Intellectual capital in the textile manufacturing sector: *An explanatory study of profitability*

Capital intelectual en el sector de confección textil: Un estudio explicativo de la rentabilidad

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Abstract

Introduction: knowledge is recognized as a key factor in the new era of the knowledge economy, and intellectual capital as the main source of value. **Objective:** to determine the influence of intellectual capital on the economic and financial profitability of companies in the textile clothing sector of Ecuador in the period 2014 - 2019. **Methodology:** The Value Added Intellectual Coefficient (VAIC) Model was used. A database was built from the filtering of 1800 financial statements in accordance with the methodological requirements. A descriptive and correlational analysis was applied to identify the evolution and association of the variables; With multiple regression, the influence of the VAIC and the control variables on profitability was established. **Results:** 29.6% of the return on assets and 38.8% of the return on equity, respectively, are explained by the VAIC and the control variables, which correspond to the size of the companies and the debt ratio. **Conclusions:** Intellectual capital positively affects key indicators of companies such as economic profitability and financial profitability represented by ROA and ROE.

Keywords: Financial performance; Intellectual capital components; Intellectual capital measurement model; Intellectual capital measurement.

Resumen

Introducción: el conocimiento es reconocido como un factor primordial en la nueva era de la economía del conocimiento, y el capital intelectual como el principal derivador de valor. **Objetivo:** determinar la influencia del capital intelectual en la rentabilidad económica, y financiera de las empresas del sector de confección textil del Ecuador en el período 2014 – 2019. **Metodología:** se utilizó el Modelo del Coeficiente Intelectual de Valor Añadido (VAIC). Se construyó una base de datos a partir de la depuración de 1800 estados financieros de acuerdo con los requisitos metodológicos. Se aplicó un análisis descriptivo y correlacional para identificar la evolución y asociación de las variables; con la regresión múltiple se estableció la influencia del VAIC y las variables de control en la rentabilidad. **Resultados:** El 29,6 % de la rentabilidad sobre activos y el 38,8 % de la rentabilidad sobre el patrimonio, respectivamente son explicadas por el VAIC y las variables de control, que corresponden al tamaño de las empresas y la razón de endeudamiento. **Conclusiones:** El capital intelectual incide positivamente en indicadores clave de las empresas como son la rentabilidad económica y rentabilidad financiera representadas por el ROA Y ROE.

Palabras clave: Rendimiento financiero; Componentes del capital intelectual; Modelo de medición del capital intelectual; Medición del capital intelectual.

Clasificación JEL: C4, J24, L25, O14

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Introduction

Knowledge has become the main factor for creating value in organizations, hence the importance of acquiring capabilities to obtain, integrate, communicate and use it. These capabilities are developed and manifested through tangible skills in a continuous learning process that leads to capitalizing knowledge. The learning process is shaped by experiences, criteria, information, values, and beliefs of each person that are internalized at both the individual and organizational levels (Valencia, 2009; Navarrete de la O and Sanchez, 2022).

Thus, the learning process is a tribute to all types of organizations, and allows the creation of a sustainable competitive advantage through the ability to process information and convert it into knowledge. Through the continuous learning process, knowledge acquires the virtue of expanding and growing in all directions within the organization (Nonaka, 1994; Stewart, 1998; Valencia, 2009; Sanchez et al., 2023). With all this, knowledge is recognized as the most significant capitalizable strategic resource in the new economy. As companies learn, they capitalize on knowledge and increase their intellectual capital in order to improve their organizational and financial performance and their competitiveness in general (Acuña-Opazo and Contreras, 2019; Bravo and Sánchez, 2022).

Knowledge as a strategic resource generates value in organizations, making them more competitive by adding value (Torrent, 2002). In this sense, Sveiby (1997), states that the expression value added is used to reflect the capacity to generate economic value in companies based on knowledge. An aspiration of every company is to grow, and this is achieved through good knowledge management practices that include its creation, storage and dissemination. Then, when knowledge expands, it develops the ability to become intellectual capital and become the support of organizations (Wiig, 1994; Pulic, 1998; Gómez et al., 2022).

In the knowledge society, the generation of intellectual capital requires investment in intangible assets and not only in physical assets (Stewart, 1998). These intangible assets such as skills, talents, aptitudes, structures, processes and relationships are those that produce added value and enrich economic results. Thus, De la Torre and Suárez (2016) agree that intangible assets are recognized as a sustainable source of competitive advantage in companies, and are represented by intellectual capital.

