual capital disclosure and corporate governance characteristics in a sample of Malaysian firms, used the terms counted in the annual report such as human capital, structural capital, relational capital, investor relation, customer relation, and supplier relation to measuring the intellectual capital disclosure and showed no significant relationship between CEO role duality and intellectual capital.

[Bendig et al. \(2018\)](#) concluded that the CEO's characteristics affect intellectual capital. They divided intellectual capital into three dimensions, namely human, social, and organisational capital and surveyed German CEOs. They reported a positive and significant relationship between the CEO role and the three dimensions of intellectual capital. However, our study provides no support for their research about intellectual capital and its three components.

The results further indicated a significant relationship between the change of auditor (as one of the aspects of corporate governance) and intellectual capital, and two of the components of intellectual capital (the level of intellectual capital efficiency and human capital efficiency). The results provided no support for the relationship between the change in board independence and intellectual capital in general. However, such a relationship is only positive and significant in human capital efficiency (and not for the other components of intellectual capital). In this case, [Kamath \(2019\)](#), in studying the relationship between board independence and intellectual capital performance among the firms listed on the National Stock Exchange in India, used the [Pulic \(2000\)](#) model to measure intellectual capital and showed a positive and significant relation between board independence and intellectual capital performance.

Finally, the results showed a significant relationship between the change in the ownership percentage of institutional investors and intellectual capital in general and human capital efficiency and structural capital efficiency. However, no meaningful relationship was observed for capital-employed efficiency. The findings implied that ownership can significantly attract intellectual capital and maintain it in the company. In this case, [Li et al.](#) showed that ownership structure had a significant relationship with intellectual capital measured by word count and the percentage of total word count in the annual report since institutional investors have a more substantial role in the company than can influence its goals and decisions such as the disclosure of intellectual capital to improve its performance and increase its value, so the increase in institutional investors could have a positive effect on the company's value and create sustainability in the company in the long-run.

The results have some applications in practice. The findings suggest that directors of firms can plan to attract and retain as much intellectual capital as possible and adjust their governance structures accordingly. Having a sound corporate governance system and improving it could increase the ability of companies to attract more intellectual capital. Therefore, it can have various economic benefits for the company's financial stakeholders including investors, creditors, board members, management, and employees in various industries and sectors. A desirable corporate governance system can increase investors' trust and play an essential role in improving a country's efficiency and economic growth. Therefore, paying attention to changes and improvements to corporate governance characteristics and selecting efficient human resources can lead to correctly using intellectual capital and improving efficiency and economic growth. The findings are even more helpful for the current environment when firms are changing their natures from being financial and physical capital-based to knowledge-based. In a knowledge-based economy, one of the most

important ways to achieve sustainable competitive advantage and good organisational performance is to focus on intellectual capital. On the other hand, corporate governance is considered the main factor in attracting intellectual capital. A proper corporate governance system in firms increases their ability to attract more intellectual capital.

As with all studies using archival data, this study may have some limitations. The most important limitation is that we haven't been able to use interviews and clarify some information if needed. The second limitation is that the selected sample may not correctly represent the firms in the country as they are very limited firms listed on the TSE. Furthermore, the limited observations in this study could be considered too few to draw a general conclusion. The other limitation is related to the period of the study. In other words, the information used in this study is related to firms' financial statements for the period from 2011 to 2018, which is the pre-COVID-19 period. So, we are unsure if COVID-19 could have impacted the results. And finally, we only used some selective models to test our hypotheses. We are uncertain if other models offer different results. However, we believe that the above limitations are less likely to undermine the validity and reliability of the results.

Further studies are recommended to include information during and after the COVID-19 period. Furthermore, future studies can look for alternative models to see if they produce the same results.

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