Article

Utilizing the value added intellectual capital (VAIC) to tourism-related industries in a tourism intensively dependent country

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Abstract: This research examines intangible assets or intellectual capital (IC) performance of tourism-related industries in an underexplored area which is a tourism intensively-dependent country. In this study, VAIC which is a monetary valuation method and also the most widely applied measurement method, is utilized as the performance measurement method for quantifying IC performance to monetary values. Moreover, to better understand performance, the standard efficiency levels are further applied for classifying the performance levels of tourism industries. The sample sizes of study are 20 companies operating in the tourism-related industries in the world top travel destination or Thailand, and the companies' data are collected from 2012 to 2021. Therefore, finally, there are 187 firm-year observations. The utilization of VAIC could assess IC performance of tourism firms and industries, and the standard efficiency levels further support the uniform interpretation of IC efficiency levels. The obtained results show the strong performance of both human and structural capital of the focused tourism dependent country especially in the logistics industry that directly supports and connects to the tourism attractions. Moreover, the finding also highlights the significance of human capital which plays as a major contributor for overall IC performance in this tourism dependent economy. This study contributes the new exploration of IC in the high impact industries and also specifically in the top significant tourism country. Moreover, the application of VAIC also confirms a practical application for management. The limited number of studied countries is a limitation of study. However, these new obtained data and information could be further applied for making comparisons or in-depth or statistical analysis in the future works.

Keywords: resource based view; intangible assets; performance measurement; Thailand; tourism industry; human capital

1. Introduction

A traditional performance measurement of commercial organizations listed in a stock market only relied on financial effectiveness and efficiency such as return on assets (ROA), return on investment (ROI), earnings before interest and taxes (EBIT), and so on. The unawareness of significance of IC measurement from the traditional management was generally found in all industries, and this conventional measurement significantly led to the insufficient and inefficient management of intangible assets or intellectual capital (IC) of companies (Yang, 2004). Finally, this incomprehensive measurement and management negatively affects firms' performance, competitive advantages and also sustainability.

In the 1990s, the importance of IC was widely recognized through numerous empirical studies, leading to the development and application of various IC measurement and management methods, such as the Skandia Navigator, Balanced Scorecard (BSC), VAIC, Economic Value Added (EVA), and the KPMG Value Explorer. Consequently, these IC methods have been broadly adopted across several industries, particularly in the banking, technology, and pharmaceutical sectors. However, despite the rise of IC management, research on IC performance within the tourism industry—a critical sector for the global economy—remains limited, especially in countries heavily dependent on tourism (Ognjanovic et al., 2023; Wudhikarn et al., 2024). The tourism industry is identified as one of the major economic drivers of the world. In 2022, after the critical impacts of the COVID-19 pandemic, the travel and tourism industry still contributed approximately 7.7 trillion US dollars, or 7.6% of the global gross domestic product (GDP) (WTTC 2023). Furthermore, during this same period, this sector also added 22 million new positions to employment worldwide. Similar to most industries, the tourism industry still lacked a focus on IC measurement and management, despite empirical evidence highlighting the crucial advantages of IC to this service-related sector. Therefore, as mentioned above, this managerial limitation stemmed from traditional measurement approaches that neglected intangible factors. This led to the incomprehensive management of tourism firms, which further negatively affected their competitive advantages and organizational sustainability. Moreover, neglecting IC in countries heavily dependent on tourism may lead to greater economic losses compared to those with more general tourism dependence. This is because the revenue in tourism-dependent countries relies substantially on tourism activities, and the quality and performance of these service-related operations are significantly influenced by intangible assets, such as human resources, innovation, relationships, information technology, and more.

Tourism-intensively dependent countries such as France, Austria, Italy, Japan, and Thailand serve as significant economic drivers globally, contributing substantial GDP to both national and global economies. Given the importance of the tourism economy and the contributions of IC measurement to the tourism industry, there have been some efforts to specifically assess IC performance within tourism-related industries. Nevertheless, these explorations remain rare and are largely limited to countries that are not tourism-intensively countries (Costa et al., 2019; Laing et al., 2010). Consequently, this underexplored topic significantly limits understanding of IC performance within the tourism industry in high tourism-revenue countries.

To address the gaps identified thus far, this study seeks to investigate the performance of tourism-related industries in one of the world's top tourism revenue countries: Thailand. Thailand is one of the world's premier tourist destinations, attracting millions of international visitors annually. It is classified as a tourism-intensive country, as the tourism industry is a primary driver of the country's economy. In 2019, this service-related sector contributed approximately 18% to Thailand's GDP, significantly higher than in many other countries (Manakitsomboon, 2022). Given the significance of Thailand's tourism industry and the limited IC measurement and disclosure in this country (Suttipun, 2018), this study addresses gaps in previous research by examining two underexplored areas: (1) the study of IC in a tourism-intensive country and (2) a country with underdeveloped IC measurement.

This paper is organized into six sections following the introduction. First, we review methods for measuring IC performance and their applications within tourism-related industries. Second, we outline the specific IC performance measurement approach employed in this study. Next, a case study focusing on Thailand's tourism-related industries is conducted, with the findings presented and discussed in subsequent sections. Finally, the conclusion section summarizes the study's key findings, highlighting limitations and suggesting directions for future research.