For Villegas et al. (2017), intellectual capital is a non-transferable intangible asset, made up of human, structural and relational resources. These intangible assets are not always reflected in the financial statements as such, however, they create future value, from which the desired competitive advantage is produced, which is made visible through intellectual capital. The visibility of intellectual capital is achieved through its measurement, the process of which involves enormous difficulty; however, enormous efforts have been made to establish ways to measure it and associate it with various methodologies (Alama et al., 2006; Armas et al., 2021; Aduna, 2022). Against this background, this research aims to measure capital

intellectual with the use of a methodology that uses a quantitative approach based on the financial values extracted from the balance sheets, which also relates them to profitability indicators and seeks to understand how it influences them.

The study addresses the economic sector of the textile apparel industry in Ecuador. This sector contributes 7% to the national manufacturing GDP, and is the third largest sector within the manufacturing industry in Ecuador. In addition, this sector is one of the most relevant due to its contribution to the Gross Domestic Product (GDP), the number of companies that make it up, and the large number of jobs it formally generates. The group of companies in this sector produces a wide range of products, among which are mainly garments in a variety of materials and uses such as clothing, executive work uniforms, casual, formal, school or work uniforms in general. According to the employment generated, this industry is in second place within the manufacturing sector, generating around 158 thousand direct jobs, and an even greater number of indirect jobs, as it is related to 33 productive branches in the country. However, the pandemic generated by Covid-19 hit this sector hard, so much so that sales decreased by 36% compared to 2019 (INEC, 2020).

This article begins with an introduction explaining the relevance of knowledge, intellectual capital, the need to study and measure it in organizations; it briefly describes the economic sector under study, and indicates the objective of the research. Then, in the literature review, it develops the background, definitions, components and measurement approaches of intellectual capital and explains the Intellectual Value Added Coefficient measurement model, which is used for its measurement. In addition, reference is made to the profitability indicators (return on assets and on equity) that constitute the dependent variables on which the influence of intellectual capital is studied.

The methodology section quantifies the units of analysis and explains step by step the measurement process that leads to obtaining the Inte- lectual Value Added Coefficient, through its components and the application of formulas. It also indicates how to calculate the profitability indicators and the economic model used. The results report the tables containing the descriptive statistics, the correlation coefficients of the variables under study, as well as the results of the multiple regression analysis and the econometric models for return on assets (ROA) and return on equity (ROE). Finally, the discussion and conclusions of the study are generated.

The purpose of this research is to determine the influence of intellectual capital on the ROA and ROE of companies in the textile apparel sector in Ecuador through the use of the Value Added Intellectual Coefficient (VAIC) method.

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2. Theoretical Framework

2.1 Intellectual Capital

In its explicit form, intellectual capital had its beginnings in the 90's, when one of its precursors Thomas Stewart wrote and published his contributions on the subject in Fortune magazine, since then individual and collective knowledge has been conceived as something feasible to be capitalized. This is how the phrase Intellectual Capital came about, and since then it has been given greater impetus to its study in the field of organizations (Stewart, 1998).

The intangible part of organizations is constituted by the intellectual capital that encompasses a wide range of components, and involves the training of workers, the ability to learn and adapt to new trends in today's market, organizational capabilities, the ability to meet customer demands, and the ability to build and maintain relationships with their stake-holders. With all this, organizations generate value based on knowledge, which, like a wide-angle lens, broadens the vision in all directions, and provides resources for their integral development, in order to face the challenges of the environment (Quiroz and Yangali, 2018; Fernández et al., 2022).

It can be seen that the statements of different researchers on this subject agree with each other, so that they define intellectual capital as the material generated from the experiences, information and knowledge of each person who is part of the organization. This concept includes intellectual property made up of copyrights, trademarks and patents, which are powerful assets for the generation of wealth (Nonaka, 1994; Stewart, 1998; Valencia, 2009; Gómez et al., 2020).

On the other hand, intellectual capital constitutes a distinctive strategy that helps to face the competition, since it is considered a practical tool for identifying intangible assets. For this reason, if companies properly manage their intangible assets, they will develop sufficient potential to turn them into a strategic resource (Tarigan et al., 2019). In this regard, it is stated that the success of organizations revolves around their intellectual capital, which is considered as the hidden gold that has not yet been fully explored (Stewart, 1998; Fávero et al., 2020; Sagas- tegui and Valiente, 2014; Hernández and Bermúdez, 2021).

2.2 Components of intellectual capital

It should be noted that a number of intellectual capital experts agree in approaching it from three dimensions: human capital, structural capital and relational capital, also known as customer capital (Stewart, 1998; Sánchez et al., 2007; Bueno et al., 2008). In reference to human capital, it is stated that in the 21st century, it should be appreciated in the same way that, in the industrial era, production plants and machinery were appreciated as an entity deriving economic value (Pulic, 2008). Díaz et al. (2009) refer to human capital as the key resource and the most important intangible asset within the company, made up of skills, abilities, creativity and experience, in addition to knowledge. Knowledge that employees possess and that has been acquired over time, which is also characterized by being unique, unique and strategic, and endowing the company with a unique and strategic value.

employees of attributes that confer them the status of assets (Stewart, 1998; Tkachenko et al., 2019).

