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Faculty of Management Studies, Sabaragamuwa University of Sri Lanka, Sri Lanka

Article

Does Intellectual Capital Influence Firms' Financial Performance? Evidence from Non-Listed, Export-Oriented Manufacturing Firms In Sri Lanka

A.A.A.G. Kumara[1]*

[1]*Board of Investment of Sri Lanka, Colombo, Sri Lanka*

Abstract: *The concept of intellectual capital is rapidly expanding within the academic field, and it is playing a dominant role in the areas of accounting and management. Based on this scenario, Empirical studies illustrate varied findings related to intellectual capital and firms' financial performance. However, there is no general conclusion related to this aspect. Therefore, this paper examines the impact of intellectual capital on financial performance based on non-listed, export-oriented manufacturing firms in Sri Lanka over the period from 2011 to 2020. Annual sales are used as a proxy for financial performance, while following the "Public Model", a value-added intellectual capital coefficient is calculated, which is used as a proxy for the intellectual capital. A deductive approach is employed using firm-level panel data, and the Hausman specification test suggested the random effect regression model as the best-fit model. As per the results of this study, value-added intellectual capital significantly influences sales. Further, two components of the value-added intellectual capital, namely, the human capital coefficient and the capital employed efficiency coefficient, significantly influence sales. However, the remaining components of the structural capital coefficient do not influence sales. The empirical findings of this study may be helpful for firm managers and policymakers to craft strategic decisions highlighting the sales of export-oriented manufacturing firms.*

Keywords: Intellectual capital, financial performance, export-oriented, non-listed manufacturing firms, random effect regression model.

*Corresponding Author: aagkumara@gmail.com

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1. INTRODUCTION

In this cutting-edge era, tangible and intangible resources have been identified as potential sources of strategic advantage (Ruta, 2009). Among them, intangible resources and competencies are crucial factors for business firms' survival (Subramaniam & Youndt, 2005). Intellectual Capital (IC) is one of the intangible assets of the firm. It is considered a factor in

the firm's profitability apart from financial assets (Alipour, 2012). Parallelly, firm resources, including IC, contribute to creating value for the firm. Previous studies found that IC contributes 50 to 90 percent of the total value created for firms in the new economy rather than production and sales (Ehrhardt, 2007).

The concept of IC plays a dominant role in the areas of accounting and management (Carson et al., 2004). However, traditional financial measures have ignored the role of some important components of the IC, such as human capital (Bontis, 2001). Thus, decisions taken by the stakeholders based on traditional financial measures can be misleading because they ignore some important value-creation components of the firms. As a remedy, modern businesses have begun reporting intangible assets such as the sum of all skills and competencies possessed by employees since they play an important role in the wealth-creation process of a firm (Smriti & Das, 2017). Hence, studying the concept of IC and its' practices is empirically significant.

Manufacturing sector companies play a vital role in most of the economies. They significantly contribute to the economic growth of each country. If a manufacturing firm can carry out its operations smoothly, it can achieve a higher level of business performance. Performance is a good indicator of a business, and it is a function of the ability of an organization to gain and manage resources in several different ways to develop competitive advantage (Iswatia & Anshoria, 2007).

In the Sri Lankan context, non-listed manufacturing firms are more numerous than listed manufacturing firms. Among them, the Board of Investment (BOI) registered export-oriented firms are playing a dominant role in the Sri Lankan economy as they are the largest merchandise export income earners in the country compared to other merchandise exporters (see Table 1.1). Apart from that, BOI-registered companies are considered financially sound firms in the country from an investment perspective. This is evidenced by the minimum investment criterion of US $0.5 million required to become a BOI Section 17-registered company. Hence, this study focuses on BOI-registered export-oriented manufacturing firms. With regard to export-oriented firms, maintaining and achieving a higher level of business performance with a stronger competitive advantage is essential for their survival in the global market. The enterprises that have managed their IC better have achieved a stronger competitive advantage over their competitors (Bornemann et al., 1999). Thus, studying the concept of IC and its practices based on BOI-registered export-oriented firms is empirically significant. Hence, the basic research problem in this is as follows:

What is the effect of intellectual capital on firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka?

Table 1: *BOI Merchandise Export as a Percentage of National Exports of the Country*

Year	2015	2016	2017	2018	2019	2020
Percentage	79.9%	80.4%	83.9%	79.9%	74.9%	77.9%

Sources: *CBSL annual reports*

The main objective of this study is to examine the impact of IC on firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka. In addition to that, the following sub-objectives will be achieved in this study:

- To identify the association between IC and its components with firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka.
- To identify the impact of IC components on firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka.

Meanwhile, the basic research question of this study is as follows: What is the impact of IC on firm performance on non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka? Also, the following sub-research questions are derived to achieve the above sub-objectives:

- What is the association between IC and its components and firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka?
- What is the impact of IC components on firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka?

