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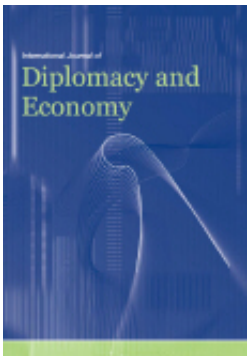


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# Intellectual capital and financial performance nexus in Indian hospitality sector: a panel data analysis

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# Intellectual capital and financial performance nexus in Indian hospitality sector: a panel data analysis

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**Abstract:** The present study empirically examines the effects of Intellectual Capital (IC) components on business performance indicators of Indian hospitality sector. Further, it explores the role of interactions among IC components to enhanced corporate performance. The study adopted the Modified Value-Added Intellectual Coefficient (MVAIC) model to measure IC and multiple regressions models to analyse the panel data, using a sample of top 50 Indian hotels. The findings demonstrated that the most important and statistically significant variables are human capital efficiency, capital employed efficiency and interaction between human and structural capital efficiencies which positively influence the hotel's performance, measured through profitability and productivity indicators. The findings also reveal IC as strategic source of enhanced corporate performance. Thus, it may assist the management, stakeholders, policymakers and government in developing economies like India to enhance and utilise their IC sources effectively and efficiently, particularly in hospitality sector.

**Keywords:** intellectual capital; financial performance; interaction effects; hospitality sector; panel data analysis.

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## 1 Introduction

World economies are shifting from production to knowledge-based economies, hence economic growth based on innovation and knowledge is the urge of time, since these are recognised as the engine of development and competitive advantage differentiator. Academicians and scholars have acknowledged the fact that organisations rely on knowledge-embedded assets rather than financial and physical assets (Marr et al., 2003; Verbano and Crema, 2016) and reached a consensus that such assets drive towards sustainable competitiveness (Xu and Wang, 2018; Gross-Gołacka et al., 2020). Knowledge-embedded assets that arise from the creation of Intellectual Capital (IC), have become a pre-eminent economic source for competitive advantage. In intellect-intensive economies, IC and the ways of recognising and recording it, are pivotal to the growth of organisations (Singh et al., 2016). In addition, the knowledge-based view considers IC as an intangible asset which contributes to sustained organisational competitive advantage (Martín-de Castro et al., 2019; Bollen et al., 2005), improved internal control, escalated assets management, and reduced risk-related decisions (Al-Musalli and Ismail, 2012). However, being a contemporary issue of high relevance, accurate measurement and reporting of IC remains a complex and challenging area of accountancy and management theories and practices (Abdi et al., 2018). Consequently, more attention needs to be paid to this issue, as organisational value depends on IC components rather than traditional resources such as land, labour and capital (Bontis et al., 1999).

One of the foremost notable omissions of traditional accounting system is the lack of demonstration of knowledge capital employed and emphasis on the assessment of tangible assets only, which results in a mismatch between book value and market value. The excess of market value over book value is termed as ‘hidden value’ of the organisations (Edvinsson and Malone, 1997), which arises due to unrecorded IC in contemporary management theory, hence failed in providing the true and fair picture of organisations’ financial health. Various scholars and academicians have argued that the lack of measurement of IC and its components results in such an accounting mismatch, as IC creates value for the organisation and the argument is supported by large number of studies (Ginesti et al., 2018; Pal and Soriya, 2012) that have delineated that IC is significantly associated with profitability and productivity.

Researchers like Jardon and Maria (2012); Lopes et al. (2016) and Novas et al. (2017) sought two types of contribution to measure the influence of IC on business performance: theoretical (expanding the conceptual knowledge of IC and assets embodied in it and their effects on financial performance) and empirical (role of IC and its constituents as key competitive differentiators in organisational profitability).

According to Marr et al. (2003), IC is still in theory-building phase, and the empirical avenue of research is yet to be explored.

Furthermore, in the era of knowledge-based and dynamic nature of economies, avoiding the significance of IC in organisational value creation is not possible. Despite the significant importance of IC, there is a lack of universally adopted method to recognise and record it in the financial statements and annual reports of companies. Present reporting system doesn't properly describe the intrinsic worth of the organisation, which contributes to the issue of asymmetric divulgation for stakeholders and adversely impacts the quality of financial statements (Bukh et al., 2005). In India, IC reporting policies are at nascent stage in emerging industries such as hospitality, hence the authors have investigated the role of IC in developing economies and industries.

## *1.1 IC and hospitality sector*

The hospitality sector is a traditional sector with a moderate level of intellect-embedded resources and innovation. India is presently in the course of economic transition, and the tourism industry is one of the rapidly growing industries. In 2021, the travel and tourism industry contributed approximately 18% ($178 billion) to the Indian GDP. The growth of hospitality sector in India is propelled by the growth of tourism industry. Consequently, Indian as well as foreign hotel-chains have evolved tremendously in Indian landscape and have established cohesive standards according to management level, hotel scale, construction equipment and service quality. However, maintaining and sustaining financial performance remains a persistent problem for this sector.

Given the growing dynamism of the tourism industry, the hospitality sector must constantly create and manage IC to enhance its proficiencies to capitalise on market opportunities (Romero and Tejada, 2020; Rienda et al., 2020). A major challenge for this sector is to think ahead of the reconfiguration phase and anticipate the required changes (Hughes and Moscardo, 2019) to respond to possible transformations. In recent studies, researchers and academicians have concluded that IC is a key contributor to sustainable organisational growth. Subsequently, it is crucial to analyse how IC components and their interactions can impact the business performance of Indian hospitality sector. This study designs an empirical analysis to measure the association between IC and financial performance using hotels' profitability, productivity and earning capability.

