



## Intellectual Capital and Firm Performance: Value-Added Intellectual Coefficient

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### Abstract

**Objective** – This article is concerned with the influence of IC and understanding the vital success factor of the components on firm performance. This study aims to deliver a complete review of existing evidence related to the effect of IC on firm performance.

**Methodology** – A review of the literature was conducted based on the five components of intellectual capital: human capital, structural capital, capital employed, relational capital, and innovation capital. Using electronic searches in three databases (Emerald, Web of Science, and Scopus) and keywords to identify relevant studies, 48 published studies are identified from 2010-2020.

**Results** – The results indicated that research focusing on IC and its impact on company performance has gained growing interest within scholarly works over recent decades. Furthermore, a steadier rise in interest can be observed from 2017 onwards, reaching its peak in 2019 with a 50% acceleration in the publication rate compared to the preceding year. In addition, the widely accepted method is the value-added intellectual coefficient approach without any modification or extension. Moreover, out of reviewed (48) studies only (12) of them utilized an adjusted VAIC model.

**Novelty/Originality** – This paper contributes to IC literature by providing a unique review of the IC and firm performance field of research.

**Keywords:** Intellectual capital, relational capital, innovation capital, VAIC, firm performance

### 1. Introduction

All firms typically have tangible and intangible resources. Both types of resources are needed for businesses to generate value and increase their financial performance (Barney, 1991). In an industrial-based economy, tangible assets are vital to achieving firm efficiency. A firm's tangible resources include the plant and equipment, land, buildings, and machinery, while the geographical location, access to raw materials, human capital, and structural capital are intangible resources (Barney, 1991). Intangible assets are also self-renewable until used. When intangible assets are used, the firm's knowledge grows, especially when shared with others (Diefenbach, 2006). In the knowledge economy, intangible assets, particularly intellectual capital (IC), refer to the knowledge-based assets that can build and enhance a firm's value (Hsu & Wang, 2012; Youndt et al., 2004).

Extent studies have indicated that IC serves as an intangible asset of the company (Sardo et al., 2018; Xu & Li, 2019). Barney (1991) defined IC as an asset that operates at the core of any firm's value creation and competitive advantage. At the same time, Edvinsson and Malone (1998) explained that IC supports both knowledge technology, a firm's client relations, and the technical skills of its employees. Demediuk (2002) suggested that expertise and skills in knowledge-based industrial economies have replaced physical assets. Youndt et al. (2004) described IC as the amount of information that a business organization can use to obtain a competitive advantage in

its activities. Therefore, because IC is an intangible asset essential in generating assets in the company, it is not listed as a physical asset on the balance sheet (Burgman et al., 2005). Moreover, Martín et al. (2011) explained that IC is the stock of expertise, intangible assets, and skills that help create organizational processes that allow organizations to gain a competitive advantage.

For the past two decades, researchers have focused on several variables of the firm's performance that have been affected. Researchers recommend that IC is viewed as a driving force of a crucial activity to improve firms' performance, for instance, profitability, productivity, and working system (Bontis, 1998; Hsu & Wang, 2012). Chen et al. (2005) demonstrated that each of the three components of IC, namely (physical, human, and structural capital) and R&D investment, has a significant impact on the firm's performance. The direct relation of IC with the firm's performance was extensively studied (Nimtrakoon, 2015; Xu & Wang, 2018). According to Tayles et al. (2007), IC can increase profits by exploiting knowledge-intensive services and innovation, eventually increasing shareholders' value. While IC items are commonly thought of as investments, scholars believe that IC will improve company performance. Therefore, innovation becomes an essential factor for the sustainability of business growth.

Hence, the association between IC and performance has yet to be thoroughly investigated, particularly in developing countries (Ahmed et al., 2022; Poh et al., 2018). To advance knowledge in this research area, this paper reviews previous studies of IC and its components for understanding the crucial success factor of the mechanisms of firm performance. Likewise, the current paper donates to the previous literature by adding two additional elements of IC, namely (Relational capital and innovation capital). Furthermore, it gives a complete assessment of significant works on the subject to crystallise, underline, and suggest key avenues for future research. The study's findings are expected to help stakeholders in contexts, such as investors, regulators, society, and academicians, make informed decisions.