According to Adnan et al. (2022), there is insufficient empirical evidence pertaining to the IC and firm performance not only in the Sri Lankan context but also worldwide. Further, as per the researcher's understanding, in the Sri Lankan context, IC and non-listed manufacturing firms' performance-related empirical evidence is rare. On the other hand, whether the BOI-registered export-oriented manufacturing firms are playing a dominant role in the Sri Lankan economy or not, no one has specifically identified the relationship between IC and firm performance. Thus, such empirical gaps will be addressed through this study.

2. LITERATURE REVIEW

2.1 Theoretical Background

The concept of intellectual capital

The concept of intellectual capital is rapidly expanding within the academic field, and it was first introduced by John Kenneth Gilberth in 1969. The IC can be defined in different ways as

it is not an objective phenomenon (Janosevic et al., 2013). IC is the sum of everything in the firm; it gives the firm a competitive edge in the marketplace. Scholars have explained that knowledge transforms raw materials and makes them more valuable. Hence, for any knowledge to be tagged as "IC", the knowledge must be used to create wealth. (Stewarts, 1991, as cited by Lucy & Ifeanyi, 2017).

The term "intellectual" refers to the fact that the source of this capital is the human mind. IC is an intangible asset, something that cannot be physically touched. Logically, this intangible asset stands to reveal some hidden value within the assets of the company's balance sheet (Janosevic et al., 2013).

There is a general agreement in the literature related to the components of IC, which include human capital (HC), structural capital (SC), and relational capital (RC) (Khan, 2014; Anuonye, 2015).

Human capital is recognized as the largest and most important intangible asset in an organization. Ultimately, it provides the goods or services customers require as solutions to their problems. It includes the collective knowledge, competency, experience, skills, and talents of people within an organization. It also includes an organization's creative capacity and its ability to be innovative (Petty & Guthrie, 2000; Maditinos et al., 2009; Joshi et al., 2013).

Structural capital can be defined as "knowledge that is created by an organization and cannot be separated from the entity." It consists of organizational structures, procedures, routines, systems, hardware, databases, and organizational cultures. This enhances employee capability but is not related to employees at the individual level (Joshi et al., 2013; Moradi et al., 2013).

Relational capital captures the value of relationships with stakeholders external to the organization, such as market channels, customers, suppliers, and regulatory agencies (Maditinos et al., 2009). Relational capital reflects the ability of the firm to interact positively with members of the business community to stimulate the potential for wealth creation. It includes all knowledge assets the firm accumulates from its relationships with stakeholders (Moradi et al., 2013).

As IC is an intangible asset, the value that firms assign to it is considerably different. Meanwhile, Pulic (2000), as cited by Tan et al. (2017), developed a sound mechanism called the "Value Added Intellectual Coefficient" (VAIC) to measure the IC of companies.

The VAIC method is designed to provide information about the value creation efficiency of intangible and tangible assets within a company. The model starts with a company's ability to create value. As per this model, IC is measured through VAIC and is a function of three coefficients, namely, capital employed efficiency, human capital efficiency, and structural capital efficiency, which represent the three basic components of the IC. This model is still used by scholars in their empirical studies to capture the IC of organizations (Aras et al., 2011; Salehi et al., 2014; Maji & Goswami, 2017).

Resource-based theory (RBT)

Penrose (1959) first laid the foundation for the RBT, and the scholar argued that the development of resources such as skills and capabilities would contribute to competitive advantage. Wernerfelt (1984) further divided these resources into tangible and intangible. In contrast, Barney (1991) further enhanced the theory by stating that the core principles of resource-based value that relate to value, rareness, inimitableness, and not substitutable resources.

The Resource-Based Theory (RBT) posits that the formation of a sustainable competitive advantage is intrinsically linked to a company's ability to maintain and effectively utilize resources that are valuable, rare, and irreplaceable.

Pratama (2016) described the IC as a resource; along the RBT, firms have different sets of resources, even though they are performing in the same industry. Assumptions regarding the heterogeneity of these resources show that some firms have better expertise in completing certain activities because they have unique resources. Second, differences in resources will remain as difficulties in switching resources among firms, which will lead to the advantage of the heterogeneity of these resources, which will continue to occur from time to time. Based on the above justification, according to RBT, IC has great potential to create a better competitive advantage for the business firm, not only for competing in the market but also for achieving optimal performance.

Knowledge-based theory (KBT)

Wang et al. (2010) proposed KBT, which explains that knowledge is not only the collection of data and information but also the systematization of instinct, experience, and reality. Knowledge is made up of elements such as information, technology, know-how, and skill. Exploiting knowledge helps to raise the value of products and gain a competitive edge for business firms. Researchers have explained that IC is knowledge that transforms raw materials and makes them more valuable. Hence, for any knowledge to be tagged as "IC", the knowledge must be used to create wealth. (Stewarts, 1991, as cited by Lucy & Ifeanyi, 2017). By properly utilizing organizational structure and knowledge management, a firm can create knowledge efficiently to increase corporate value. Various types of knowledge can be employed to address different problems. Through the systematic integration of individual knowledge, new insights can be generated. Moreover, effective communication among members of the organization can lead to competitive advantage and optimal performance.