On the other hand, structural capital is considered as the most independent and stable element of the firm, since this capital has to do with internal aspects of the firm, such as non-human intangible organizational processes and systems (Santos et al., 2011). To this component belong patents, trademarks, technology, and administrative systems that as a whole are in the companies even when their collaborators have left; for this reason, structural capital is considered to be the property of the company (Stewart, 1998; Gutiérrez, 2020).

Relational capital, known as customer capital, refers to relations with the environment, as well as external relations with stakeholders, suppliers, customers, competitors and institutions, and other interested economic agents that directly or indirectly affect the company (Delga- do-Verde et al., 2011; Mondal and Ghosh, 2012). On the other hand, Bueno et al. (2008) add that relational capital also includes the company's image, reputation and popularity in the environment, i.e. the company's social environment is valued. According to Quiroz and Yangali (2018) it is difficult to determine what value this component contributes to intellectual capital in companies, therefore, it is necessary for companies to maintain efforts for its identification and measurement. Finally, it is established that the three components of intellectual capital seek to explain the added value that is created in the company and incorporated within the intangible assets based on knowledge.

2.3 Intellectual capital measurement approaches

The value of a firm depends as much on intangible assets as it does on physical and financial assets (Quiroz and Yangali, 2018). However, companies are so adapted to traditional valuation methods that they focus on tangible assets and limit managers and researchers to start exploring new methods for measuring intangible assets, therefore, learning opportunities related to measurement are not taken advantage of (Sveiby, 2010). Measuring Intellectual Capital is not an easy task, as there are different measurement methods with which different results are obtained depending on the approach and degree of importance that the company confers to the components of Intellectual Capital (Quiroz and Yangali, 2018).

Sveiby (2010) grouped the methods for measuring intangibles into four categories: the direct intellectual capital method, the market capitalization method, the return on assets method and the integral command quan- dary method. While some of the methods take a qualitative approach, others take a quantitative approach, for example, Chu et al. (2011) emphasizes the asset return method approach which points to the Value Added Intellectual Coefficient (VAIC) and economic value added (EVA) as the most distinguished methods for financial valuation. VAIC and EVA are useful measurement methods for clarifying the financial value of intangible assets because they are established on the basis of established accounting rules, and offer ease of communication. In addition, these methods allow comparison between companies in the same sector. With this background this research used the VAIC Intellectual Value Added Coefficient model, which has been widely applied in various researchers, to measure intellectual capital (Bayraktaroglu et al., 2019; Aduna, 2022).

2.4 Intellectual Value-Added Coefficient Model

The value-added intellectual coefficient (VAIC) model was developed by Pulic in 1998. It aims to measure and monitor the efficiency of capital employed and the efficiency of intellectual capital components based on existing financial figures, and has been used in different contexts (Pulic, 1998; Bayraktaroglu et al., 2019; Xu and Liu, 2020).

Figure 1 shows the Value Added Coefficient (VAIC) according to the methodology proposed by Pulic (1998; 2004). This is made up of the efficiency coefficient of employed capital and the efficiency coefficient of intellectual capital. In turn, the intellectual capital efficiency coefficient is composed of the human capital efficiency coefficient and the structural capital efficiency coefficient. The calculation of the Value Added Intellectual Coefficient (VAIC) is carried out in six steps, which are detailed in the methodology section. The following scheme explains what the VAIC consists of.

Figure 1

Components of the Intellectual Value Added Coefficient
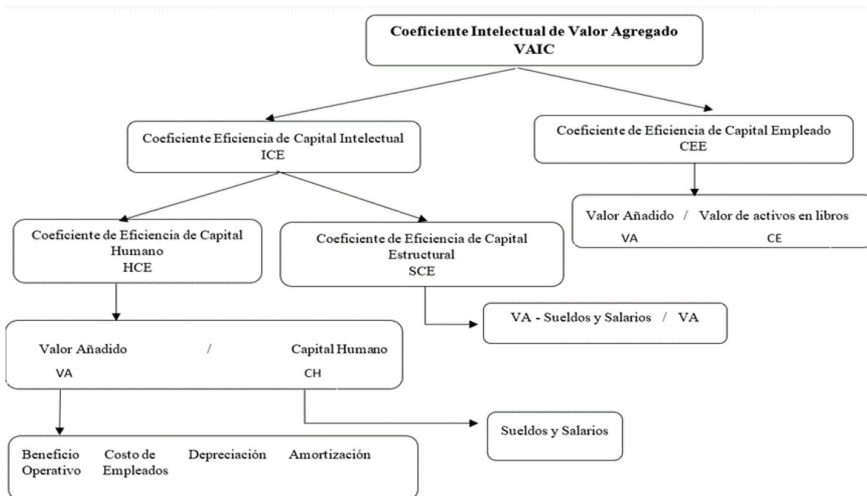
Note: The figure shows the structure of the Intellectual Value Added Coefficient (Pulic, 1998; 2004).