2. Literature review

2.1. IC performance measurement

The critical role of performance measurement in organizational management is widely acknowledged, as effective management fundamentally depends on accurate evaluation metrics (Kaplan and Norton, 1992). In the domain of IC management, the evaluation of intangible assets has been an area of sustained scholarly interest due to the essential role these assets play in enhancing organizational performance and competitive advantage (Sveiby, 1997). Rigorous assessment of intangible assets is thus indispensable for informed strategic decision-making and sustainable value creation, highlighting the importance of comprehensive measurement frameworks (Edvinsson and Malone, 1997). The capability of organizations in effectively managing IC relies on the efficacy of IC measurement systems, so the evaluation of IC performance stands as a critical undertaking for organizational improvement (Roos et al., 2005). Therefore, the continuous performance is identified as one of the two primary objectives of IC management (Lee and Wong, 2019), and it also constitutes a crucial procedure for organizations of all sizes and across diverse sectors.

Regarding the significance of IC performance measurement, several IC measurement methods have been proposed over past several years, and, they are generally classified into two major categories which are (1) monetary valuation method and (2) non-monetary valuation method. The well-known IC evaluation methods and their measurement scopes are depicted in **Table 1**.

Table 1. The renowned IC measurement methods and the scopes of measurement (adapted from Wudhikarn (2021)).

Measurement methods	Scope of measurement			
	Overall	Human capital	Structural capital	Relational capital
Monetary valuation method				
Tobin's Q ratio	✓	-	-	-
EVA	✓	-	-	-
Market value added (MVA)	✓	-	-	-
VAIC	✓	✓	✓	-
Calculated intangible value	✓	-	-	-
Human resource accounting (HRA)	-	✓	-	-
Accounting for the future	✓	-	-	-
Investor's assigned market value	✓	-	-	-
Knowledge capital earnings	✓	-	-	-
Market-to-book value	✓	-	-	-

Table 1. (*Continued*).

Measurement methods	Scope of measurement			
	Overall	Human capital	Structural capital	Relational capital
Cost, market and income approaches	✓	-	-	-
Intellectual asset valuation	-	-	✓	-
Total value creation	✓	-	-	-
Technology broker	✓	✓	✓	✓
KPMG value explorer	✓	✓	✓	✓
Non-monetary valuation method				
Balanced scorecard (BSC)	-	✓	✓	✓
Intangible asset monitor	-	✓	✓	✓
IC-index	✓	✓	✓	✓
Skandia navigator	-	✓	✓	✓
Weighted patent count (WPC)	-	-	✓	-
Human capital intelligence	-	✓	-	-
Value creation index (VCI)	✓	-	-	-
Holistic approach value	✓	✓	✓	✓
Inclusive valuation methodology	✓	✓	✓	✓

As shown in **Table 1**, IC measurement methods can be used to evaluate performance for both holistic and component levels, and, generally, IC composes of three major components including human capital (HC), structural capital (SC), and relational capital (RC). HC represents the skills possessed by the labor force that are considered as the most valuable intangible assets, contributing to organizational and economic growth (Chi et al., 2016). SC encompasses other intangible assets such as organizational processes, databases, patents, trademarks, company culture, and systems that still remain within the firm even after employees have left (Bontis et al., 2015). RC is a firm's ability to create value through strong, complex relationships with external stakeholders, such as customers, suppliers, and partners, fostering trust, reputation, and competitive advantage (Meles et al., 2016).

Although some IC measurement methods can assess only overall performance (e.g., EVA, MVA) or performance of one specific IC component (e.g., HRA, human capital intelligence), some of them can evaluate IC performance for both overall and IC components (e.g., VAIC, IC-index). Among these various approaches, each method holds different advantages and disadvantages. Nevertheless, generally, the common strengths and weaknesses of methods mainly depends on categories of measurement methods.

The monetary valuation method is broadly acknowledged for its simple as well as standard calculation, and, especially, the comparability. Generally, these methods use accounting methods and public data of organizations disclosed in financial and/or annual reports, so companies and researchers do not face with the problems related to the data acquisition (Jurczak, 2008). However, this is generally for the public companies listed in the stock market. One of major disadvantages of the monetary valuation method is that most methods could measure only overall IC performance as

presented in **Table 1**, so they mainly lack of capability to quantify performance of IC components. Nevertheless, there are some distinctive methods that could overcome this critical limitation such as VAIC, technology broker, and KPMG value explorer.

Similar to the advantage of non-monetary valuation approach, the measurement methods in this category are generally capable to evaluate performance of IC components. Nevertheless, fundamentally, they require complex and unique measurement varying firm-by-firm and this subsequently leads to non-standard calculation and assessment of IC performance (Jurczak, 2008; Nimtrakoon, 2014). For example, scorecards and performance measurement indicators that each firm obtained from BSC could be totally different between opposite industries, and could be partially or mostly dissimilar within the same business sector. Finally, non-comparable outputs obtained from this approach generally cannot be used for benchmarking and identifying best practice among competitive companies (Jurczak, 2008) and this is a critical weakness of non-monetary valuation approach.

As mentioned above, each major approach has its pros and cons. Nevertheless, regarding the distinctive strengths of monetary valuation method, especially the comparability of obtained outputs, this approach has been widely applied by both researchers and practitioners than the non-monetary valuation approach. Moreover, among the various IC measurement methods of monetary valuation method, Pulic's VAIC (Pulic, 2000) is one of the mostly accepted approaches. It has been widely adopted by both practitioners and researchers (Nimtrakoon, 2015), since it was firstly proposed in 2000. Specifically, this method has general advantages of the monetary valuation method which normally make it is more preferred than the non-monetary valuation approach. Moreover, VAIC also has the distinctive advantages which generally could not be found in most monetary valuation approaches, specifically, including (1) the capability to measure IC performance of both holistic and component levels, and (2) a mechanism to evaluate efficiency of organizational activities operated by employees. Regarding various strengths of VAIC as presented above, the method has been globally applied by academics and practitioners. Therefore, to gain distinctive capabilities of VAIC method, and especially to provide standard outputs that could broadly benefit to other future works, this study decides to utilize VAIC as IC measurement method in the case of tourism-related industries in a tourism intensively dependent country.