Real Option Theory (ROT)

Anuonye (2015) introduced the ROT and, as per the theory, the value of opportunities arising from IC, which is based on non-financial assets where the underlying asset is non-tradable. IC value depends on the idea developed by the firm's research and development (R & D) activity, the risk of the R & D activity, and the speed with which it is completed and introduced into the market before its competitors. If a firm has more competitive advantages

than its rivals, it can perform well in the marketplace. That performance can be measured as financial performance. Further, Ahangar (2010) stated that manufacturing firms use IC with their physical assets to sharpen their competitive edge.

2.2 Empirical Review

Several studies have been conducted on IC and firm performance in emerging countries, such as Zeghal et al. (2010) and Nadeem et al. (2016) in the UK, Clarke et al. (2011) and Nadeem et al. (2018) in Australia, Riahi-Belkaoui (2003) in the US, Mavridis (2004) in Japan, Tan et al. (2007) in Singapore, and Phusavat et al. (2011) in Thailand. However, as this study will be conducted in the Sri Lankan context, the researcher attempts to give more priority to empirical evidence related to emerging countries.

In the Nigerian manufacturing sector, the components of VAIC, namely, HC efficiency and SC efficiency, show a significant impact on their financial performance. However, the remaining components of CE efficiency didn't show a significant impact on their financial performance (Salman, 2013). In the manufacturing industry in the Kenyan context, IC and its three components, namely human capital, structural capital, and relational capital, significantly contribute positively to firm performance (Karimi, 2014).

In Vietnam, using the data from 13,900 firms from 2012to 2016, Hoang (2020) examined the impact of IC on firm performance, and the results revealed that IC positively correlated with firm performance during the period. Further, human capital correlates positively only with business performance, material capital, and financial capital in the short term. In addition, among the traditional VAIC components, structural capital efficiency has the greatest positive correlation with short and long-term firm performance. In the same context, using 60 listed firms on the Ho Chi Minh Stock Exchange from 2011 to 2020, it was identified that structural capital efficiency and capital employed efficiency are the two important components of IC and are affecting firm performance (Tran et al., 2022).

By using multiple regression analysis, the impact of IC on the financial performance and market valuation of Indian manufacturing and service firms is examined, and results disclose that the financial performance and market value are indeed influenced by the IC of the firms (Kamath, 2015). In the same context, using the same data analysis techniques and traditional "pulic model", it was identified that human capital had a major impact on firm productivity, while structural capital efficiency and capital employed efficiency equally contributed to the firm's sales growth and market value (Smriti & Das, 2018).

In Bangladesh's pharmaceutical industry, the components of traditional VAIC significantly influence asset turnover and return on assets. However, it failed to predict the return on equity outcome. Further, asset turnover was negatively influenced by structural capital and positively influenced by capital employed. Furthermore, variation in human capital was most influential in determining the return on assets (Chowdhury et al., 2019). In Pakistan's manufacturing sector, among the components of intellectual capital, relational

capital shows the strongest effect on knowledge process capability and organizational performance (Barkat & Beh, 2018). However, in the same context, using data on the top 100 companies on the Karachi stock exchange, it was identified that human capital efficiency strongly contributes to forming IC in relationship with corporate performance. However, Structural capital efficiency is a very poor contributor to IC. Apart from that, the efficiency of capital employed efficiency contributes significantly towards IC (Saeed et al., 2016).

In the Sri Lankan context, Kehelwalatenna & Gunaratne (2010) conducted a study related to listed financial services and manufacturing sector firms to identify the impact and relationship between IC, firm performance, and investors' responses. The scholars found a significant positive relationship between IC, FP, and investors' responses. Further, Sivalogathasan and Wu (2013) conducted a study related to the Sri Lankan apparel industry's performance and IC. In contrast, scholars have collected data by distributing a questionnaire. The results confirmed that IC shows a positive relationship with firm performance. Using six dimensions of IC, namely, human capital, customer capital, structural capital, social capital, technological capital and spiritual capital, Adnan et al. (2022) examined the impact of IC on firm performance in non-listed manufacturing firms in Sri Lanka and the results confirmed that except for Human capital and social capital, all other capitals significantly positively influence on firm performance.

The empirical reviews confirm that there is no general conclusion about the effect of IC on firm performance, and the results vary according to context, variables, adopted methodologies, etc. Thus, further investigation of the relationship between IC and firm performance is empirically significant.

3. RESEARCH METHODOLOGY

This study could be identified as quantitative research as it focuses on quantifying the collection and analysis of numerical data and does not use a descriptive story based on human feelings or subjective interpretations. Thus, positivism can be identified as the relevant paradigm followed by the researcher in conducting the study.

In terms of conducting social science research, two main approaches can be identified: the inductive approach and the deductive approach. According to Snieder and Larner (2009), the deductive approach follows the path of logic most closely, and then the reasoning starts with a theory and leads to a new hypothesis. This hypothesis is tested by confronting it with observations that either lead to a confirmation or a rejection of the hypothesis. This study has used the deductive approach to construct an empirical model and hypothesize the relationships between IC and firm performance.