This paper comprises five sections: the first section offers the background of the study. The second section explains the main concepts and the relationship of IC with performance. The third section discusses the strategy utilised to collect earlier studies as well as the trend of the analysis. The fourth section has shown the results and discussion. The last part summarises the limitations and future research recommendations.

## 2. Literature Review

### 2.1 Intellectual Capital (IC)

IC and firm performance have become increasingly crucial in the last two decades, especially in the k-economy. IC is recognized as a central contributor that can impact financial performance. Prior studies revealed the importance of the correlation between IC and firm performance to achieve competitive advantage. This research reviews the resource-based view (RBV) theory to understand how IC influences firm performance. The RBV theory of the firms described that the firm's resources require reaching four attributes: valuable, rareness, inimitable, and non-substitutability, to achieve competitive advantages (Barney, 1991). However, researchers have tried to describe IC in various ways due to its abstract and complex nature. However, there is no specific definition or classification of IC. Numerous scholars have defined IC but there are no universal definitions of IC. For instance, Roos and Roos (1997) described IC as an organization's hidden properties, like trademarks, copyrights, and brands involving all resources not seen on the financial statement. Meanwhile, IC is an intangible value non-expressed in financial performance (Ghosh & Mondal, 2009).

IC may be seen as a mobilizer of persons, assets, and information, bringing different resources together to produce wealth (Nikolaj et al., 2005). Chen et al. (2014) described IC as intangible knowledge assets entrenched in a company, such as

intellectual capabilities, intellectual property, and intellectual sources. Recently, Sardo et al. (2018) identified IC as providing value to firm stakeholders as knowledge-based activities and functions leading to firm creativity, value development, competitive benefits, and potential benefits. Other prior researchers briefly defined IC as something to do with intangibility, wealth generation, and knowledge (Bontis, 1998; Vishnu & Kumar Gupta, 2014). In general, all definitions agree that IC consists of unique and organised knowledge used for production or offers the organisation a competitive advantage in the market since there is no consensus definition of IC.

IC has been divided into various components based on the definitions discussed above. Bontis (1998) pointed out that knowing the IC elements gives us a better understanding of what IC is and helps organisations to manage and disclose IC to their investors. For instance, Stewart (1997) divided IC into human, structural, and relational capital, referring to relational capital, which includes the value and information of the business network among customers and all other relevant parties. According to Bontis (1998), relational capital is an essential IC element. Similarly, Youndt et al. (2004) classified IC into three components: human, organizational, and social capital. Moreover, prior scholars have reported that the major components of IC are Human, structural, and relational capital (Abdullah & Tursoy, 2023; Harvey Pamburai et al., 2015; Karem et al., 2021; Kweh et al., 2019; Nawaz, 2018; Smriti & Das, 2018; Weqar, Khan, et al., 2021). The following sections will discuss in detail each component of IC.

### 2.1.1 *Human Capital*

Human capital (HC) refers to the vital significant components in successfully implementing corporate goals, as it helps increase production and efficiency (Tran & Vo, 2020). Human capital is skills and information that permit workers to succeed in various circumstances, such as values and motivation (Sveiby, 1997). Human capital, or human assets, was not widely viewed as a vital area of concern in organizations. It adds value to the environment of the business. Firms regard their workers as essential resources and invest heavily in them when it comes to the knowledge agenda (Hsu & Wang, 2012). As HC is one of the main strategic tools of continuous innovation success, human resources need to build to enhance workers' skills and expertise, improving business efficiency (Hsu & Wang, 2012). Martin et al. (2013) have stressed the notion of differentiating between expenditure in human resources and HC by concentrating on HC's dynamic approach. In a broader spectrum, HC comprises both the corporate workforce's human resource concerns and the unique standards of personal competence in workers' expertise, abilities, and values (Mcgregor et al., 2004).