2.2. IC measurement

Nowadays, IC has been widely accepted as highly valuable assets of organizations, since it empirically affects to the firms' success and sustainability. As a result of its importance, the IC performance measurement was utilized in several sectors such as banking, manufacturing, pharmaceutical industries. Specifically, tourism is also one of significant sector contributing to both global and local economy, and this industry is empirically identified for the necessity of IC measurement. Nevertheless, in the past, the study concentrating on this crucial topic is still very limited, and these studies can be classified into two major categories (1) utilizing only IC measurement methods to quantify IC performance and (2) applying IC

measurement methods and then examining the relationships between IC performance and organizational performance.

From the intensive literature review, there are only few studies are classified in the first group of work. Since all studies could provide insights of IC performance in the tourism-related industry, hence, they were published in the top IC journal which is Journal of Intellectual Capital (Serenko and Bontis, 2022). The first study (Engstrom et al., 2003) measured the IC performance of 13 hotels of Radisson hotel chain in Norway by utilizing ICAP methodology. Even though the outputs of study provided a report presenting IC performance of tourism-related firms and highlighted the values and priorities of firms' IC, these results could not be used to compare with outputs of other related studies regarding the characteristic of method that develops a tailor-made model. By utilizing this method, the IC indicators could vary firm to firm. Therefore, this unstandardized approach significantly limits the comparability of IC performance among other studies. On the other hand, to gain the comparable capability, another study (Laing et al., 2010) adopted the VAIC to Australian hotels. This applied method could provide a robust measurement tool supporting firms to assess their IC performance by overcoming the differences of managerial characteristics and also standards among various organizations. However, this study limited number of examined samples to two companies from only one tourism business which is a hotel sector. Moreover, it explored the tourism-related business located in Australia which is still not classified as the tourism intensively dependent country. Therefore, from this study, there are several improvement opportunities that can be further addressed. As presented above, the studies in the first group are very rare, and, they still hold flaws and gaps of knowledge which can be further addressed. However, from the literature review, we can notice that the VAIC could provide more benefits to other studies especially the comparability capability. Regarding this strength, it supports the adoption of VAIC in our study.

Table 2. The reviewed studies related to the IC measurement and IC relationships with firms' performance.

Authors	IC measurement methods	Tourism-related sectors	IC measurement	
			Overall	Components
Angkasaputra et al. (2022)	VAIC	Indonesian tourism sector	✗	HC, SC, and CEE
Costa et al. (2020)	VAIC	Portuguese hospitality and tourism sector	✓	HC, CEE, RC, and SC
Silva et al. (2021)	VAIC	Portuguese tourism sector	✓	HC, CEE, RC, and SC
Papíková and Papík (2022)	VAIC	Slovak tourism and gastronomy sectors	✓	HC, CE, ICE, and SC
Sardo et al. (2018)	Tailor-made IC indicators	European SME hotels	✗	HC, SC, and RC
Ashraf et al. (2023)	Tailor-made IC indicators	Small and large European hospitality firms	✗	HC, SC, and RC
Ognjanović et al. (2022)	VAIC	Serbian hotels	✗	HC, and SC
Ognjanović and Slavković (2022)	VAIC	Serbian hotels	✓	✗
Ognjanović et al. (2022)	VAIC	Serbian hotels	✗	HC, SC, and ICE

The second category of study has received higher attention as well as exploration than the first group. There were several studies that explored tourism-related industries by both measuring IC performance and also examining the relationships between IC and financial performance. From the reviewed studies as presented in **Table 2**,

unsurprisingly in accordance to the distinctive advantages of VAIC method, it was the most applied method (approximately 80% of studies). This IC measurement method was applied for evaluating performance of either overall or component level and also both levels. For example, as shown in **Table 2**, the study of Costa et al., 2020 utilized VAIC to assess IC performance of both overall and component levels. On the other hand, the study of Ognjanović and Slavković (2022) utilized the method to measure only overall IC performance, while VAIC in another study (Ognjanović et al., 2022) was adopted only for evaluating IC component level.

The reviewed results presented in **Table 2** not only emphasized the significant utilization of VAIC method but also highlighted the lack of studies concentrating on the IC measurement of tourism-related industries in a high valued tourism country which is known as a tourism intensively dependent country. Therefore, from these crucial findings, in this study, we have decided to select VAIC as the IC measurement method and then apply it to the underexplore area or the tourism intensively dependent country in order to utilize superior advantages of VAIC and also contribute new exploration results to communities respectively.

As outlined above, the introduction and literature review sections highlight a significant gap in the existing literature concerning the measurement of IC performance of tourism-related industries, particularly in the tourism-dependent country where IC could play a critical role in enhancing firms' performance and sustainability. To address this gap, the first research question is formulated as follows: "What is the IC performance level of tourism firms in a country highly dependent on tourism?" Additionally, to examine trends in IC performance over multiple time periods and provide insights into whether IC performance in the tourism sector is improving, declining, or fluctuating, the second research question is defined as: "How has IC performance evolved over time in tourism-related industries within a country highly dependent on tourism?" By analyzing IC performance across several years, this study aims to identify potential patterns, especially in countries with high reliance on tourism revenue. This analysis may illuminate the impact of external factors on the development and transformation of IC over time. Finally, as noted in the literature, the VAIC method enables the assessment of performance at both the overall and component levels of IC. To better understand the contribution of individual IC components to firms' performance, the third research question is articulated as follows: "To what extent do individual components of IC contribute to the overall IC performance of tourism-related firms in countries highly dependent on tourism?"