Intellectual capital is the independent variable in this study. Using the pulic model, a numerical value can be assigned to intellectual capital (Pulic, 2000, as cited by Tan et al., 2007). Hence, intellectual capital is measured using the pulic model and represented through Value Added Intellectual Capital (VAIC). The VAIC can be calculated as follows.

$$VAIC = CEE + HCE + SCE \quad (1)$$

3.1 Conceptualization and Operationalization

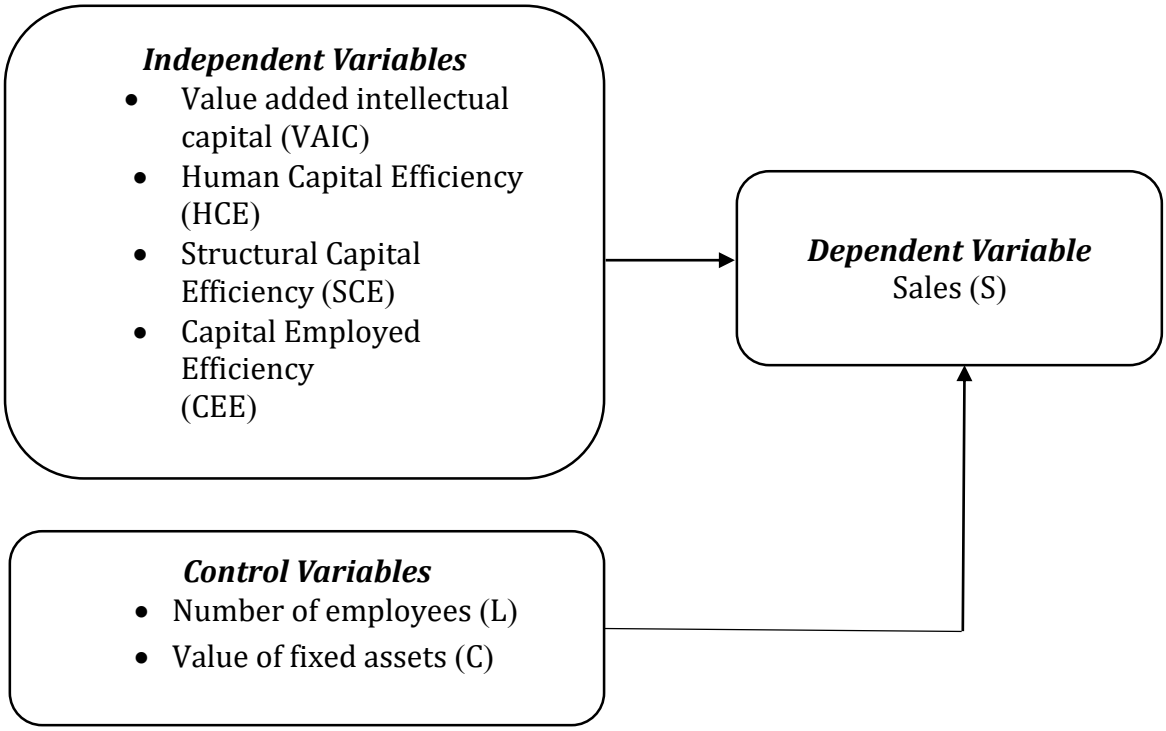

Figure 1: *Conceptual Framework*
Source: *Author's source based on literature review*

Where,

VAIC = Value Added intellectual coefficient for firm
CEE = VA / CE; VA Capital Employed coefficient for firm
HCE = VA / HC; Human Capital coefficient for firm
SCE = SC / VA; Structural Capital VA for firm

VA = I + DP + D + T + M + R + C; VA for firm computed as the sum of interest expenses(I); depreciation expenses (DP); dividends (D); corporate taxes (T); equity of minority shareholders in net income of subsidiaries (M); profits retained for the year (R); Employee expenses (C)

CE = book value of the net assets for the firm
HC = total salary and wages for the firm
SC = VA - HC; structural capital for the firm

The researcher gathers data by examining the audited financial statements of the selected enterprises, as all of the aforementioned components, including I, DP, D, T, M, R, and C, are incorporated within these statements.

Firm performance is the dependent variable of this study, and it was proxied through annual sales amounts. Previous scholars such as Bushman et al. (1995), Vanderpal (2015), Smriti & Das (2018) and Okafor et al. (2021) also used this proxy to represent firm performance.

The Cobb–Douglas production function is one of the most popular functions used in economics to measure productivity. In this function, productivity is a function of labour and the capital of the particular firm. As per Yang (2008), productivity is a major determinant of sales. Thus, this study employed labour and capital as control variables. The number of employees and value of fixed assets are used as proxies for control variables. These proxies were used by previous scholars such as Zhang et al. (2010), Marcin (2007), & Zhou et al. (2002) in their studies to represent labor and capital.