Present study adds to the IC literature in following respects. India, an emerging Asian market, is economically dynamic in terms of growth and technology adoption. Unlike in developed countries, in India, direct policy implications are vital for IC fraternity, including academicians, practitioners and policymakers. Furthermore, in this study, the MVAIC model, with interaction variables, is applied for IC measurement. The presence of interaction terms indicates that the effect of one predictor variable on the response variable is different for different values of the other predictor variable. The authors believe that the research findings provide direct insights and practical implications for IC fraternity in India, particularly concerning policies that address the efficiency and effectiveness of IC management in hospitality sector.

## *1.2 Statement of the problem*

Review of related studies brings forth the fact that majority of the literature on IC concentrated on developed economies. However, the global prosperity and stability

progressively depends on developing economies because of the huge growth opportunities with large potential market and low labour cost. An emerging economy with different socio-economic and political settings requires an understanding of IC evolution and its impact on organisational performance (Firer and Williams, 2003). Further, hospitality sector may assist developing countries like India, more in addressing their various challenges as it is among the swiftest expanding sectors in terms of foreign exchange earnings, capital investment and job creation. This sector boasts the highest employment-to-investment ratio among all sectors, and India's primary challenge is finding ways to employ its continuously expanding population. Tourism industry directly generates employment opportunities in travel agencies, airlines, passenger ships, hotels & restaurants and as a result of the spread effect, produces jobs in different industries such as construction, manufacturing, telecommunication and retail trade, etc.

This study differs from previous studies in that the authors introduced interaction variables while measuring the impact of IC components on organisational performance. Further, robust inferences are drawn from underlying heterogeneous datasets using panel fixed effects, controlling all time-invariant unobserved within-individual variation among individual firms (Baltagi, 2008), which past studies lack. Following the introduction section, the remainder of the study is structured as follows. Section 2 presents the relevant literature to identify research gaps. Section 3 discusses the research methodology and measurement of the study variables. The empirical results and interpretations thereof are furnished in Section 4, followed by policy implications and conclusion in Section 5.

## 2 Review of literature

IC is a rapidly evolving concept (Mehralian et al., 2012; Kamath, 2017) that has been alluring the consciousness of academicians, practitioners and researchers over the last two decades. Previous studies fixate on how IC components improve organisational performance across different industries (Xu and Wang, 2018; Ozkan et al., 2017; Bontis et al., 2015; Joshi et al., 2013; Pal and Soriya, 2012) but few studies analyse the inter-relationships among these IC components and their impact on financial performance of the firms. According to Bontis et al. (2015) and Sardo et al. (2018), the synergetic value of IC is rooted not only in its components but in the interactions among these components also. Sydler et al. (2014) claimed that the aforementioned three-dimensional categorisation of IC offers perspicuous and least ambiguous cataloguing of IC.

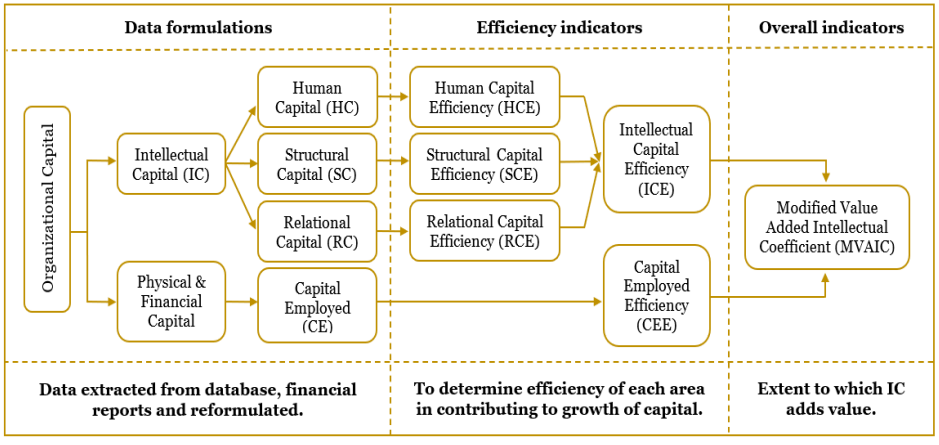
### *2.1 Measurement techniques of IC*

There is a multi-faceted description of IC as proposed by IC theorists. Hence, the literature provides many generic definitions of IC with no consensus on a single definition. Since IC is regarded as an important strategic source in knowledge-based economies (Zerenler and Gozlu, 2008), academicians and researchers propounded various techniques for its evaluation (see Appendix 1). The Value-Added Intellectual Coefficient (VAIC™) model, developed by Dr. Ante Pulic in 2000, is among the most significant contributions for measuring IC. It evaluates organisational efficiency by categorising total worth into two components: Intellectual Capital Efficiency (ICE) and physical assets, or Capital Employed Efficiency (CEE). ICE is further classified into

Human Capital Efficiency (HCE) and Structural Capital Efficiency (SCE). This coefficient materialises actual organisational worth and evaluates the intellectual potential. A higher value of such coefficient reveals a superior mechanism for value creation. This model is universally acclaimed and accepted by various contributors (Goh, 2005; Pal and Soriya, 2012; Joshi et al., 2013) to establish the association between IC and financial performance. However, Stale et al. (2011) criticise the VAIC$^{TM}$ model by denoting that it merely measures the labour efficiency and organisational capital investments. Chu et al. (2011) contended that the model could not assess the level of IC in case of negative figures that undervalued corporate risk (Maditinos et al., 2011). Furthermore, interaction effects between IC components and physical capital cannot be contemplated (Dzenopoljac et al., 2017). However, despite all the criticisms, it is the only quantitative measurement model available for computing IC through reliable and audited financial information (Clarke et al., 2011).