3. Research methodology

As presented above, regarding the distinctive advantages of VAIC method, it was broadly and significantly utilized by several studies more than other IC measurement methods both the monetary valuation methods and non-monetary valuation methods. Specifically, one of its significant advantages is the comparability of IC performance results that could be utilized for not only within the study but also between or among other VAIC studies. Since this study aims to examine IC performance of tourism-related industries in the underexplore area which is the tourism intensively dependent country, therefore, to provide benefits for future works, we have decided to utilize

VAIC in this study regarding its significant strengths as mentioned above. Moreover, to newly discover IC performance of tourism-related industry in the tourism intensively dependent country, this research selects Thailand, one of the world's leading travel destinations, as a case study. The tourism industry of Thailand could contribute approximately 18% of country's GDP which was greatly higher than global average rate of around 10% (Manakitsomboon, 2022).

Since this study aims to examine data of industries related to the tourism services, regarding the classification of business sectors of Thailand stock market, therefore, we have included two major service sectors listed in the stock exchange of Thailand (SET) which are (1) tourism and (2) transportation and logistics sectors. The first sector includes major propellers driving tourism activities which are hotel, temporary accommodation, and travel services, whereas the latter sector consists of transportation businesses which could service tourists and support tourism activities including airports, airlines, seaports, train, other land transports, and also integrated logistics services. There are various businesses in this service sector, and some firms directly support the tourism industries such as airlines, airports and so on. Nevertheless, some of them did not relate to the tourism activities such as warehouses, sea freight, etc. Therefore, in this study, all firms listed in the transportation and logistics sector of SET were reviewed for their business profiles and provided services. Only firms related to the tourism activities were included to our study.

This study collected secondary data from annual reports and financial reports of companies published on their web pages or on the website of the Stock Exchange of Thailand, SET (www.set.or.th). Due to the research funding allowed for conducting study in the year 2022, the data between 2012 and 2021 period were collected. The starting year was determined based on the earliest year for which all the companies under our consideration still had data available. From this search protocol, finally, there were 187 firm-year observations.

The data were used to calculate IC performance through the VAIC method proposed by Pulic (2000). As explained above, VAIC provides several distinctive strengths beyond other IC measurement methods. Fundamentally, the method can measure both overall performance and also performance of IC components. The overall IC performance or VAIC can be computed by equation below.

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

where ICE is intellectual capital efficiency, which is the sum of human capital efficiency (HCE) and structural capital efficiency (SCE) and CEE is capital employed efficiency which represents an efficiency rate of capital employed. ICE and CEE are identified as two major components of VAIC.

Nevertheless, VAIC is more widely perceived for three components, since ICE composes of HCE and SCE as shown in Equation (2). HCE represents the contribution created by resources invested in organizational employees to the value added of the firm, and SCE is the efficiency of firm's infrastructure and intangible resources supporting human capital. These two IC parts are generally recognized as major components of IC in other concepts, models and methods. All three components of IC can be calculated through the equations below.

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

$$\text{HCE} \quad = \text{VA/HC} \tag{3}$$

$$\text{SCE} \quad = \text{SC/VA} \tag{4}$$

$$\text{CEE} \quad = \text{VA/CE} \tag{5}$$

where VA is the value added of particular firm calculated from the aggregation of operating profit (OP), human capital (HC), depreciation, and amortization. HC is measured by the summation of employee expenditure. It is a source of firm's knowledge, creativity, and innovation capability. Structural capital (SC) is computed by excluding HC from VA. SC is intangible assets remained in an organization after employees have left the company. Capital employed (CE) is measured by excluding the intangible assets from the total assets. CE represents the utilization of physical and financial capital of firm.

Following the past related studies as shown in **Table 2**, in this study, VAIC is adopted to represent overall IC performance of firm, and, according to the established methodology of VAIC, ICE, HCE, SCE, and CEE are utilized for valuating performance of IC components.

To describe IC performance levels of tourism-related industries in the tourism intensively dependent country obtained through VAIC calculation, this study follows the interpretation of IC efficiency levels proposed by Lazzolino and Laise (2013) as presented in **Table 3**. These standard efficiency values are elaborated from Pulic's study (Pulic, 2008). Firstly, the benchmarking scale of ICE was only studied and developed by Pulic (2008) after that Lazzolino and Laise (2013) extended the assessment scales to HCE and SCE, the components of ICE, which are calculated from the equations developed from the correlational analysis between HCE and SCE. These reference values support the interpretation of IC efficiency and specifically the benchmarking of IC among various businesses and industries. Regarding the advantages of this reference, therefore, this study utilizes the IC efficiency levels as shown in **Table 3**.

Table 3. Efficiency levels of IC according to VAIC.

Efficiency levels			Interpretation
ICE	HCE	SCE	
< 1.000	< 1.000	< 0.000	Very low IC efficiency
1.000–1.249	1.000–1.129	0.000–0.119	Low IC efficiency
1.250–1.749	1.130–1.439	0.120–0.309	Moderate IC efficiency
1.750–2.499	1.440–2.000	0.310–0.499	High IC efficiency
> 2.50	> 2.00	> 0.500	Very high IC efficiency

4. Results

The VAIC method was applied to data of 20 companies of two tourism-related industries obtained from SET, and, finally, there were 187 firm-year observations in this study. The descriptive results of VAIC are presented in **Table 4**.

Table 4. Average efficiency of VAIC and its components for the tourism-related firms.