3.2 Research Hypotheses

Based on the above 3.1 conceptual diagram and operationalization, the following hypotheses are formulated to achieve research objectives.

H1: There is a significant association between IC firm performance**.**
H2: There is a significant association between human capital and firm performance
H3: There is a significant association between Structural capital and firm performance
H4: There is a significant association between Capital employed and firm performance
H5: IC significantly affects the firm performance**.**
H6: Human capital significantly affects on the firm performance
H7: Structural capital significantly affects the firm performance
H8: Capital employed significantly affects on the firm performance

3.3 Nature and sources of data

Secondary data are used in the analysis**.** Every BOI-registered firm should submit its audited financial statements and bi-annual financial statements to the BOI Project Monitoring Department as a mandatory requirement**.** By using such data, all the proxies are calculated**.**

Sampling technique, sample and sample period

Annual financial statement data are essential for calculating IC and its components. Consequently, the continuous submission of annual financial statements by export-oriented manufacturing firms to the Board of Investment (BOI) is the primary criterion for sample selection. However, it has been observed that some export-oriented manufacturing firms submit their annual audited financial statements in an unsystematic manner. Therefore, the

researcher excluded such enterprises from the data collection process. Using purposive sampling, 21 export-oriented manufacturing firms were selected for the sample, and data were gathered for the period from 2011 to 2020.

Data analysis

STATA software is used to analyze the data. The data analysis section of the study includes descriptive analysis, correlation analysis and panel regression analysis. Descriptive statistics include summary details about the collected data. These summary details are useful for understanding the behavior of the data. The correlation analysis section of this study shows how variables are associated with each other. It represents the nature and significance of the correlation of the variables in the study (Asuero et al., 2006)

The multiple regression analysis technique is used to study the linear relationship between the dependent variable and independent variables by calculating the coefficients for a straight line. (Hair et al., 2000). As this study aims to identify the effect of IC and its components on firm financial performance, multiple linear regression analysis is employed. The hypothesized multiple linear regression model is as follows.

$$S_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \beta_4 VAIC_{it} + \beta_5 L_{it} + \beta_6 C_{it} + \varepsilon_{it} \quad (2)$$

Where;

- S_{it} = Sales by "ith" non-listed, export-oriented, BOI-registered manufacturing firm at a time "t"
- β_0 = Constant of the model
- β_1 to β_4 = Coefficient parameters of the independent variables
- β_5 to β_6 = Coefficient of control variables
- HCE_{it} = HCE in "ith" company at time "t"
- SCE_{it} = SCE in "ith" company at time "t"
- CEE_{it} = CEE in "ith" company at time "t"
- $VAIC_{it}$ = VAIC in "ith" company at the time "t"
- L_{it} = Number of Laboures in "ith" company at time "t"
- C_{it} = Value of fixed assets in "ith" company at time "t"
- ε_{it} = Error term

This study utilizes panel data, employing panel regression analysis, which represents an expanded form of regression analysis technique suited for longitudinal data analysis. Panel data can include three types of effects, namely entity effect, time effect or both. The fixed effect model (FE), random effect model (RE) or pooled ordinary least squares (OLS) regression model can be used to capture these effects. The F test, Breusch and Pega's Lagrange Multiplier (LM) test and Hausman test are used to identify the best model among the three types of models discussed above.

Model Assumptions

Normality, multi-collinearity, stationarity, Heteroskedasticity and serial correlation are the fundamental assumptions of the panel data regression analysis**.** The normality ensures that the residuals (errors) of the model are normally distributed, which is an assumption of many statistical tests and ensures the reliability of inferential statistics of the study. Multicollinearity checks for high correlations among independent variables, which can distort the estimation of coefficients and affect the interpretation of the model. Next, Stationarity assesses whether the variables in the model exhibit stable statistical properties over time, ensuring that the relationships estimated are meaningful and reliable. Then, Heteroskedasticity examines whether the variance of the residuals is constant across observations. If violated, it can lead to inefficient estimates and biased standard errors. Finally, serial correlation tests determine whether residuals are correlated across time periods. If present, it violates the assumption of independent errors over time and can lead to biased coefficient estimates. Thus, the researcher follows and tests the above-mentioned assumptions when performing panel data regression analysis.

4. DATA ANALYSIS & RESULTS

This section includes descriptive analysis, bivariate correlation analysis, panel regression analysis, post diagnosis tests, hypotheses testing, and the discussion of the results.