### 2.1.2 *Structural Capital*

Structural capital (SC) is described as the knowledge that remains within an organisation at the end of the day (Longo et al., 2009; Stewart, 1997). SC is also recognized as an internal resource of the company's processes, programs, database, projects, and even organizational cultures, all designed to motivate workers to accomplish corporate objectives. Such skills are integrated into the business and cannot be isolated (Joshi et al., 2013). SC refers to the procedures, processes, and systems that workers use to put their available expertise and skills to use in the production of wealth (Hsu & Wang, 2012). According to Longo et al. (2009), SC refers to the whole company, which should report and shared.

### 2.1.3 *Capital Employed*

In general, CE is a form of financial capital commonly known sum of capital utilised in fixed and current assets. The company's direct management power extends to such resources. It is viewed as a benefit that allows the firm to increase sales. It is vital to consider financial capital during the overall study of the efficacy of business value-generating services (Pulic, 2000). According to Smriti and Das (2018), physical

assets are essential in improving corporate efficiency, profitability, and market valuation.

#### 2.1.4 *Relational Capital*

Relational capital (RC) is an essential component, which scholars pay attention to a little in the literature and more ignorance as an IC component. RC is an organisation's powerful ability to improve engagement with community stakeholders in a constructive way to raise asset generation capacity by improving HC and SC (Viedma Marti, 2001). Furthermore, Joshi et al. (2013) mentioned that RC must create and strengthen the link with outside parties to be strong or successful. According to the authors, businesses with higher IC, specifically RC, can increasingly keep up with customer needs in terms of growth, allowing them to predict future customer needs and trends (Hsu & Wang, 2012). Also, RC consists of the value of the relationship between the people and the institutions that do business (Longo et al., 2009).

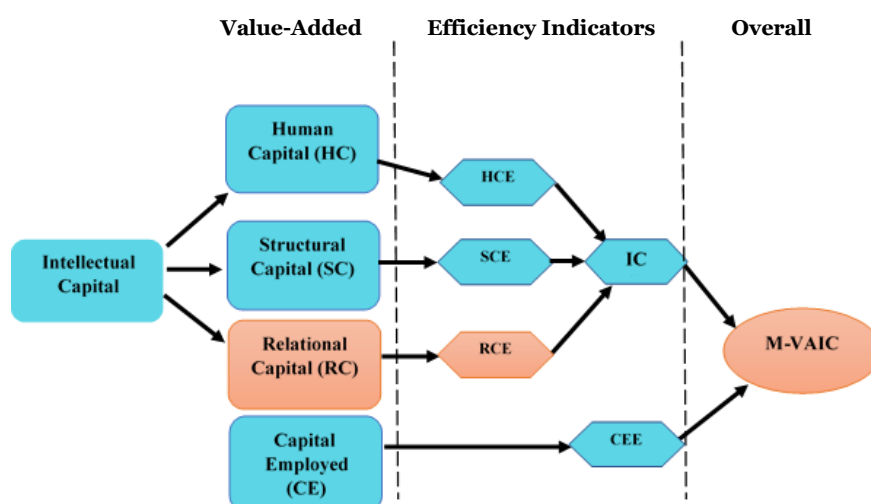
#### 2.1.5 *Innovation Capital*

Innovation capital is the ability of an organisation to create new technologies, products, innovation, and distribution systems is referred to as innovation capital. Innovation capital is made up of everything that encourages growth and the improvements required to achieve innovation outcomes within the marketplace advantage organization (Lee et al., 2020). According to Chang (2007), without investing in R&D, which is equal to two times the return on investment, no company will be able to discern, utilize, and generate revenue from new technologies. In general, innovation increases a business's growth, increases overall profits, provides a competitive advantage, and appeals to stakeholders.