Therefore, to address the above-mentioned constraints of VAIC$^{TM}$, recent studies (Xu and Li, 2022; Tiwari, 2022; Xu and Liu, 2020) have applied the Modified VAIC (MVAIC) model, which includes other constituents of IC, namely relational and innovation capital. Since its inception, this model has been extensively applied in empirical studies to measure organisational IC (Tran and Vo, 2022; Mohammad and Bujang, 2019; Xu and Wang, 2018). Further details about the estimation of the MVAIC model are explained in the methodology section.

**Figure 1** Modified value-added intellectual coefficient (MVAIC)




Taxonomy of IC as synthesised from the literature provides three interconnected constructs. First, Human Capital (HC) represents the stock of applied tacit and explicit knowledge accumulated through personal traits and intellectual abilities, such as education, experience, skills and behavioural attitude, aimed at generating economic value and increasing organisational efficiency (Stewart, 1997; Anam et al., 2012; Cohen et al., 2014). The significance of HC lies in its role as a driver of innovations and renovations which eventually influences organisational performance. Second, Structural Capital (SC) pertains to the supportive non-physical infrastructure, strategies, procedures, and proprietary databases within firms that enable HC to function effectively (Bounfour, 2002; Anam et al., 2012). Third, organisational Relational Capital (RC) reflects the value

created through relations between a firm and its constituents, including competitors, suppliers, customers, marketing channels, and stakeholders involved in business activities and the reputation of firm based on its brand portfolio, products and services offered and transactions (F-Jardón and Martos, 2009). It epitomises the total available resources as well as the potential resources which can emerge from organisational and personal networks (Henry, 2013). Finally, Capital Employed (CE) comprises tangible resources, that is, physical and financial capital efficiency, which allow HC to contribute towards value creation (Chen-Goh, 2005; El-Bannany, 2008).

### *2.2 Magnitude of IC in enhanced performance of hospitality sector*

Despite being among the most obvious representatives of the service industry, hospitality sector is not necessarily considered as intellect-intensive sector (Engström et al., 2003). Consequently, IC literature lacks studies in hospitality sector. Most of the studies in the service industry have predominantly focused on two sectors: financial and insurance (Joshi et al., 2013; Mondal and Ghosh, 2012; Ting and Lean, 2009; Kamath, 2007). Engström et al. (2003) further contended that employees of the organisation and their knowledge are the linchpin constituents of the success of hospitality sector. Rudež and Mihalič (2007) concluded that IC components, HC and SC ensure the service quality in hospitality sector and are capitalised through organisational alliances constituted with primary stakeholders. Bontis et al. (2015) investigated the association between IC components and business performance of Serbian hotels and concluded that human, structural, physical and financial capital positively affects the financial performance. Nevertheless, they realised that the physical and financial capital predominantly influenced the financial performance of Serbian hotels.

Vale et al. (2022) investigated micro, medium and small-sized Portuguese hotels and the results suggested that VAIC is positively and significantly associated with hotels' financial performance. More specifically, HCE and CEE are the most statistically significant dimensions. In another study, Kim et al. (2012) found that SC and RC positively impact the business performance of Korean upper-upscale hotels, whereas HC impacts the business performance indirectly. Babajee et al. (2020) demonstrate the effects of IC components on the financial performance of Mauritian hotels using decadal data (2007–2017) of 43 hotels and the results are in tune. IC enhances firm's financial performance, with a reported higher impact in long-term as compared to short-term. The findings affirm that hotels' financial performance is also a significant determinant of IC, recommending the existence of reverse causal relationship. Liu and Jiang (2020) assessed the moderating role of brand-equity, IC and social capital in lavish hotels in China. The study reveals the moderating role of managerial liaisons that reinforce the association between brand-equity and social capital development. Zeglat and Zigan (2013) conducted a primary study of Jordanian four-and-five-star hotels and establish that all components of IC have significant and positive association with financial performance. Kırıcı Tekeli and Özkoç (2022) revealed that personality traits (HC) in tourism sector have an intermediary role in problem-solving skills.

### *2.3 Research gap*

From the literature review, it is apparent that few studies have empirically examined the association between IC and hotels' financial performance (Engström et al., 2003; Walsh