2.5 Profitability

According to Faga and Ramos (2006), profitability is the profit, yield or economic gain obtained by companies over a period of time for the provision of goods and/or services. This is in agreement with Sánchez (2002), who indicates that profitability is the progress made by the company over a certain period of time. Thus, profitability attests to the present of a company in order to obtain positive results that allow the efficiency of the actions carried out by the company to be evaluated.

tion. Profitability is classified into economic profitability and financial profitability (Gironella, 2005; Fernandez, 2018).

Economic or asset profitability refers to the performance of a company's assets in creating profit over a period of time, independently of its financing, which assesses the efficiency of business management; that is, in economic terms it determines whether or not a company is profitable (Hoz et al., 2008). Moreover, by not considering its financing, whether with the company's own resources or equity, assets will make it possible to establish whether a company is unprofitable due to a lack of financing policies or problems in the development of its economic activities (Sánchez, 2002). Hence, economic profitability as a measure of asset capacity is measured by the return on assets (ROA) index, an indicator that seeks to determine the efficiency of assets to generate profits, whose formula is given by the quotient between net income and total assets (SUPERCIAS, 2020).

Financial profitability, also known as ROE (return on equity), is the yield obtained by the capital of the partners, shareholders or owners of a company, generally independently of the distribution of the result. This reflects the relationship between net income and the equity equivalent to the investment made by the owners of the company over a period of time. In this sense, the purpose of any company is to increase its profitability through various mechanisms that involve the decision-making of its owners and shareholders, which is why it is often the subject of analysis and study (Sánchez, 2002; Veliz, 2023).

The returns expressed as ROA and ROE are calculated by means of formulas that indicate the mathematical relationships established for this purpose. Thus, ROA, as mentioned above, corresponds to the quotient between net income and the value of total assets, while ROE is the quotient between net income and equity (equity invested). As for the calculation of the control variable, leverage or debt ratio (DEBT), it is the quotient between total assets and total liabilities. On the other hand, the size of the company is calculated by the logarithm of total assets (Díaz et al., 2009; Pardo-Cueva et al., 2017; SUPERCIAS, 2020).

3. Methodology

This is a quantitative, longitudinal, descriptive-explanatory research, which used the Value Added Intellectual Coefficient Model (VAIC) using the method proposed by Pulic (1998; 2004), which has been widely used by several researchers such as Gómez et al. (2022), Tarigan et al., (2019), Chu et al., (2011) in different countries around the world. This model is developed in six steps, as shown in Table 1, where the formulas that were applied to find the VAIC and its components are also shown in Figure 1.

Information from the annual financial statements of the companies in the sector was used.

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The financial statements were taken from the database of the Superintendence of Companies, Securities and Insurance of Ecuador for the years 2014-2019 (SUPERCIAS; 2020). The financial statements were taken from the database of the Superintendencia de Compañías, Valores y Seguros del Ecuador for the years 2014-2019 (SUPERCIAS; 2020).

The total number of companies belonging to the textile sector was 1880 whose information needed to be purged; after that, the number of companies was reduced to 270. The purging was the result of the verification of compliance with essential requirements to apply the calculations, these requirements were: operating profits, the wages and salaries account, equity and net income, should not be zero, and should not present negative values. On the other hand, only those companies that remained active throughout the 2014-2019 study period, and those that did not present outliers, were selected. This is how a set of 45 companies that met the requirements for this study was formed.

On the other hand, the return on assets and return on equity, respectively (ROA and ROE) were calculated. The debt ratio and the size (DEBT and FSIZE) of the companies, which constitute the control variables, were also calculated. The calculations were developed with the application of the algebraic expressions shown in Tables 1 and 2.