#### 2.2 *Intellectual Capital Model*

The VAIC model has been commonly employed to assess IC efficiency in the literature (Nadeem et al., 2016; Soetanto & Liem, 2019). Pulic (2000) generated the VAIC model to provide information about its tangible and intangible assets' value creation efficiency. According to Pulic (2000), two types of resources define a firm's overall value-added factors: physical capital and IC efficiency. However, scholars pointed out the model has ignored the vital component, which is relational capital. After Pulic (2000) developed this model, Ulum et al. (2017) expanded it by including relational capital as an additional component (see Figure 1).

Furthermore, the VAIC model has several advantages. When determining IC's value, the model is easy to use and obtaining the model's data is feasible since all financial reporting data is available (secondary data). Second, the measurement is unbiased and testable because it is derived from audited financial statements (Goh, 2005). Third, compared to other models, which often include financial and non-financial indicators and some subjective decisions, the model allows for cross-organisational or cross-national comparisons. On the contrary, the VAIC model has some disadvantages. Several academics have questioned the IC's performance estimation using the VAIC model. Chang (2007) suggested changing the VAIC model by incorporating R&D expenditure into the calculation of IC. His research discovered that new components like R&D spending are positively linked to firms' market value and profitability, suggesting that the VAIC model lacks IC information. Many academics argued that the model excludes relational capital from the IC calculation (Ulum et al., 2017).



**Figure 1:**  
Formulation of M-VAIC

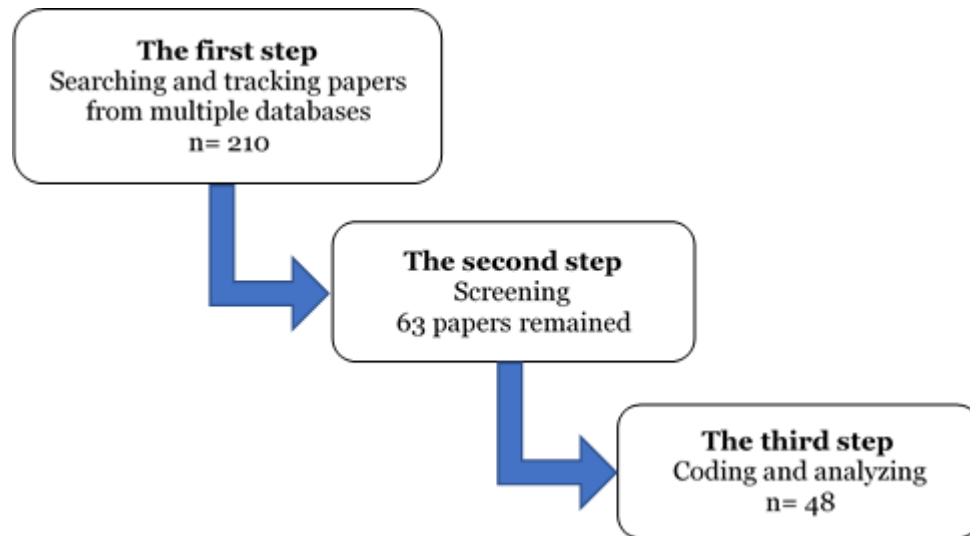
### 3. Methodology

This study is a review paper on IC and firm performance. The primary goal of analyzing the literature is to create summaries of past studies in a certain study area (Nekmahmud et al., 2020). In addition, to consolidate previous studies of IC and business performance, a review of related literature was chosen as the research approach to achieve the study objective. Likewise, this study has used the review to have three elements: literature search, screening, and selection of eligible past publications. This research also collects and summarises IC information and business performance from 2010 to 2020.

The multiple popular databases (Scopus, Web of Science, and Emerald Insight) were used as the literature search engine. Furthermore, these databases are widely acknowledged for encompassing a broad spectrum of top-tier journals and peer-reviewed articles of excellent quality. This paper employed sequential steps by searching, screening, coding and analysis as developed (Saad et al., 2021). Figure 2 depicts an overview of the procedures used to conduct the literature review. The first step in gathering relevant papers for analysis and subsequently generating insights is to conduct a literature search. We completed two activities in this step. Firstly, the study used the following keywords "intellectual capital, intangible assets, firm performance, and value-added intellectual coefficient". Second, the material search was carried out based on the following subject areas: Accounting, Business Management, and Social Sciences.