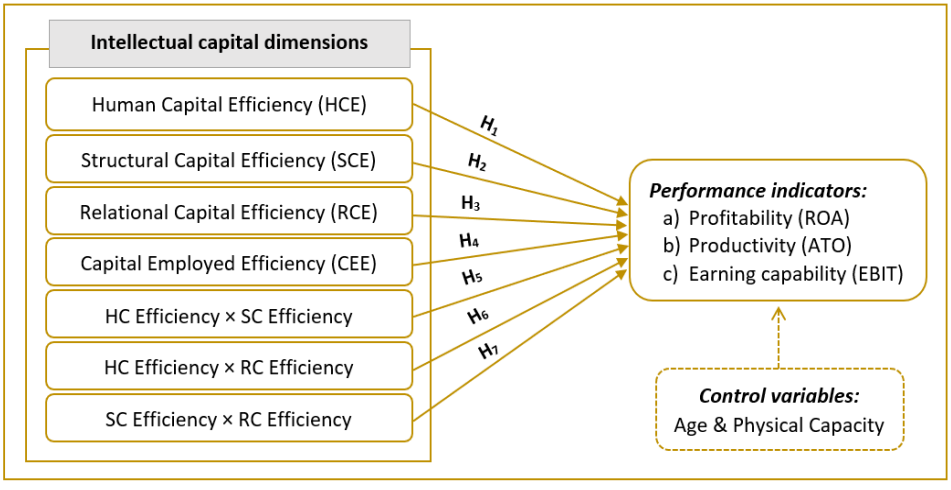
et al., 2008; Laing et al., 2010). Moreover, the preponderance of studies has focused on hotel firms located in industrialised and developed economies, with few studies conducted in developing countries such as India, where the hospitality sector is one of the fastest growing sectors. Moreover, India enjoys large potential of HCE and SCE, offering immense scope for examining and taking advantage of IC efficiency. Furthermore, the application of interaction variables is lacking in the literature. Incorporating interaction variables into a regression model can significantly inflate the cognizance of associations among study variables. The present study attempts to bridge this gap in the IC and hospitality literature.

## 3 Research methodology

### *3.1 Database*

The data used in present study are extracted from the Prowess for Interactive Querying (ProwessIQ) database, managed by the Centre for Monitoring Indian Economy (CMIE) Private Limited, which provides the financial information of Indian listed companies. Audited information, particularly annual reports, is the source of this database. It provides time-series data from 1989–90 onwards. Sample firms are selected according to market capitalisation and decadal data are collected from 2012 to 2021. Thus, the study uses a balanced panel data, with 50 firms and 10 firm-years, providing 500 observations.

**Figure 2** Research framework




*Source*: Authors' compilation.

### *3.2 Research objectives*

This study analyses the Indian hotel industry for the purpose of measuring the contribution of various components of IC with interaction variables and their association with Return on Assets (ROA) as profitability indicator, Assets Turnover Ratio (ATO) as productivity indicator, and Earnings before Interest and Tax (EBIT) as earnings

capability indicator. Correlation and regression (fixed and random) models have been applied to the dataset.

### *3.3 Estimation method and variables' measurement*

In this study, the MVAIC model is used to measure IC, which is an indicator-based financial approach to estimate and provide a convenient measure of firms' IC (Tran et al., 2020; Xu and Li, 2019; Nimtrakoon, 2015; Vishnu and Gupta, 2014). According to this model, Value Added (VA) is the difference between net revenue (output) and cost of goods sold (input) of the firms. It stipulates the residual value after deducting all expenditures from revenue, excluding employees' costs (Tran and Vo, 2022). Further, output is the revenue generated during a fiscal year by selling products (tangibles) and services (intangibles) while input includes factors that contribute to the production of output, that is, the sum of total expenditures incurred by the firms towards purchase of inputs for running business activities. Here, compensation and other costs incurred on employees are excluded as these are treated as investment, not expenditure. Kharal et al. (2014) mathematically expressed it as:

$$Value\ Added\left(VA\right) = Output\left(OUT\right) - Input\left(IN\right)$$

According to this approach, MVAIC consists of four elements: HCE, SCE, RCE and CEE. These efficiencies are expressed as follows:

$$MVAIC = HCE + SCE + RCE + CEE$$

HCE quantifies the VA generated per monetary unit invested in HC. SCE measures the VA in the organisational worth through the proper use of SC. CEE appraises the efficiency of CE, which includes organisational net worth, i.e., physical and financial capital. RCE represents the contribution of RC in creating value.

$$Human\ Capital\ Efficiency\left(HCE\right) = \frac{Value\ Added\left(VA\right)}{Human\ Capital\left(HC\right)}$$

$$Structural\ Capital\ Efficiency\left(SCE\right) = \frac{Structural\ Capital\left(SC\right)}{Value\ Added\left(VA\right)}$$

$$Relational\ Capital\ Efficiency\left(RCE\right) = \frac{Relational\ Capital\left(RC\right)}{Value\ Added\left(VA\right)}$$

$$Capital\ Employed\ Efficiency\left(CEE\right) = \frac{Value\ Added\left(VA\right)}{Capital\ Employed\left(CE\right)}$$

Researchers commonly use interaction variables in social science research to analyse the simultaneous impact of explanatory variables on dependent variables. Interaction variables were applied to measure the moderating effects of IC components on financial performance. The purpose of such inclusion is to determine the extent to which interaction variables increase the explanatory power of the proposed model. However, the application of interaction variables in IC literature is still in its infancy. This study introduces three interaction variables (based on all possible combinations of IC

components) to examine the simultaneous impact of explanatory variables on the response variables by adding multiplicative terms in linear regressions: i) HCE×SCE, ii) HCE×RCE and iii) SCE×RCE.

Table 1 presents the variables (dependent, independent and control) employed in the study and their measurements. ROA, ATO and EBIT are the proxies for business performance, whereas IC dimensions, CE, and the interaction between IC dimensions serve as the independent variables. Physical capacity and age remain the control variables.