4.1 Descriptive analysis

Table 2: *Descriptive Statistics*

Variable	Obs.	Mean	Std. Dev	CV	Min.	Max.
S	210	1.068	1.642	1.537453	0.024	7.124
HCE	210	0.341	0.703	2.061584	0.001	3.7
SCE	210	0.128	0.439	3.429688	-4.511	1.829
CEE	210	0.314	0.668	2.127389	-0.987	4.012
VAIC	210	4.249	3.334	0.784655	-7.303	22.865
L	210	570.852	770.422	1.3496	14	3406
C	210	0.371	0.653	1.760108	0.003	4.899

Source: *Author's source*

As per Table 4.1, descriptive statistics, Manufacturing firms' sales (S) are the dependent variable of this study, and their range lies between Rs. 0.024 billion and Rs. 7.124 billion from 2011 to 2020. The average S is Rs. 1.068 billion, and its standard deviation is Rs. 1.642 billion. Relative to the mean value, summary statistics show a high standard deviation, and the coefficient of variance (CV) value has confirmed that. It indicates significant variability in sales among export-oriented manufacturing firms. HCE, SCE and

CEE are the components of VAIC, and their mean values are 0.341, 0.128 and 0.314, respectively. Meanwhile, its standard deviations are 0.703, 0.439 and 0.668, respectively. Compared to the means, all three components' standard deviations are high, as their CV values. Among these, a higher coefficient of variation (CV) is observed in SCE, indicating significant variability in the structural capital among export-oriented manufacturing firms. The mean value of VAIC is 4.249, and it can be varied on both sides by 3.334. In comparison to the components of VAIC, the coefficient of variance for VAIC is notably low, as confirmed by a CV value of 0.78. This suggests that while there may be significant differences in the components of IC individually, overall, the variance of VAIC among export-oriented manufacturing firms is relatively small. Labour (L) and Capital (C) are the control variables of this study, and their mean values are 570.852 employees and Rs. 0.371 billion, respectively. However, these values can be varied on both sides by 770.42 employees and Rs. 0.623 billion, respectively.

4.2 Correlation analysis

Table 3: *Correlation Matrix*

	Sales	
	Pearson Correlation Coefficient	**Sig.**
HCE	0.8056*	0.0323
SCE	0.2902*	0.0471
CEE	0.4966*	0.0000
VAIC	0.0386	0.0715
L	0.6052*	0.0000
C	0.7521*	0.0000

Source: *Author's source*

Note: Star (*) shows the significant variables at 0.05 levels

The correlation coefficient[1] represents the linear association between two variables. Pearson's "r" correlation coefficient is used to identify the linear relationship between two quantitative variables. As this study measured all variables quantitatively, Pearson's "r" correlation coefficient is the most appropriate statistical technique for measuring the linear association between variables.

As per Table 4.1, the correlation matrix, all the components of VAIC show a significant positive association with sales as the calculated p-values are less than 0.05. Besides, HCE

[1] The coefficient may assist in between -1 to +1 and the significance level calculated for each coefficient provides the powerful information regarding the reliability of the correlation. A strong or high correlation means that two or more variables have a strong association with each other while a weak or low, correlation means that the variables are hardly.

shows a strong positive association with S as its' correlation coefficient is closer to +1. This suggests that efforts by firms to enhance their human capital are positively correlated with increased sales. Similarly, efforts by export-oriented manufacturing firms to enhance their SCE and CEE are positively correlated with increased sales, as indicated by the positive correlation coefficients of SCE and CEE. However, the VAIC does not show a significant association with sales, but the association is positive. This coefficient is insignificant at the 0.05 level. However, at the level of 0.1, VAIC also becomes significant as its calculated p-value is 0.0715. The control variables of L and C show a strong positive association with sales. This suggests that initiatives taken by firms to improve their labour and capital are positively associated with increased sales.

The first sub-objective of this study was to identify the association between IC and its components with firm performance in non-listed, export-oriented, BOI-registered manufacturing firms in Sri Lanka. To achieve the said objective, four hypotheses were built in Section 3.3. As per the correlation matrix, the proxy VAIC for IC does not show a significant association with sales. Thus, the researcher rejects the H1 hypothesis. However, all the components of VAIC show a significant association with sales. Thus, the researcher accepts H2, H3 and H4.

4.3 Panel data analysis

As mentioned in the methodology section, panel regression analysis is used to investigate the impact of IC on the firm's performance. Before that, the researcher checked the multi-collinearity assumption using the Inflation Factor (VIF). The rule of thumb is that if the VIF value is less than ten, such variables are free from the multi-collinearity problem. As per Table 4.3, collinearity statistics, all independent variables are free from the multi-collinearity problem as their VIF values are less than 10.

Table 4: *Collinearity Statistics*

Variable	VIF Value
HCE	8.71
SCE	1.67
CEE	4.06
VAIC	1.23
L	2.10
C	6.56

Source: *Author's source*

As panel data includes time series properties, testing the stationarity of the variables is conducted using the Levin-Lin-Chu unit-root test. As per the test results in Table 4.4, test

statistics' p-values for all the variables are less than the critical p-value of 0.05. This indicates that there are no unit roots in the level series of the variables.

Table 5: *Levin-Lin-Chu unit-root test results for stationarity*

Variable	Adjusted t* stat	p-value
S	-4.077	0.000
HCE	-2.521	0.005
SCE	-2.116	0.017
CEE	-3.321	0.000
VAIC	-3.728	0.000
L	-2.428	0.007
C	-4.791	0.000

Source: *Author's source*

4.4 Model selection

The OLS model, FE model and RE model are tested separately, and the results are as follows.