Type of major businesses and business sectors	Company Abbreviation*	VAIC	HCE	SCE	ICE	CEE
Transportation and logistics sector		6.93	6.02	0.81	6.83	0.10
Mass transit system	BTS	7.01	6.11	0.81	6.92	0.09
Mass transit system	BEM#	6.84	5.92	0.81	6.73	0.11
Entertainment sector		3.97	3.22	0.68	3.9	0.07
Golf course	CSR	3.97	3.22	0.68	3.9	0.07
Hotel sector		2.43	1.78	0.48	2.25	0.17
Hotel	SHANG	4.16	2.77	1.22	3.99	0.17
Hotel	BEYOND	3.45	2.64	0.68	3.32	0.14
Hotel	ASIA	2.80	2.19	0.53	2.72	0.08
Hotel	CENTEL	2.71	1.95	0.48	2.43	0.28
Hotel	OHTL	2.49	1.57	0.57	2.14	0.35
Hotel and Shopping Plaza	GRAND	2.48	1.84	0.54	2.38	0.10
Hotel	ROH	2.24	1.46	0.44	1.90	0.34
Hotel	MANRIN	2.05	1.46	0.27	1.73	0.10
Hotel	VRANDA#	2.05	1.60	0.33	1.92	0.13
Hotel	SHR#	1.82	1.29	0.5	1.79	0.04
Hotel	LRH	1.67	1.47	0.12	1.59	0.08
Hotel	DUSIT	1.28	1.08	0.04	1.11	0.17
Aviation sector		1.88	1.33	0.48	1.81	0.04
Airport	AOT	6.27	4.66	1.44	6.10	0.17
Airline	AAV	3.08	2.25	0.45	2.70	0.22
Airline	THAI	1.94	1.28	0.52	1.8	0.14
Airline	BA#	1.58	1.35	0.10	1.45	0.13
Airline	NOK	−3.49	−2.91	−0.11	−3.02	−0.48

Note: Abbreviation name according to SET (www.SET.or.th).
Data from some certain years are unavailable due to the companies not being listed on the stock market yet.

Table 4 depicts IC performance of both business sector and company levels. For the sector level, results show the transportation and logistics is the best sector for both overall performance and all IC components except CEE that is achieved by the hotel sector. Similarly, other sectors also hold the same rankings for both overall and component levels unless the CEE component. Therefore, the entertainment, hotel, and aviation sectors hold the second, third, and fourth ranks respectively.

For the organizational level, surprisingly, the first three ranks of VAIC all came from the companies listed in the transportation and logistics sector. Moreover, both top two firms (BTS and BEM) similarly service as a mass transit provider, while the

third-rank firm (AOT) is the Thailand's largest airport operator operating several airports in top destinations in Thailand.

On the other hand, two companies (BA and NOK) that were ranked in the worst three VAIC also similarly provided the airline services that were both classified in the transportation and logistics sector, while the second last VAIC firm (DUSIT) operated several hotels in various top destinations in Thailand.

From the results, it is apparent that most of IC impacts mainly came from the HC, while SC and CE less affected to the overall IC efficiency. Interestingly, more than half of overall IC values of all firms were derived from the human-related capital. For instance, the proportions between HC and VAIC of top three firms are 0.87, 0.87, and 0.84 respectively. The substantial impacts of HC were similarly found in the low VAIC firms. The proportions of three lowest IC companies are 0.85, 0.84, and 0.83 respectively. Therefore, from this finding, it apparently highlights the significance of HC to the overall IC of both high and low IC efficiency firms in the tourism-related industries of tourism intensively dependent country.

Apart from the majority of HC, other components of VAIC which are SC and CE could provide significantly less impacts to firms' IC efficiency than HC. Moreover, generally, SC could deliver more IC values than CE. From the IC results of **Table 4**, almost tourism-related firms had higher SC values than CE. For example, the top three firms in VAIC have the proportions between SC and VAIC as 0.12, 0.12, and 0.23, while the ratios between CE and VAIC of these top companies are 0.01, 0.02, and 0.03 respectively. However, interestingly, the opposite results were found in the three lowest companies in accordance with VAIC. These low IC efficiency companies had SC lower than CE. The proportions between SC and VAIC as 0.06, 0.03, and 0.03, while the ratios between CE and VAIC of them are 0.08, 0.13, and 0.14 respectively.

Moreover, to comprehensively perceive the overall performance of business sector, the IC efficiency of tourism-related industries is further provided in **Table 5**. Moreover, to better visualize IC data and their tendency, the efficiency is presented in **Figure 1**.

Table 5. Average efficiency of VAIC and its components for tourism-related firms.

Year	HCE	SCE	ICE	CEE	VAIC
2012	1.99	0.37	2.36	0.02	2.51
2013	1.60	0.82	2.42	0.10	2.53
2014	3.37	0.41	3.78	0.19	3.97
2015	2.73	0.86	3.59	0.19	3.78
2016	2.64	0.65	3.28	0.18	3.46
2017	2.68	−0.41	2.27	0.19	2.46
2018	2.51	0.61	3.12	0.17	3.29
2019	2.13	0.48	2.62	0.14	2.76
2020*	1.02	0.11	1.13	0.03	1.18
2021*	1.04	1.36	2.40	0.02	2.48
Average	2.16	0.53	2.69	0.12	2.83