**Table 1** Variables and measurement

| *Variables* | *Measurement References* | *References* |
|---|---|---|
| *Dependent variables* | | |
| Return on Assets | Ratio of net profit to total assets | Bontis et al. (2005); Laing et al. (2010); Soetanto and Liem (2019); Singla (2020) |
| Assets Turnover Ratio | Ratio of net sales to total assets | Kamath (2007); Mondal and Ghosh (2012); Nadeem et al. (2018); Xu and Li (2019) |
| Earnings before interest and tax | Revenue – (COGS + operating expenses) | Dzenopoljac et al. (2017); Xu and Li (2019); Xu and Wang (2019) |
| *Independent variables* | | |
| a) *Intellectual capital dimensions* | | |
| Human Capital (HC) | Employees' costs including salaries, PF, gratuities, welfare & training costs etc. | Bontis et al. (2000); Kamath (2007); Maditinos et al. (2011); Vishnu and Gupta (2014); Chowdhury et al. (2019) |
| Structural Capital (SC) | Innovation and Research & development expenses | Bontis et al. (2005); Nimtrakoon (2015); Tiwari (2022); Chowdhury et al. (2019) |
| Relational Capital (RC) | Marketing, selling, distribution and advertising expenses | Ferenhof et al. (2015); Yaseen et al. (2016); Sardo et al. (2018) |
| b) *Physical capital* | | |
| Capital Employed (CE) | Physical and financial capital employed | Bontis et al. (2000); Kamath (2007); Singh et al. (2016); Poh et al. (2018); Tiwari (2022) |
| c) *Interactions between intellectual capital dimensions* | | |
| *HCE × SCE* | HC multiplied by SC | Kamukama et al. (2010); Sardo et al. (2018); Tiwari and Vidyarthi (2018); Bayraktaroglu et al. (2019); Tiwari (2022) |
| *HCE × RCE* | HC multiplied by RC | |
| *SCE × RCE* | SC multiplied by RC | |
| *Control variables* | | |
| Age | Number of years since incorporation | Ahmad and Ahmad (2016); Kamath (2017); Sardo et al. (2018); Kaawaase et al. (2020) |
| Physical Capacity | Fixed assets to total assets ratio | Pal and Soriya (2012); Smriti and Das (2018) |

*Source*: Authors' compilation.

### 3.4 Hypotheses development

In order to achieve the aforementioned objectives, seven testable research hypotheses have been constructed. In the first three hypotheses ($H_1$, $H_2$ and $H_3$), it is hypothesised that IC components, HCE, SCE and RCE, respectively, of Indian hotel firms positively impact business performance as IC leads to innovation, which in turn creates value, especially in knowledge economies (Bontis et al., 2015; Li and Liu, 2018; Sardo et al., 2018; Liu and Jiang, 2020). Moreover, Resource-Based Theory (RBT) considers IC as a vital source to drive performance. Next, it is hypothesised ($H_4$) that CEE positively impacts the business performance of Indian hotels. The existence of CE is essential to allow HC to contribute towards value creation (Chen-Goh, 2005; El-Bannany, 2008). Finally, in an attempt to measure the impact of interaction variables, interdependency is assumed between IC components that complement each other and enhance business performance, rather than working in isolation. Hence, it is hypothesised ($H_5$, $H_6$ and $H_7$) that interaction variables when incorporated into the model, increase its explanatory power, as interaction variables moderate the effect of predictor variables on outcome variable (Franzese and Kam, 2009). Therefore, if the RBT performs as advocated in the literature, the proposed measurement model of IC should contribute to the higher performance of Indian hotel firms.

### 3.5 Regression models

The relevance of IC determinants to business performance is accredited not only to individual contributions but also by the interactions between these determinants. Hence, the impact of such interactions among IC determinants on business performance was examined using the following estimation models:

$$\mathrm{M}_1)\quad ROA_{i,t} = \alpha + \beta_1 HCE_{i,t} + \beta_2 SCE_{i,t} + \beta_3 RCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 Age_{i,t} + \beta_6 PC_{i,t} + \varepsilon_{i,t}$$

$$\mathrm{M}_2)\quad ROA_{i,t} = \alpha + \beta_1 HCE_{i,t} + \beta_2 SCE_{i,t} + \beta_3 RCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 \left(HCE_{i,t} \times SCE_{i,t}\right) + \beta_6 \left(HCE_{i,t} \times RCE_{i,t}\right) + \beta_7 \left(SCE_{i,t} \times RCE_{i,t}\right) + \beta_8 Age_{i,t} + \beta_9 PC_{i,t} + \varepsilon_{i,t}$$

$$\mathrm{M}_3)\quad ATO_{i,t} = \alpha + \beta_1 HCE_{i,t} + \beta_2 SCE_{i,t} + \beta_3 RCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 Age_{i,t} + \beta_6 PC_{i,t} + \varepsilon_{i,t}$$

$$\mathrm{M}_4)\quad ATO_{i,t} = \alpha + \beta_1 HCE_{i,t} + \beta_2 SCE_{i,t} + \beta_3 RCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 \left(HCE_{i,t} \times SCE_{i,t}\right) + \beta_6 (HCE_{i,t} \times RCE_{i,t}) + \beta_7 \left(SCE_{i,t} \times RCE_{i,t}\right) + \beta_8 Age_{i,t} + \beta_9 PC_{i,t} + \varepsilon_{i,t}$$