Furthermore, by directing the search to these fields, we could track articles from those various sources and not limit the search to keywords or titles. Furthermore, the preliminary search yielded 210 article samples that were used as the foundation for the next steps. We discovered the following records related to IC and firm performance. Firstly, we found (210) papers. Following that, we searched and removed (42) duplicated papers because the majority of them were compiled from multiple sources. Also, we removed (68) papers and (37) papers based on title and abstract, respectively. The objective of eliminating papers based on their titles and abstracts is to produce a review article that is concentrated, of excellent quality and imparts valuable insights to its audience. We studied each research more extensively to estimate the impact of IC on firm performance based on definitions, measures, models, and components of IC. After excluding and removing all articles, we reached 63 articles in this step. In this step, we presented a common code to label studies based on types (proceedings, articles in journals or conferences) to the Excel sheet. We discovered that (48) of the (63) papers were publications from scientific journals. Finally, after excluding papers the sample reached a final sample of (48) relevant papers for discussion on the concept of IC in the global and developing country contexts have been found.





**Figure 2:**  
Literature search  
strategy

## 4. Results and Discussion

### 4.1 Intellectual Capital and Firm Performance

IC is a common paradigm for characterising knowledge assets, and it is widely acknowledged as the most crucial source of long-term competitive advantage (Nadeem et al., 2017). Various research has undertaken the influence of IC on performance, but the findings are mixed (see Table 1). For example, prior studies have shown IC positively significant to the firm's performance (Sardo et al., 2018; Xu & Wang, 2018), whereas IC does not have any impact on performance according to (Kehelwalatenna, 2016; Weqar, Khan, et al., 2021). Utilizing sample data of publicly listed companies in Australia from 2004-2008, Clarke et al. (2011) reported that IC directly affected performance, particularly human and physical capital efficiency.

In contrast, Maditinos et al. (2011) were unsuccessful in illustrating the relationship of most hypotheses of VAIC with each ROA, growth revenues, ROE, and M/B ratio from 2006 to 2008 on 96 companies listed in Greek. Joshi et al. (2013) revealed that VAIC is related to ROA as an indicator of performance. Moreover, Vishnu and Kumar Gupta (2014) incorporated relational capital in research on IC and its impact on the pharmacy sector in India. The authors exposed that IC is positively association with performance, but the novel component of relational capital has no effect. A study in the technology sector for five ASEAN countries by Nimtrakoon (2015) revealed a positive influence of IC market value, ROA and margin ratio. Furthermore, the most essential element for firm performance is capital employed and HC, whereas SC and RC are less relevant.

Ozkan et al. (2017) revealed an insignificant impact of VAIC, but a positive effect of HC and capital employed on performance. Amin and Aslam (2017) investigated the linkage between the IC with innovation and performance listed pharmaceutical firms on London Stock Exchange. The results indicated that IC efficiency and innovation capital have a direct relation with performance. Similarly, taking 390 manufacturing firms on the Korean Stock Exchange, Xu and Wang (2018) argued that each sub-components of IC greatly impacts performance. Consequently, the authors found that relational capital is the most influencing factor.

Bontis et al. (2015) investigated IC effects on Serbia's hotel industry's firm performance from 2009 to 2012. They reported that IC is insignificantly related to firms' profitability and the most significant aspect of a hotel's profitability is physical capital. Recent studies in Malaysia by Mohammad et al. (2018) discovered that the

VAIC is correlated with the ROA of 41 Malaysian construction firms. However, on the individual components, only financial capital positively affects ROA. While Ibrahimy and Raman (2019) reported that SC and capital employed had a positive influence the Malaysian firms' performance. Bayraktaroglu et al. (2019) noticed a positive effect of SCE on firms' profitability in the Turkish manufacturing industry.