Note: Years affected by the impact of the COVID-19 pandemic.
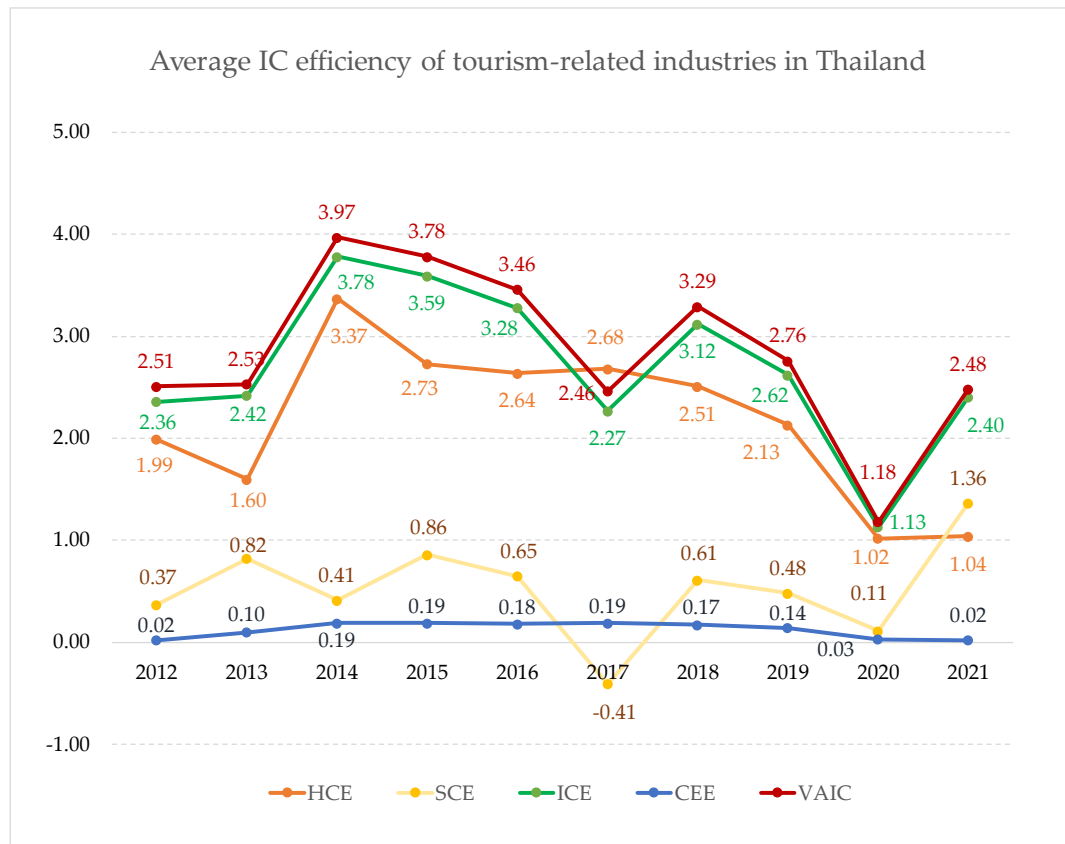
Figure 1. Average efficiency of VAIC and its components for tourism-related firms.

As presented in **Figure 1**, the pattern of VAIC line continually decline since 2014, and this trend is highly similar to the ICE and HCE lines. Unsurprisingly, this similarity occurred since VAIC is calculated from ICE and ICE is previously computed from the aggregation between HCE and SCE. The similarity of trend lines highlights the dependence of VAIC and ICE to HC. This finding emphasizes the significance of HC to overall IC in tourism industries and specifically in the tourism intensively dependent country.

On the other hand, from the chart, the patterns of other IC components, SC and especially CE, seem to be less similar to overall IC performance. This represents that these IC components could contribute very low impacts to the overall IC performance. Although SC and CE could contribute lower impacts to overall IC performance than HC, these components are still highlighted for their significance to performance of tourism industries. Specifically, in the COVID-19 pandemic period, the pattern of overall IC performance seems to be dominated by the efficiency of SC. Hence, from this finding, it highlights the importance and impact of SC in the crisis period.

Furthermore, to better assess IC performance of tourism-related industries of Thailand, this study utilizes the standard efficiency levels of IC proposed by Pulic (2008) and Lazzolino and Laise (2013) as presented in the research methodology section, so the results of interpretation are depicted in **Table 6**. However, regarding the proposed efficiency levels, only one major component (ICE) of VAIC and its two sub components (HCE and SCE) can be interpreted for their efficiencies.

Table 6. Efficiency levels of VAIC and its components for tourism-related firms.

Year	HCE	SCE	ICE
2012	High	High	High
2013	High	Very high	High
2014	Very high	High	Very high
2015	Very high	Very high	Very high
2016	Very high	Very high	Very high
2017	Very high	Very low	High
2018	Very high	Very high	Very high
2019	Very high	High	Very high
2020[*]	Low	Low	Low
2021[*]	Low	Very high	High
Average	Very high	Very high	Very high

Note: Years affected by the impact of the COVID-19 pandemic.

The results of **Table 6** obviously present the high efficiency of all components of VAIC (HCE, SCE and ICE) in the tourism-related industries in Thailand. Almost all annual efficiency of VAIC components is equal or higher than the high efficiency level. This finding highlights the high IC performance of tourism industries in the tourism intensively dependent country, Thailand.

Nevertheless, apart from the periods of strong performance or in the last two years (2020 and 2021), most IC performance were at low level, since, in these time periods, tourism industries especially of the tourism dependent country were affected by severe impacts of the COVID-19 pandemic. In Thailand, there were several causes critically impacting IC efficiency of tourism firms such as the shrinking of tourism demand, travel restriction, social measure, organizational restructuring, and so on.