$$\mathrm{M}_5)\quad EBIT_{i,t} = \alpha + \beta_1 HCE_{i,t} + \beta_2 SCE_{i,t} + \beta_3 RCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 Age_{i,t} + \beta_6 PC_{i,t} + \varepsilon_{i,t}$$

$$\mathrm{M}_6)\quad EBIT_{i,t} = \alpha + \beta_1 HCE_{i,t} + \beta_2 SCE_{i,t} + \beta_3 RCE_{i,t} + \beta_4 CEE_{i,t} + \beta_5 \left(HCE_{i,t} \times SCE_{i,t}\right) + \beta_6 \left(HCE_{i,t} \times RCE_{i,t}\right) + \beta_7 \left(SCE_{i,t} \times RCE_{i,t}\right) + \beta_8 Age_{i,t} + \beta_9 PC_{i,t} + \varepsilon_{i,t}$$

where $i = 1, ..., n$ and $t = 1$, $t$ denote the firm and year respectively; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ and $\beta_9$ are the presumed parameters; and $\varepsilon$ represents the measurement error term.

## 4 Empirical results and analysis

### *4.1 Descriptive statistics, normality test and correlation analysis*

The descriptive statistics are displayed in Table 2. For the analysis period (2012 to 2021), it can be observed that profitability, measured by ROA, presents a positive mean value of 0.263, implying that hotels generally don't face any difficulty in making a profit. However, the standard deviation of 0.113 points that Indian hotels' profitability exhibits certain volatility. The HCE is the most influential determinant with the highest mean value of 0.868, compared to that of CEE, SCE, and RCE, which is consistent with previous findings (Nimtrakoon, 2015; Rahman and Ahmad, 2012). Further, the combined mean value of IC components (1.684) is much higher than the mean value of tangible component, i.e., CEE (0.453), which indicates that hotels generate value more efficiently using IC rather than conventional resources.

**Table 2** Descriptive statistics

| *Variables* | *Mean* | *Median* | *Std. Dev.* | *Skewness* | *Kurtosis* |
|---|---|---|---|---|---|
| ROA | 0.2625 | 0.2636 | 0.1127 | 0.2074 | 3.0825 |
| ATO | 0.9219 | 0.7359 | 0.6095 | 2.0660 | 8.2447 |
| EBIT | 0.1279 | 0.1205 | 0.1313 | 0.8811 | 11.4839 |
| HCE | 0.8680 | 0.3383 | 0.2461 | –0.5300 | 36.9228 |
| SCE | 0.6320 | 0.6617 | 0.2461 | 0.5300 | 36.9228 |
| RCE | 0.1840 | 0.0870 | 0.3306 | 4.6138 | 28.8246 |
| CEE | 0.4529 | 0.3706 | 0.3034 | 2.7458 | 16.4647 |
| HCE×SCE | 0.1721 | 0.2133 | 0.3742 | –16.9464 | 320.8655 |
| HCE×RCE | 0.0703 | 0.0272 | 0.2779 | 19.0203 | 407.2526 |
| SCE×RCE | 0.1137 | 0.0586 | 0.3061 | 0.1990 | 61.0489 |

*Source*: Authors' calculations.

The Shapiro-Wilk test was applied to check the normality of the data. The null hypothesis of the test is that the population is normally distributed, with an alpha value of 0.05. The results of the normality test (see Table 3) show that the variables, predictor as well as response, do not have normal data distribution ($p$<0.05). This indicates that further analysis should apply the Pearson correlation coefficient ($r$), which does not assume normality but is only an exhaustive measure of associations.

**Table 3** Normality test

| *Variables* | *Shapiro-Wilk W* | *Significance* |
|---|---|---|
| ROA | 0.135017 | 0.0000 |
| ATO | 0.918058 | 0.0000 |
| EBIT | 0.515863 | 0.0000 |
| HCE | 0.284589 | 0.0000 |
| SCE | 0.098423 | 0.0000 |
| RCE | 0.123709 | 0.0000 |
| CEE | 0.899402 | 0.0000 |
| HCE×SCE | 0.320392 | 0.0000 |
| HCE×RCE | 0.189736 | 0.0000 |
| SCE×RCE | 0.088166 | 0.0000 |

*Source:* Authors' calculations.

Table 4 displays the results of the correlation analysis, which show that the financial indicator, EBIT, is significantly and positively correlated with HCE and SCE but negatively correlated with RCE. Regarding the productivity indicator, ATO was significantly associated with RCE and CEE. In addition, RCE and the interaction variables were identified as elements that had the least significant association with financial performance indicators. These outcomes are in tune with the results of Xu and Li (2019) and Nimtrakoon (2015).

**Table 4** Correlation matrix

| *Variables* | *ROA* | *ATO* | *EBIT* | *HCE* | *SCE* | *RCE* | *CEE* | *HCE×SCE* | *HCE×RCE* | *SCE×RCE* |
|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 1.000 | | | | | | | | | |
| ATO | 0.225 | 1.000 | | | | | | | | |
| EBIT | 0.724 | 0.224 | 1.000 | | | | | | | |
| HCE | 0.185* | 0.123 | 0.140* | 1.000 | | | | | | |
| SCE | 0.100* | –0.162 | 0.242* | 0.593 | 1.000 | | | | | |
| RCE | –0.081 | 0.233* | –0.176 | 0.032 | 0.348 | 1.000 | | | | |
| CEE | 0.554* | 0.394* | 0.186 | 0.221* | 0.131 | 0.125 | 1.000 | | | |
| HCE×SCE | 0.150 | –0.034 | 0.271* | 0.401 | 0.305 | –0.103 | 0.102 | 1.000 | | |
| HCE×RCE | –0.157 | 0.029 | –0.195 | 0.397 | –0.269 | 0.505 | 0.053 | 0.228* | 1.000 | |
| SCE×RCE | 0.145 | 0.163 | 0.096 | –0.325 | –0.092* | 0.447 | –0.088 | 0.270 | 0.429 | 1.000 |

Note: * represents level of significance at 5%.