Table 1

Formulas of the process of obtaining the Intellectual Value Added Coefficient

Pasos	Fórmulas
Primero	$Valor\ Añadido\ (VA)$ $= Beneficio\ Operativo\ (P) + Costos\ de\ empleados\ (C) + Depreciación\ (D) + Amortización\ (A)$
Segundo	$Coeficiente\ de\ Eficiencia\ del\ Capital\ Humano\ (HCE)$ $= \dfrac{(VA) Valor\ Añadido}{(HC)\ Capital\ Humano = Total\ Sueldos\ y\ Salarios}$
Tercero	$Coeficiente\ de\ Eficiencia\ del\ Capital\ Estructural (SCE)$ $= \dfrac{(SC)\ Capital\ Estructural = Valor\ añadido - Total\ Sueldos\ y\ Salarios}{(VA)\ Valor\ Añadido}$
Cuarto	Coeficiente de Eficiencia del Capital Intelectual (ICE) $=$ (HCE) Coeficiente de eficiencia del Capital Humano + (SCE) Coeficiente de eficiencia del Capital Estructural.
Quinto	$Coeficiente\ de\ Eficiencia\ del\ Capital\ Empleado\ (CEE)$ $= \dfrac{(VA) Valor\ añadido}{(CE)\ Valor\ en\ libros\ de\ los\ activos\ netos\ de\ la\ empresa}$
Sexto	Coeficiente Intelectual de Valor Añadido (VAIC) $=$ (ICE) Coeficiente de Eficiencia del Capital Intelectual + (CEE) Coeficiente de Eficiencia del Capital Empleado.

Note: Pulic (1998; 2004).

Table 2

Formulas to obtain returns and control variables

Rentabilidad	Fórmulas
ROA	$Rentabilidad\ de\ activos\ = \dfrac{Utilidad\ Neta}{Activo\ Total}$
ROE	$Rentabilidad\ financiera = \dfrac{Utilidad\ Neta}{Patrimonio\ (fondos\ propios\ invertidos)}$
DEBT	$Apalancamiento\ o\ Razón\ de\ Endeudamiento\ = \dfrac{Pasivo\ Total}{Activo\ Total}$
FSIZE	$Tamaño\ de\ la\ empresa\ = Logaritmo\ de\ los\ activos\ totales.$

Note: Own elaboration based on Díaz et al. (2009), Pardo-Cueva et al. (2017) and SUPERCIAS (2020).

The data were processed with SPSS statistical software (version 25) with which the corresponding analyses were carried out to obtain descriptive statistics (averages, standard deviations, maximum and minimum values), in addition to correlation and multiple linear regression analyses in order to estimate the effect of intellectual capital expressed through the VAIC, and of the control variables (debt ratio and company size), on the return on assets (ROA) and return on equity (ROE).

With the results of the applied analyses, it was possible to verify the hypothesis of the research, which establishes the following:

Intellectual capital influences the profitability of companies in the textile apparel sector in Ecuador, period 2014-2019.

The econometric models used are as follows:

MODELO 1: $ROA = \beta_0 + \beta 1 VAIC + \beta 2 FSIZE + \beta 3 DEBT + \varepsilon_i$

MODELO 2: $ROE = \beta_0 + \beta 1 VAIC + \beta 2 FSIZE + \beta 3 DEBT + \varepsilon_i$

Where:

ROA = Return on assets ROE =

Return on equity βo, *βn* = Regression

estimators

VAIC = Intellectual Value Added Coefficient

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DEBT = Debt ratio (ratio of total liabilities to total assets). *FSIZE* = Firm size

(logarithm of total assets).

4. Results

4.1 Descriptive analysis

Table 3 shows the descriptive statistics of the Value Added Intellectual Coefficient (VAIC), in addition to some of its components such as: the human capital efficiency coefficient (HCE), structural capital efficiency coefficient (SCE) and capital employed efficiency coefficient (CEE), because authors such as Stewart (1998), Sánchez et al. (2007), Bueno et al. (2008), Díaz et al. (2009), point to human capital, structural capital and capital employed as basic components of intellectual capital. In addition, it is taken into consideration that the VAIC is composed of HCE + SCE + CEE as shown in the representation of Figure 1 Pulic (1998; 2004). Thus, the average, standard deviation, and the corresponding minimum and maximum values are reported below.

Table 3
Descriptive statistics of VAIC, HCE, SCE and CEE in the period 2014 to 2019.

Variables/Estadísticos/ Años		2014	2015	2016	2017	2018	2019
VAIC	Promedio	4,998	4,599	3,972	4,228	4,284	4,391
	Desviación típica	2,365	2,025	0,987	1,982	1,701	1,943
	Mínimo	1,402	2,631	1,832	1,055	1,663	1,675
	Máximo	13,328	14,546	6,131	4,822	9,154	10,238
HCE	Promedio	2,049	1,797	1,846	1,982	1,965	1,929
	Desviación típica	1,255	0,672	0,609	0,834	0,723	0,718
	Mínimo	1,154	1,034	1,081	1,055	1,050	1,007
	Máximo	7,839	3,699	4,015	4,822	4,324	4,360
SCE	Promedio	0,413	0,380	0,407	0,426	0,429	0,416
	Desviación típica	0,195	0,186	0,172	0,188	0,186	0,196
	Mínimo	0,133	0,038	0,075	0,052	0,047	0,007
	Máximo	0,872	0,730	0,751	0,793	0,769	0,771
CEE	Promedio	2,536	2,421	1,719	1,819	1,889	2,046
	Desviación típica	2,259	2,089	0,935	1,266	1,604	1,847
	Mínimo	0,091	0,412	0,041	0,409	0,252	0,212
	Máximo	11,579	12,470	4,216	8,434	7,473	8,654

Note: Prepared from the results reported by the statistical software SPSS 25 when analyzing the financial statements of the companies in the textile apparel sector in Ecuador.