5. Discussion

As shown in **Table 4**, the IC results show the transportation and logistics sector as the best IC performer, and its major performance substantially comes from HCE. Only the human capital of this business was greater than overall IC of other sectors. The significance of HC to the companies in this sector was also stated by BTS (BTS Group, 2023). Therefore, our finding greatly emphasizes the significance of HC to the businesses or activities directly supporting the tourism industry. The significance of HC also coincides with findings or suggestions of other past related studies in the logistics-related fields (Tromba, 2005; van Hoek et al., 2002; Wu and Chou, 2007). Therefore, to strengthen and maintain the intangible assets of the tourism-related industries, government should continually create and support the development of human capital in all related sectors.

Apart from the best sector, the aviation business had the lowest IC performance among all businesses for both overall and component levels. The aviation sector was perceived as one of businesses heavily relying on tangible or physical assets (e.g., such as aircrafts, equipment, etc.) than intangible assets. However, in this study, there was another major reason leading the sector to the lowest IC capability that was major financial loss and negative performance of NOK company. This airline firm faced

several problems for several past years such as strikes of pilots and airline staffs (Post Today, 2016), high maintenance and fuel costs (FlightGlobal, 2023), etc. also affecting both tangible and intangible performance. The negative impact of NOK overshadows the excellent performance of AOT, Thai airport company, which holds the third-highest performance ranking at the company level.

Although there were various performance levels of IC among tourism-related sectors and firms, all companies had the same pattern of overall performance mainly depending on human capital even the lowest performance company. The majority impact of HC to overall IC found in this study is novel, specifically, in the context of tourism intensively dependent country. However, the significance and remarkableness of tourism staffs in Thailand were widely recognized in several past studies before. Fundamentally, the skills and knowledge of employees in tourism related industry is very important as it impacts directly on customer satisfaction which is reflected in the company's performance and competitive advantages (Butter et al., 2015). This shows that tourism workforces are required not only an educational background, but also a working experience. To increase business competitive advantage in tourism industry and tourism intensively dependent country where service skills of all staffs is the most impact intangible assets, the companies must consider improving the professional skills to their staffs, especially in the post COVID-19 pandemics, when there are many challenges regarding human capital problems such as skill erosion and mismatch skills (Wudhikarn et al., 2024). Therefore, in order to gain a greater market share and success in business performance, the tourism firms should consider to invest in training all service skills for their employees, as well as developing a reskill-upskill policy.

The majority of HC to the overall IC also coincide with some other studies in the different industries and stock markets (Matinfard and Khavari, 2015; Yilmaz and Acar, 2018). HC was broadly identified as the primary component of IC and also the most important intangible assets for sustaining businesses and gaining competitive advantages. Therefore, this emphasizes the significance of HC to overall IC in various businesses. However, from past studies and our findings, the differences of HC impacts between two types of countries (the tourism dependent country and the non-tourism dependent countries) are still unknown. Therefore, to better improve and manage HC following the policies and practices of tourism industries in the more efficient countries, it is necessary to realize the differences between two different types of countries. Hence, this is an improvement opportunity for the future work.

Apart from the majority of HC, other IC components, SC and CE, substantially provided less impacts than HC as presented in **Table 4**. Moreover, generally, SC could deliver more IC values than CE. The phenomenon of greater of SC than CE in high VAIC firms and the higher of CE than SC in low IC efficiency companies is similar to the findings of another study focusing in the media company (Fijałkowska, 2014). Moreover, according to the study with broader scope by examining whole industries, SC could provide more IC impacts than CE (Angkasaputra et al., 2022). Therefore, from past findings and especially our evidence, SC seems able to provide more IC impact than CE. Although many past findings emphasized the higher impact of SC than CE, it still should be noted that there were some conflicting findings found in the different scope of study which is the industry level and also in the different business which is the football club. Therefore, to better understand more about this

phenomenon, the future study examining the impact of SC and CE to overall IC performance especially in the tourism intensively dependent country is highly suggested.

When evaluating the trend of VAIC and its components in **Figure 1**, it clearly depicts that both VAIC and its components, especially HCE, continuously declined in a consistent direction since 2014. The decline of HCE in Thai tourism-related sectors can be attributed to the reduction in tourism's workforce and also human-related expenditures, largely influenced by advancements in automation and transformation technology (Akkapin, 2021). For example, Central Plaza Hotel PCL (CENTEL) adopted automated concierge applications, providing guests with instant access to hotel services, local attractions, and personalized recommendations (CENTEL, 2023), similarly, Asia Aviation PCL (AAV) employs AI-powered chatbots for customer inquiries and automated systems for flight scheduling and crew management (AirAsia, 2019), and Airports of Thailand (AOT) has implemented automated check-in kiosks and advanced baggage handling systems across major airports, streamlining passenger processing and reducing wait times (Airports of Thailand, 2021). Moreover, from **Figure 1**, the decline trend was also notably exacerbated by the impacts of the COVID-19 pandemic during the period of 2020–2021, similar to patterns observed in other countries worldwide.

The significance of HC to IC and financial performance of Thailand's tourism industries is similar to several findings in other domains (Tran and Vo, 2020; Veltri and Silvestri, 2011). Therefore, from this finding, to strengthen IC of tourism-related industries of tourism intensively dependent country, government and firms should focus on the policy and investment positively affecting to HC such as increasing industry academia interaction (Raj, 2008), designing and creating practical trainings, utilizing modernization of technology, adopting employee reward systems, designing efficient organizational structure, etc. (Milovanović, 2017), since the improvement of human resources could significantly develop sustainable smart tourism and finally impact to the economic growth of country (Lombardi et al., 2021).