Kennedy (1985) endorsed that if the correlation coefficient between two explanatory variables exceeds 0.8, it is problematic in the context of multicollinearity. Accordingly, multicollinearity does not exist in the above results.

### *4.2 Results of regression models*

Levin, Lin & Chu unit root test was performed to examine the stationarity of the data, before running the OLS regression. The result of unit root test leads to the rejection of its hypothesis. Both, Fixed Effect (FE) and Random Effect (RE) models were applied to panel data to perform a comparative analysis and the outputs were checked using the Hausman Specification Test (Hausman, 1978). In circumstances, in which both models provide significant results, the results of the RE model are considered. The impact of IC determinants with interaction variables on business performance was analysed using multiple regression analysis. Table 5 presents the empirical analysis, where ROA is the dependent variable. Results of the regression models aim to investigate how hotels' financial performance depends on the individual determinants of IC and interactions thereof. The empirical results of both the models (FE and RE) are provided in the table. In models-1 and 2, the results of Chi-square test actuate to reject the null hypothesis of the Hausman test, which indicates that the FE model is consistent and more appropriate.

**Table 5** Regression results of profitability indicator, i.e., ROA

| *Variables* | *Model-1* | | *Model-2* | |
|---|---|---|---|---|
| | *FE* | *RE* | *FE* | *RE* |
| Intercept | 3.5467<br>(1.7059) | 4.5660*<br>(2.3257) | 6.4751*<br>(3.1202) | 7.1213*<br>(3.6019) |
| HCE | 0.0122*<br>(6.0062) | 0.8517*<br>(6.7210) | 0.6073*<br>(9.4729) | 0.5391*<br>(9.8347) |
| SCE | 0.0709*<br>(0.0675) | 0.1840<br>(0.1784) | 0.3522*<br>(0.3473) | 0.2856*<br>(0.2868) |
| RCE | –2.6241<br>(–2.1518) | –1.6790<br>(–1.4754) | –4.1874<br>(–1.7308) | –4.5071<br>(–1.9747) |
| CEE | 6.4365*<br>(13.3072) | 7.5617*<br>(15.1237) | 6.5126*<br>(14.2355) | 7.7209*<br>(16.2475) |
| HCE×SCE | – | – | 6.7780*<br>(7.8738) | 6.5433*<br>(7.8724) |
| HCE×RCE | – | – | 7.0513*<br>(2.7187) | 8.2650*<br>(3.3293) |
| SCE×RCE | – | – | –0.8180<br>(–0.1409) | 3.2561<br>(0.5902) |
| Age | 0.0802*<br>(2.5004) | 0.05601*<br>(2.2419) | 0.0738*<br>(2.4354) | 0.0449<br>(1.8856) |
| Physical Capacity | 2.3296<br>(0.8348) | 0.8449<br>(0.3444) | –0.3858<br>(–0.1472) | –1.8981<br>(–0.8175) |
| $R^2$ | 0.6270 | 0.4567 | 0.6783 | 0.4425 |
| Adjusted $R^2$ | 0.5855 | 0.4496 | 0.6403 | 0.4332 |
| *F*-stats | 15.1004 | 50.1893 | 17.8503 | 47.6304 |
| Prob. (*F*-stats) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| D-W stats | 1.7763 | 1.9631 | 1.8333 | 1.7301 |
| Hausman test ($\chi^2$) | 11.5713 (0.0422) | | 14.9199 (0.0093) | |

Note: * depicts level of significance 5%; *t*-values are in parentheses.

Assessment of Table 5 disseminates that in model-1, HCE coefficient ($\beta$ = 0.0122, $t$ = 6.01), SCE coefficient ($\beta$ = 0.0709, $t$ = 0.07), and CEE coefficient ($\beta$ = 6.4365, $t$ = 13.31) are significantly positive, consistent with Vale et al. (2022), while RCE coefficients are negatively correlated, though insignificant. This indicates that in terms of profitability, hotels with greater HC, SC, and physical capital perform better. Thus, ROA being the dependent variable, the formulated hypotheses $H_1$, $H_2$ and $H_4$ cannot be rejected. In model-2, HCE coefficient ($\beta$ = 0.6076, $t$ = 9.47), SCE coefficient ($\beta$ = 0.3522, $t$ = 0.35), coefficient of interaction between HCE & SCE ($\beta$ = 6.7780, $t$ = 7.87) and HCE & RCE ($\beta$ = 7.0513, $t$ = 2.72), along with CEE ($\beta$ = 6.5126, $t$ = 14.24), are found significantly positive and consequently, $H_1$, $H_2$, $H_4$, $H_5$ and $H_6$ are supported whereas $H_3$ and $H_7$ are rejected. The adjusted $R^2$-values (FE) of model-1 (58.55%) and model-2 (64.03%) stipulate fairly good explanatory power of the models. Further, the results confirm that IC components along with their interactions (model-2) are marginally better measure than the individual measure of IC components in construing hotels' profitability. In terms of the control variables, hotels' age has a significantly positive impact on business performance, whereas PC has an insignificant impact. Overall results produce evidence that firms which create and possess IC, outperform in the sector.