From these results, it is established that the average of VAIC averages in the study period is 4.412 with a variation coefficient of 41.56% (percentage ratio between average standard deviation of the period 1.833 and 4.412), which implies that there is a considerable variation in the values of VAIC throughout the six years of study. When analyzing the descriptive statistical values of the Intellectual Value Added Coe- ficient, it was found that its average decreased by 20.52% from 2014 to 2016; while, in the period 2016 to 2019 there was a growth of 10.5%. On the other hand, although the highest average for the VAIC is exhibited in 2014, and the lowest in 2016, it can be seen that there are no significant differences in the variations represented by the standard deviation. Thus, in 2014 the standard deviation was 2.365 and in 2019 it was 1.943. The above suggests that the companies in the sector under study do not exhibit high differences, but rather, it can be considered that there are similarities in capital employed, human capital and structural capital.

Table 4 shows the results of the descriptive statistics (averages, standard deviation, maximum and minimum values) of the dependent variables economic profitability (ROA) and financial profitability (ROE) during the six years (2014-2019).

Table 4
Descriptive statistics of economic profitability (ROA) and financial profitability (ROE) in the period 2014 to 2019.

Variables/Estadísticos/ Años		2014	2015	2016	2017	2018	2019
ROA	Promedio	0,1167	0,1014	0,0826	0,0822	0,0790	0,0520
	Desviación típica	0,109	0,0957	0,0809	0,0694	0,0724	0,0478
	Mínimo	0,008	0,0087	0,0043	0,0089	0,0001	0,0008
	Máximo	0,546	0,4247	0,4233	0,2954	0,3316	0,1771
ROE	Promedio	0,3458	0,2665	0,2049	0,1988	0,2042	0,1456
	Desviación típica	0,288	0,2056	0,1686	0,1335	0,1996	0,1543
	Mínimo	0,011	0,0299	0,0080	0,0177	0,0004	0,0023
	Máximo	1,301	0,9411	0,9047	0,5446	0,9734	0,8708

Note: Prepared from the results reported by SPSS 25 statistical software when analyzing the financial balance sheets of the companies in the textile apparel sector in Ecuador.

It is observed that, ROA described a decrease from 11.67% to 5.20% in the period 2014 to 2019. While, when analyzing the behavior of the ROE values, it was identified that from 2014 to 2016, it decreased from 34.58% to 20.59%, and continued to decrease steadily in subsequent years until 2019. These results suggest that it is worth investigating the causes of this notable decline. In summary, when comparing the evolution of the two income indicators during the study period, it is determined that the ROE had a notorious and sustained decrease; on the contrary, the ROA shows a gradual decrease during the same period.

4.2 Correlational analysis

Table 5 shows the Pearson correlation coefficients for the Value Added Intellectual Coefficient (VAIC), HCE, SCE, CEE, return on assets (ROA), return on equity (ROE), debt ratio (DEBT) and firm size (FSIZE), at the 5% and 1% significance levels.

Table 5
Correlation analysis of VAIC, HCE, SCE, CEE, returns and control variables of the textile apparel sector in Ecuador, period 2014- 2019.

		VAIC	HCE	SCE	CEE	ROA	ROE	DEBT	FSIZE
VAIC	Correlación de Pearson	1							
	Sig. (bilateral)								
HCE	Correlación de Pearson	0,324*	1						
	Sig. (bilateral)	0,034							
SCE	Correlación de Pearson	0,336*	0,840**	1					
	Sig. (bilateral)	0,028	0,000						
CEE	Correlación de Pearson	0,817**	0,279	0,195	1				
	Sig. (bilateral)	0,000	0,070	0,210					
ROA	Correlación de Pearson	0,296*	0,430**	0,232	0,020	1			
	Sig. (bilateral)	0,085	0,004	0,134	0,897				
ROE	Correlación de Pearson	0,511**	0,071	0,123	0,570**	0,582**	1		
	Sig. (bilateral)	0,000	0,651	0,433	0,000	0,000			
DEBT	Correlación de Pearson	0,337*	-0,399**	-0,348*	0,588**	-0,415**	0,370*	1	
	Sig. (bilateral)	0,027	0,008	0,022	0,000	0,006	0,015		
FSIZE	Correlación de Pearson	0,368*	0,597**	-0,460**	0,015	0,218	0,032	0,156	1
	Sig. (bilateral)	0,015	0,000	00,002	0,923	0,160	0,0840	0,318	

*. La correlación es significativa en el nivel 0,05 (bilateral).
** La correlación es significativa en el nivel 0,01 (bilateral).