On the other hand, they reported that innovation capital directly affects firms' productivity. Xu and Li (2019) used the improved VAIC model by adding RCE and using different measurements of performance. Specifically, IC is related to higher profitability, firm profits, and operating efficiency. They documented that HC, CE, and SC are the maximum powerful value for enhancing firm performance, while an RC is less important. A recent study by Costa et al. (2020) determines IC's impact on Portuguese tourism firms' performance (ROA). The conclusions show that only CE and HC had a positive effect, but SC was negatively related to performance. While RC had no impact on firm performance. More recently, Ahmed et al. (2022) found that overall IC and its components had a positive impact on non-financial companies in Malaysia.

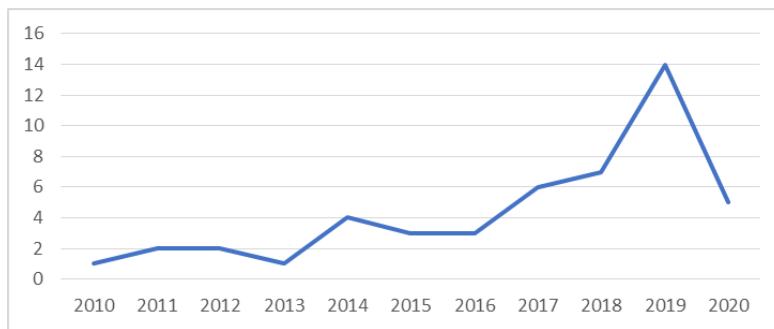
**Table 1:**  
Summary of prior  
research on IC and  
performance

Author (s), Year	Sample- scope	Independent variable	Dependent variable	Results
Nadeem et al. (2017)	BRICS 2005-2014	Intellectual capital	ROA and ROE	Positive significant
Soetanto and Liem (2019)	Indonesia 2010-2017	Intellectual capital	ROA M/B ratio	Positive significant Insignificant
Pal and Soriya (2012)	India 2000-2010	Intellectual capital	ROE and ROA ATO and M/B	Positive significant Insignificant
Sardo and Serrasqueiro (2017)	14 Western Europe countries 2004-2015	Intellectual capital	ROA and Tobin's Q.	Positive significant
Yao et al. (2019)	Pakistan 2007-2018	Intellectual capital	ROA, NOM and ATO	Positive significant
Xu and Liu (2020)	South Korea 2013-2018	Intellectual capital	ROA, ROE, ATO and M/B	Positive significant
Hsu and Wang (2012)	Taiwan 2001-2008	Intellectual capital	ROA	Positive
Celenza and Rossi (2014)	Italy 2003-2008	Intellectual capital	ROE, M/B, ROI and ROS.	insignificant
Sardo et al. (2018)	Portugal 2007-2015	Intellectual capital	ROA and ROE	Positive significant
Oppong et al. (2019)	Ghana 2008-2016	Intellectual capital	EP and ATO	Positive significant
Buallay et al. (2019)	Gulf Cooperation Council 2012-2016	Intellectual capital	ROE, ROA and Tobin's Q.	Positive significant
Soetanto and Liem (2019)	Indonesia 2010-2017	Intellectual capital	ROA and M/B	Positive significant
Poh et al. (2018)	Malaysia 2007-2016	Intellectual capital	ROA, ROE and LEV	Positive significant

In the last two decades, intangible assets particularly IC rather than physical ones mainly determine a company's worth. Furthermore, experts have focused increasingly on the function of intangible assets, particularly IC, in the value-generation

processes of firms and acquiring a competitive edge. In this regard, after reviewing the literature on the effect of IC on firm performance. Furthermore, most studies rely on the performance measures and assessment of the value-added creation of IC (Madinetos et al., 2011; Mohammad & Bujang, 2019; Xu & Wang, 2018). Several studies conducted the influences of either individual components or the combination of IC on the performance of the firm.