Table 6: *Summary of Regression Results of OLS, Fixed Effect and Random Effect Models*

S	Pooled OLS Model	Fixed Effect Model	Random Effect Model
HCE	2.649	0.732	0.825
	(0.000)*	(0.000)*	(0.000)*
SCE	-0.070	-0.029	-0.042
	(0.691)	(0.547)	(0.405)
CEE	0.926	0.268	0.285
	(0.000)*	(0.000)*	(0.000)*
VAIC	0.088	0.011	0.014
	(0.000)*	(0.093)	(0.048)*
L	0.000	0.000	0.000
	(0.969)	(0.457)	(0.249)
C	-1.263	0.817	0.774
	(0.000)*	(0.000)*	(0.000)*
Overall R^2	0.718	0.651	0.658
F-test		152.56	
		(0.000)*	
LM test			603.94
			(0.000)*
Hausman test			4.75
			(0.576)

Source: *Author's source*

Note: Star (*) shows the significant variables at 0.05 levels

To identify the best-fit model among OLS, FE and RE models, the F-test, LM test and Hausman test are run separately. The F-test is used to compare the OLS model with the fixed effect model, and the results suggest that the FE model is more appropriate than the OLS model as the calculated p-value of the F-stat is lower than the critical p-value of 0.05. Subsequently, the LM test is used to compare the OLS model with the RE model, and the results confirmed that the RE model is more appropriate than the OLS model, as the calculated p-value for the Chibar2 statistic is lower than the critical p-value. Finally, a Hausman test is conducted to select the most appropriate model between the FE and RE models, and the results confirm that the RE model is the best-fit model due to the test statistics' p-value being higher than the critical p-value of 0.05.

According to Ayele (2012), the normality assumption is that the mean of the residuals is zero. However, there is a general acceptance, which suggests that normality cannot be expected in panel data. Thus, the researcher has conducted the study using real data without making any adjustments to the original data series. However, after fitting the best model (RE), the researcher checked the normality of the residuals by using a graph and as per Figure 4.1, the histogram is also approximately normally distributed. Thus, it can be concluded that the regression results are consistent with the normality assumption.

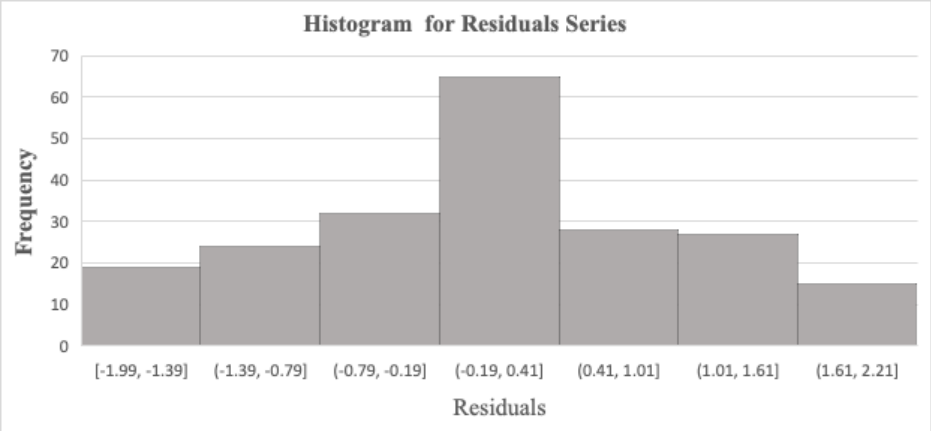

Figure 2: *Histogram for residuals series*
Source: *Author's source*

If the fitted model is good, the error term has the same but unknown variance. This situation is called homoscedasticity. For testing the heteroskedasticity in the RE model, robust standard error regression can be used (Torres-Reyna, 2007), and as per Table 4.5, the variables' coefficients of HCE, CEE, VAIC and C have been significant. In a robust error

standard RE model, if the coefficients are significant, it indicates that, no need to worry about heteroskedasticity (Yameogo, 2019). Thus, it can be concluded that the fitted model is free from heteroskedasticity issues.

Serial correlation is another important assumption that should be tested in regression analysis. However, as per Torres-Reyna (2007), Serial correlation tests should be applied to macro panels with long time series (over 20–30 years), and they are not a problem in micro panels (with very few years). As this study has been conducted using a micro panel, it is not necessary to conduct a test for serial correlation. However, in a robust error standard RE model, if the coefficients are significant, it indicates that, no need to worry about the serial correlation (Yameogo, 2019). As per the results of the robust error standard RE model in Table 4.5, the coefficients of HCE, CEE, VAIC and C have been significant, which indicates that the fitted model is also free from serial correlation problems.