Note: Own elaboration based on the results achieved and processed in SPSS 25 statistical software, from the financial statements of the companies of the textile apparel sector in Ecuador, period 2014-2019.

The VAIC presents moderate significant correlations of 0.324 (*) and 0.336 (*) with the HCE and SCE, while with the CEE the correlation is strong 0.817 (**). Similarly, the control variables exhibit moderate significant correlations with VAIC of 0.337 (*) and 0.368 (*). On the other hand, it is worth noting that there is a strong correlation between HCE and SCE (0.84 (**), but not with CEE with which there is no significant correlation.

In addition, the correlations of ROA and ROE are presented, so that moderate significant correlations of ROA only with the HCE 0.430 (**), and of ROE only with the CEE 0.570 (**) are observed, while neither of the two returns has significant correlations with the

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SCE. However, it is important to establish whether there are significant correlations between the VAIC and the returns as a whole in order to move on to the estimation analysis with the multiple regression, since significant correlations of the VAIC with the control variables are also observed.

It should be noted that both economic profitability (ROA) and financial profitability (ROE) presented significant and positive correlations with the VAIC coefficient for the levels of significance indicated as shown in Table 5: ROA 0.269* and ROE 0.511** for 5% (*) and 1% (**) significance respectively. This reflects the association between them, which confers importance to intellectual capital within the operation of the companies.

4.3 Multiple regression analysis

Table 6 shows the results of the multiple linear regression analysis used to estimate ROA and ROE as a function of VAIC and the control variables, indebtedness ratio (DEBT) and firm size (FZISE).

The results of the multiple linear regression model presented in Table 6 also provide evidence of the association and influence of VAIC with return on assets and return on equity. Thus, the standardized coefficients β are 0.343 and 0.456, for ROA and ROE respectively. In addition, the existence of a high significance is shown through the p-value lower than 0.001 (p-value < 0.001) for 1% significance level, since with values lower than 0.05 statistical significance is identified ($p < 0.05$). These results lead to the verification of the research hypothesis that states that intellectual capital influences the profitability of companies in the textile apparel sector in Ecuador, period 2014-2019.

Furthermore, the results indicate that the presence of interactions between the predictor or independent variables (VAIC, FSIZE, DEBET), and both returns (ROA and ROE) is highly significant. Additionally, the adjusted R-squared value in model 1 explains 29.6 % of the variance of ROA. While, in model 2, it explains 38.8 % of the variance of ROE. With the values found, it is concluded that the intellectual capital measured by the VAIC has a moderate and highly significant impact on the profitability of companies in the textile apparel sector in Ecuador for the period 2014-2019 (see Table 6).

Table 6

Multiple linear regression results for ROA and ROE returns as a function of VAIC, DEBT and FZISE over the period 2014-2019.

Variables	Estadísticos / Rentabilidades	ROA (Modelo 1)	ROE (Modelo 2)
VAIC	Coeficiente estandarizado β	0,343**	0,456**
	t – test	5,996	8,559
	Significancia	0,000	0,000
DEBT	Coeficiente estandarizado β	- 0,477 **	0,023
	t – test	- 3,573	0,439
	Significancia	0,000	0,661
FZISE	Coeficiente estandarizado β	- 0,255 **	- 0,342 **
	t – test	- 4,890	- 7,016
	Significancia	0,000	0,000
Constante del coeficiente		0 ,312	0,598
R cuadrado ajustado		**0,296**	**0,388**

** Significance at 0.01

Source: Prepared based on the results achieved and processed in SPSS 25 statistical software from the financial statements of the companies in the textile garment sector.

The models generated from the multiple linear regression analysis are as follows:

Model 1: ROA= 0.312 + 0.343 VAIC - 0.477 DEBT - 0.255 FSIZE

Model 2: ROE = 0.598 + 0.456 VAIC + 0.023 DEBT - 0.342 FSIZE

5. Discussion

When comparing the VAIC averages of the textile sector with those of the bodywork sector in Ecuador, studied by Gómez et al., (2022), it was found that the overall average VAIC for the period 2014-2019 in the textile sector was 4.412; while, in the bodywork sector for the same period, it was 5.134. This implies that the intellectual coefficient of added value of the bodywork sector exceeds that of the textile sector by 14%, which is explained because the business dynamics of the bodywork sector requires greater investment in technology and human talent capabilities to maintain quality standards and demands, due to the requirements for the means of transport that carry with them the commitment to protect the lives of people, and reduce possible risks as much as possible.