Figure 3 shows the general trend, over time, of the papers on the topics of IC and firm performance. As for this result, we can see that study on these themes has received increasing attention from academic publications only since 2011. Indeed, since 2014, research on IC and firm performance has grown more systematic. Just looking at the number of publications in 2014, we can see that it has more than doubled. Furthermore, beginning in 2017, the increase becomes more consistent, culminating in 2019, when papers rise 50% faster than the previous year.



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**Figure 3:** Trend overtime on 48 papers

Alongside the primary research objective, the VAIC model has been widely utilized across developed and developing countries. It offers a consistent measure and makes data collection from annual reports and calculations easy. The majority of the examined research used the three characteristics of the IC measurement model: HCE, SCE, and CEE. Therefore, out of 48 studies, 36 used the original VAIC model, as shown in Table 2. Thus, some studies used the adjusted VAIC, which introduced the additional component (relational capital) to the initial model (Ahmed et al., 2022; Sardo & Serrasqueiro, 2017; Xu & Li, 2019; Yao et al., 2019; Zulkifli et al., 2017). However, a few studies added innovation capital as a new component of IC or changed the structural capital to innovation capital (see Figure 4). Moreover, only three studies added innovation capital as a new component. Although innovation capital appears to have not been forgotten in current IC studies, it does not appear to have received the same level of attention as the more traditional IC dimensions, particularly in developing countries.

Author(s)/ Year	Countries	HCE	SCE	CEE	RCE	RDE
Dženopoljac et al. (2016)	Serbia	✓	✓	✓		
Zulkifli et al. (2017)	Malaysia	✓	✓	✓	✓	
Nadeem et al. (2016)	United Kingdom	✓	✓	✓		
Sardo and Serrasqueiro (2017)	Western Europe	✓	✓	✓	✓	
Chowdhury et al. (2018)	Bangladesh	✓	✓	✓		
Nawaz (2018)	United Kingdom	✓	✓	✓		
Ozkan et al. (2017)	Turkey	✓	✓	✓		
Buallay et al. (2019)	GCC	✓	✓	✓	✓	
Vishnu and Gupta (2014)	India	✓	✓	✓	✓	
Kweh et al. (2019)	Malaysia	✓	✓	✓		
Mohammad and Bujang (2019a)	Malaysia	✓	✓	✓		

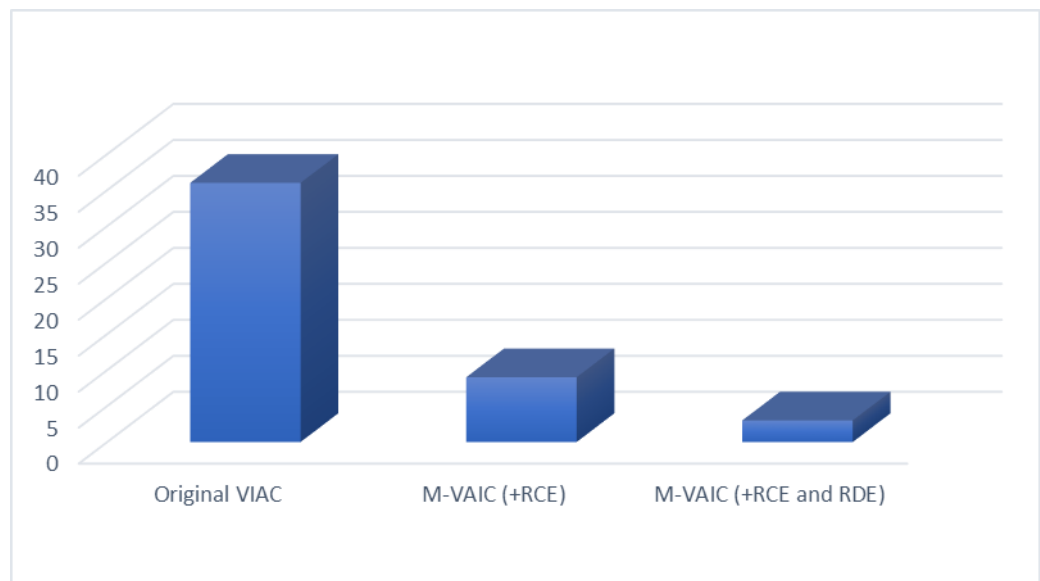
**Table 2:** Components of the VIAC model of the reviewed articles