Table 7: *Robust Standard Error Random Effect (RE) Model Summary*

VA	Coef.	Robust Std. Err.	z	P>z
HCE	0.825	0.252	3.14	0.002*
SCE	-0.042	0.042	-1.01	0.315
CEE	0.285	0.091	3.10	0.002*
VAIC	0.014	0.008	1.66	0.049*
L	0.000	0.000	0.88	0.381
C	0.774	0.257	3.01	0.003*
Overall R^2	0.658			

Source: *Author's source*

Note: Star (*) shows the significant variables at 0.05 levels

As per the RE model in Table 4.4, two components of the VAIC, namely, HCE and CEE, significantly positively influence sales. However, the remaining components of SCE negatively influence sales. However, it is an insignificant relationship, as the coefficient p-value is higher than the critical p-value. The main variable of VAIC significantly positively influences sales as the coefficient p-value is lower than the critical p-value. When considering control variables, except the number of employees, fixed assets significantly positively influence sales.

The R^2 value indicates that the change of 65.8% from the dependent variable value is explained by the independent variables of the RE model. As VAIC significantly positively influences sales, the H5 hypothesis is accepted. In addition, HCE and CEE significantly positively influence sales, and thus, the H6 and H8 hypotheses are accepted.

The results indicate that components of IC, such as HCE and CEE, have a positive impact on sales. This implies that increased investment in these components by export-

oriented manufacturing firms leads to higher sales. Similarly, overall investment in IC by these firms is also associated with increased sales. The above results are consistent with previous studies such as Kehelwalatenna and Gunaratne (2010), Kamath (2015), and Saeed et al. (2016). However, SCE does not show a significant relationship with sales, and thus, the H7 hypothesis is rejected. These results are consistent with the findings of Firer and Williams (2003), Saeed et al. (2016) and (Hejazi et al., 2016). However, while individual components of IC may exhibit varying impacts on sales, overall, the results confirmed that intellectual capital as a whole contributes to increased sales. According to Adnan et al. (2022), there is not sufficient empirical evidence pertaining to the IC and firm performance worldwide. Therefore, the above findings address the previously identified empirical gap.

5. DISCUSSION AND CONCLUSION

In summary, this study has adduced a picture of the impact of IC and its components on the firm performance of BOI-registered export-oriented manufacturing firms from 2011 to 2020. The correlation results indicate that, except VAIC, all the components of IC are significantly positively associated with firm performance. Besides, as per the RE model, except for the SCE, the remaining components of VAIC show a significant positive relationship with firm performance. In addition, VAIC also shows a significant positive relationship with firm performance. Hence, it is proposed that manufacturing firms focus more on the development of their intellectual capital. For that, firms can follow different approaches, such as hiring better employees, organizing more training and development programs for employees, developing new patents, enhancing business relationships with customers, suppliers, and other stakeholders, etc.

In terms of training and development, it is recommended to implement ongoing training programs to keep employees updated with the latest technologies, industry standards, and best practices. Given the nature of manufacturing firms, these continuous ongoing training programs are essential; without them, there could be a negative impact on productivity in the short term. Additionally, organizing skill development workshops focused on specific skills relevant to manufacturing processes and innovations would be advantageous.

For the development of new patents, increased investment in research and development activities is crucial as it drives innovation in products, processes, and services. Creating platforms for employees to propose and develop new ideas while providing the necessary resources and support will also significantly contribute to the development of intellectual capital.

To enhance business relationships, collaborating with universities and research institutions to access new research and technological advancements is beneficial. Forming alliances with other firms and industry groups to share knowledge and resources will further augment intellectual capital. Furthermore, documenting and sharing knowledge within the

organization is critical. Developing systems to document best practices, lessons learned, and critical knowledge, making this information accessible to all employees, and implementing knowledge management software to facilitate the capture, storage, and sharing of intellectual capital will be highly advantageous.

However, with the economic crisis in the country, it can be identified that there is a significant brain drain. Human capital is the crucial component of intellectual capital, and such a brain drain will adversely affect not only the firms' intellectual capital but also the whole economy in the long term. The potential adverse effects include loss of talent, reduced innovation, decreased productivity, weakened public services, and increased economic costs, all of which negatively impact both the country and its firms. Thus, firms should be careful about brain drain if it has occurred in their organizations. Moreover, at a national level, it is suggested that policymakers implement programs to at least control this brain drain. Otherwise, it may generate economic and social problems in the long term. Several initiatives can be identified to address this issue, including improving working conditions, creating research and development opportunities, fostering a positive work environment, offering incentives for returnees, and enhancing political and economic stability.

This study is limited only to export-oriented manufacturing firms that are registered under the Board of Investment of Sri Lanka. However, there are a number of small and medium-scale firms in the economy that are catering only to the domestic market. At present, conducting this kind of study with a focus on small-scale domestic firms is questionable due to the unavailability of data. Furthermore, there are a number of service-oriented small and medium domestic firms, such as IT sector firms, finance sector firms, etc. However, their performances are not properly recorded anywhere, and as a result, it is difficult to identify the impact of IC on such firms. In the future, if improved data is available, new avenues will be open to future researchers to discover these problematic areas.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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