The study by Higuerey et al. (2020) shows that, in communication companies in Ecuador, efficiency was positively affected by human capital, structural capital, intellectual capital, and by the sum of intellectual capital plus capital employed, i.e. by VAIC. Similarly, in the present study it was established that financial efficiency, expressed through the return on assets and return on equity, was also positively affected by the VAIC. On the other hand, Herrera et al. (2021), in their research carried out in the same period of this research (2014-2019), established that intellectual capital measured by the VAIC methodology significantly affects the risk of communication companies in Ecuador. According to the above, it is established that all the baggage that contains the intellectual capital influences the different business edges related to efficiency.

This research establishes that ROA was significantly correlated with HCE, but not with SCE and CEE; on the other hand, ROE was significantly correlated only with CEE. These results differ from those obtained by Pardo-Cueva et al. (2017) who showed that ROA and ROE are positively related to HCE, SCE, and CEE. This difference is justified because the study by Pardo-Cueva et al. (2017) includes a broader group of companies in Ecuador, such as the industrial sector, in 2016; however, the existence of significant correlations between the components identified in the VAIC methodology and the profitability of the companies in Ecuador can be seen. This is also consistent with the findings of Pardo-Cueva et al. (2018) in their study conducted in manufacturing companies in Ecuador in the period 2012-2016 in which they established significant positive correlations between the ECI (HCE + SCE) and the CEE.

Empirical studies conducted in previous years in Hong Kong, Malaysia, Ecuador and Indonesia used the Intellectual Value Added Coefficient VAIC method (Chu et al., 2011; Moham-madghorban et al., 2013; Pardo-Cueva et al., 2017; Tarigan et al, 2019). The results of these studies agree that intellectual capital has a positive correlation with the profitability of companies in different economic sectors, and also has an influence on ROA and ROE. On the other hand, it can be seen from the figures from the financial statements that investment in intangible assets can be reflected in higher profitability at the end of the fiscal year.

The study by Bravo and Sanchez (2022), which was carried out with a different methodology from the present research, also showed the relationship between the components of intellectual capital and organizational performance in a Peruvian shipyard, where 92 surveys were applied; the study concluded that there is a need to strengthen intangibles. On the other hand, Faraji et al. (2022), in their bibliometric study mapping the conceptual structure of intellectual capital, establish that the most used word in Asia, Europe, North America, Oceania and Africa is performance, while in South America, the most used word is innovation, from which it can be deduced that, in Ecuador as in the Southern Cone countries, the management of intangibles still needs to be developed to enhance the performance of companies; Several of the studies cited in this research are supported by the results that intellectual capital has a positive and significant influence on financial and organizational performance.

In addition, it is relevant to point out that several researches corroborate the importance of managing intellectual capital in organizations, since it is related to knowledge management.

and together positively influence multiple aspects of organizational performance and growth, based on the quality of their products and services. This is how it is also related to competitiveness, which has been increasing in recent decades in Latin America within the new economies (Gascó, 2001; Chamba et al., 2020; Giampaoli et al., 2021; Gómez, 2021).

6. Conclusions

The execution of this research contributes to the textile apparel sector in Ecuador and to the professional who aspires to deploy capabilities in management tasks. By establishing the influence that intellectual capital has on profitability, through the generation of strategic components, it makes it possible to achieve objectives, compete and remain in the markets.

The results of this research allow managers in the textile apparel sector to intensify the search for better support strategies for the development of intangible assets. Hence, a consolidated and broad vision on the management of intangible resources based on learning and financial results contributes to continuous improvement in organizational management to meet the demands of an increasingly competitive environment.

The methodology used, although it employs financial information as concrete, objective and evident elements for the calculation of the intellectual coefficient of added value, leaves out all those companies that for some reason present biases, inconsistencies or absence of the financial figures required for the calculation. However, this does not mean that those companies do not have intellectual capital, because intellectual capital, like knowledge, is inherent to the development of people. In these cases, then, it will be necessary to resort to another methodology that allows to make approaches or records of intangibles for their measurement, and from this, to investigate their relationships and incidence with aspects of interest to the company.

By suggesting that VAIC has a positive impact on key business indicators such as economic profitability and financial profitability represented by ROA and ROE, opportunities for new research are opened up. In new research, it is considered relevant to take into account strategic factors of business management such as knowledge management, trust management and organizational culture in order to create or facilitate processes and environments for the capitalization of knowledge. In this way, it is feasible to visualize its impact on financial benefits, and other aspects, such as corporate social responsibility, which are capable of channeling the efforts of organizations to improve the quality of life of their environment.

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