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Joshi et al. (2013)	Australia	✓	✓	✓		
Xu and Li (2019)	China	✓	✓	✓	✓	
Soetanto and Liem (2019)	Indonesia	✓	✓	✓	✓	
Bayraktaroglu et al. (2019)	Turkey	✓	✓	✓	✓	✓
Celenza and Rossi (2014)	Italy	✓	✓	✓		
Soewarno and Tjahjadi (2020)	Indonesia	✓	✓	✓		✓
Costa et al. (2020)	Portugal	✓	✓	✓	✓	
Xu and Liu (2020)	Korea	✓	✓	✓	✓	✓
Ulum et al. (2017)	Indonesia	✓	✓	✓	✓	
Weqar et al. (2020)	India	✓	✓	✓		
Buallay et al. (2020)	GCC	✓	✓	✓		
Celenza and Rossi (2014)	Italy	✓	✓	✓		
Soewarno and Tjahjadi (2020)	Indonesia	✓	✓	✓		✓
Costa et al. (2020)	Portugal	✓	✓	✓	✓	
Xu and Liu (2020)	Korea	✓	✓	✓	✓	✓
Ulum et al. (2017)	Indonesia	✓	✓	✓	✓	
Weqar et al. (2020)	India	✓	✓	✓		
Buallay et al. (2020)	GCC	✓	✓	✓		

**Figure 4:**  
The distribution of reviewed studies by the model



## 5. Conclusion

The current study presented a review literature of previous empirical studies on IC and firm performance for the years 2010-2020. Based on the sample of (48) studies published in the last 10 years, the bulk of them come from developed countries. This study improves the body of knowledge by giving a comprehensive summary of the key findings of previous studies on the effect of IC on firm performance. An in-depth analysis of the literature was conducted in this context, and it was found that intellectual capital performs a crucial and fundamental element of firm performance. Hence, through reviews previous literature demonstrates that IC positively affects the firm's

performance; however, a vast literature is shown in large firms, especially in western ones. In addition, it is concluded that intellectual capital can enhance firm performance. Prior study has discovered that IC is vital for a firm's performance since it influences a company's financial and market values. Firms' performance is expected to increase because of practising intellectual capital.

This study also shows that in recent decades, researchers and academicians have widely used the VAIC approach to measure the effectiveness of IC. However, it has been criticised by scholars in the literature for ignoring a major component which is Relational Capital. Moreover, based on the reviewed (48) studies in the current paper, only (12) empirical studies utilized the modified VAIC by adding either relational capital or innovation capital. More specifically, only three of them used innovation capital as an additional component. This review reveals that the majority of empirical studies used the original VAIC model. The present study added to the literature by showing a review of empirical studies. The results of the research will also be valuable to stakeholders, investors, regulators, society, academics, and decision-makers in terms of strategic assets that may be used and optimised to enhance a firm's financial performance and market value.

This study has some limitations. First, the decision to investigate select databases and use specific keywords to search them significantly impacts the results. Future research could include a broader range of databases and journals. Second, only studies based on secondary data and statistical analysis methodologies were accepted within the scope of this study throughout the literature selection procedure. Therefore, studies based on surveys and questionnaires were excluded. Future research could include other methodological approaches. Third, while the focus of this study was on IC and firm performance, it might be shifted elsewhere. Future research could be to undertake a thorough industry-specific review of the variances in IC between various industries. Fourth, this review paper is limited to focusing only on the VAIC model. Future studies should be conducting other models that would provide more insights into the relationship.

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