Apart from the high contribution of HC, other IC components which are SC and especially CE, provided lower impacts. The less contribution of these two components to overall IC performance coincide with other past studies in the tourism-related literature (Angkasaputra et al., 2022; Laing et al., 2010). Nevertheless, regarding the long-term benefits of these components to firms' successes in other businesses (Nimtrakoon, 2015) and also found in some tourism studies (Ognjanović et al., 2022, 2023), the management of SC and CE is still recommended to the tourism-related industries. For example, the innovations, new products, and new services of tourism industries (e.g., service robots, and mobile room keys) are key success factors for high efficiency SC, and also for organizational sustainability. Similarly, financial assets that is a core element of CE is acknowledged as firms' fundamental resources which all tourism companies must own and utilize for achieving businesses' goals. Therefore, to better strengthen the overall IC of firms, both high impact IC (HC) and low impact IC (SC and CE) components must be managed altogether.

Considering firms' performance as assessed by the standard efficiency measures of IC presented in **Table 6**, it apparently shows that tourism-related firms in Thailand, had a very high level of IC performance. This could imply the significance and impact

of IC performance to the tourism-intensively dependent country. Since, generally, the more IC efficiency tourism firms achieve, the more success they experience. This was also found in the past study conducted in the tourism intensively dependent country, Thailand (Na Phayap et al., 2023). This study found the strong performance of IC major components; those of HC and SC could significantly and positively affect the efficiency and effectiveness of tourism firms.

From the results of our study and also past evidence, we could realize the strong efficiency of IC components and also their advantages to the firms' performance. This emphasizes the significance of IC to tourism-related industries in tourism dependent country. Hence, to strengthen IC and firms' performance, companies and also policy maker should concentrate on the improvement of HC in tourism industries following the past crucial suggestions especially updating skills and knowledge of latest trends and technologies (Law et al., 2014), and upskill training (Heredia-Colaço and Rodrigues, 2021; Kim et al., 2005). Similar to SC, to enhance firms' performance in the intensively tourism-dependent country, the crucial implications consist of developing innovation, utilizing social media to strengthen relationships as well as reputation, and improving social responsibility. While this study yields several crucial findings with potential contributions to the field of tourism, significant limitations in the existing literature persist, warranting further investigation. One valuable area for future research is the examination of differences in intellectual capital (IC) impacts and IC performance between tourism-dependent and non-tourism-dependent countries. A deeper understanding of these distinctions and the effects of IC could inform more effective management strategies across various types of countries. Therefore, there is a meaningful opportunity to empirically explore this underexamined topic.

6. Conclusion

This study investigates the underexplored topic of intellectual capital (IC) efficiency within tourism industries in a highly tourism-dependent country. Specifically, we analyze IC performance at both holistic and component levels across several tourism-related sectors that have not previously been examined. This research utilizes annual data from 20 tourism-related companies spanning 2012 to 2021. By employing the VAIC methodology and standard IC efficiency metrics, we gain insights into IC performance within these high-value industries, particularly in a leading tourist destination country. The adoption of VAIC has led to several significant findings, specifically from the perspective of a tourism-intensive country: (1) the overall IC efficiency of both high and low tourism-related firms was predominantly driven by HC, underscoring the critical role of HC in tourism businesses within tourism-dependent countries, (2) firms with high IC efficiency generally exhibited SC performance exceeding CE performance, whereas firms with low IC efficiency showed SC efficiency lower than CE efficiency. However, both SC and CE contributed only minimally to overall IC efficiency, (3) across the tourism industry, the efficiency of overall IC and its components (HCE, SCE, and ICE) remained consistently high throughout the study period, with the exception of the last two years, during which the tourism sector faced significant challenges due to the COVID-19 pandemic, and (4) SC and CE provided minimal contributions to the tourism industry

in the tourism-intensive country studied. Notably, this contrasts with some previous findings that emphasized the importance of these IC components in such a context. These insights offer a nuanced understanding of IC efficiency in tourism industries within a tourism-dependent economy, highlighting the unique contributions and limitations of various IC components in this setting.

Overall, this research firstly explores the IC performance of under-exploration area which is the tourism-related industry in the intensively tourism-dependent country. The study demonstrates strong performance of IC in this intensively tourism dependent country. Moreover, from the exploration, we further perceive the major source of intangible assets mainly came from human assets. Therefore, to strengthen this capital and also to provide recommendations to both practitioners and policy makers in the tourism dependent economy, crucial practices from related studies were suggested especially updating new technology skills, and reskill and upskill training.

Our study reveals certain gaps related to the research methodology and sample groups. Additionally, some findings require further investigation to better explain the observed phenomena. Therefore, potential areas for improvement and future research are suggested as follows: (1) the distinctions in HC between tourism-dependent and non-tourism-dependent countries remain underexplored. To effectively enhance HC through policies and practices suited to tourism-dependent countries, it is essential to understand the similarities and differences in IC between these two country types, (2) a conflicting finding emerged, with higher values of SC than CE observed, contrasting with a previous study focused on a different industry and company-level performance. To clarify this phenomenon, an empirical study examining differences among IC components in tourism-dependent countries is recommended, and (3) our literature review and discussion identified a lack of comparative studies on the impact of IC on firm performance between tourism-dependent and non-tourism-dependent countries. A deeper understanding of these differences and similarities would provide insights into effective management practices for countries with less efficient IC performance.

Finally, it should be noted about limitations of this study which can be improved in the future study. First, there are limitations of sample sizes which are restricted to small size and also comes from only one tourism dependent country. To improve this issue, future study should increase the sample size by examining more companies and more intensively tourism-dependent countries. Second, this study utilizes the original VAIC. Therefore, some of significant intangible assets are not included into our consideration for example relational capital, social capital, etc. To address this issue, other IC measurement methods which could measure more IC components than VAIC are suggested in future study.

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