The Durbin-Watson (D-W) test checks the autocorrelation in the residuals from a statistical regression analysis. A statistical value of D-W test equal to or nearly 2 indicates that there is no first-order autocorrelation. Statistical figures from 0 to 1.5 indicate that successive error differences are small and explain positive serial correlation, whereas figures from 2.5 to 4 indicate that successive error differences are large and explain negative serial correlation. As a rule of thumb, D-W test statistic values in the range of 1.5 to 2.5 are acceptable. The results of D-W statistic test for all six models confirm no autocorrelation among the variables.

Table 6 presents the results of organisational productivity where the dependent variable is ATO. The results of Chi-square test for the productivity models support the null hypothesis of Hausman test, which stipulates that RE model is preferred. In model-3, all the coefficients of IC components, i.e., HCE ($\beta$ = 0.8076, $t$ = 8.50), SCE ($\beta$ = 0.3941, $t$ = 6.54) and RCE ($\beta$ = 0.5131, $t$ = 7.54) along with CEE ($\beta$ = 0.9556, $t$ = 13.79) are significantly positive and lends support to $H_1$, $H_2$, $H_3$ and $H_4$ in terms of productivity of the hotels. Analysis of the results shows that IC components assist hotel firms to use physical assets in a more effective and efficient way. Further, the introduction of interaction variables in Model-4 depicts that IC determinants along with physical capital are still significantly positive, but none of the three interaction variables is found to be significant. Thus, the results support first four hypotheses and stand to reject $H_5$, $H_6$ and $H_7$. Age remains a consistent control variable across the models, presenting a significant negative association, whereas PC is insignificantly associated with productivity. The adjusted $R^2$-values (RE) of model-3 (42.4%) and model-4 (43.8%) stipulate good explanatory power of the models, which slightly enhances when the interaction terms are considered. The findings are in sync with Sardo et al. (2018) and Tiwari and Vidyarthi (2018).

**Table 6** Regression results of productivity indicator, i.e., ATO

| *Variables* | *Model-3* | | *Model-4* | |
|---|---|---|---|---|
| | *FE* | *RE* | *FE* | *RE* |
| Intercept | 1.1204*<br>(9.3037) | 1.0649*<br>(8.5926) | 1.1123*<br>(8.6077) | 1.0741*<br>(8.0917) |
| HCE | 0.7924*<br>(8.2064) | 0.8076*<br>(8.5043) | 0.7879*<br>(5.8166) | 0.8373*<br>(6.3151) |
| SCE | 0.3938*<br>(6.4763) | 0.3941*<br>(6.5375) | 0.3967*<br>(6.2824) | 0.3984*<br>(6.3684) |
| RCE | 0.5354*<br>(7.5797) | 0.5131*<br>(7.5361) | 0.3749*<br>(2.4884) | 0.3979*<br>(2.7239) |
| CEE | 0.9633*<br>(13.4645) | 0.9556*<br>(13.7984) | 0.9743*<br>(13.4884) | 0.9631*<br>(13.7803) |
| HCE×SCE | – | – | 0.0140<br>(0.2614) | 0.0051<br>(0.0975) |
| HCE×RCE | – | – | 0.1896<br>(1.1739) | 0.1523<br>(0.9648) |
| SCE×RCE | – | – | 0.4309<br>(1.1925) | 0.2694<br>(0.7656) |
| Age | –0.0040*<br>(–2.1755) | –0.0025<br>(–1.5330) | –0.0044*<br>(–2.3476) | –0.0028<br>(–1.6791) |
| Physical Capacity | –0.0018<br>(–0.0115) | 0.0267<br>(0.1776) | –0.0011<br>(–0.0068) | 0.0212<br>(0.1389) |
| $R^2$ | 0.6743 | 0.4454 | 0.6753 | 0.4468 |
| Adjusted $R^2$ | 0.6380 | 0.4249 | 0.6369 | 0.4382 |
| *F*-stats | 18.5949 | 47.7609 | 17.6099 | 31.8498 |
| Prob. (*F*-stats) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| D-W stats | 1.9559 | 1.8685 | 1.9554 | 1.8689 |
| Hausman test ($\chi^2$) | 6.5056 (0.3690) | | 9.0668 (0.4311) | |

Note: * depicts level of significance 5%; *t*-values are in parentheses.

In regression models-5 and 6, the results of Chi-square test support the null hypothesis of the Hausman test, which indicates that the RE model is consistent and more appropriate. Furthermore, the results of the regression models (EBIT as dependent variable) reveal that coefficients of HCE ($\beta$ = 0.0922, $t$ = 3.88) SCE ($\beta$ = 0.2026, $t$ = 13.35) and CEE ($\beta$ = 0.0731, $t$ = 4.28) have significantly positive relationships with earning capability whereas RCE coefficient has negative relationship, though insignificant. Age has an insignificant positive effect, while PC has an insignificant negative effect on firms' earning capability. The outcomes support $H_1$, $H_2$ and $H_4$ but reject $H_3$ and are in conformity with the results of studies by Dzenopoljac et al. (2017); Xu and Li (2019) and Xu and Wang (2019). Further, in model-6, where the interaction terms are considered, coefficients of all three interaction variables, i.e., HCE×SCE ($\beta$ = 0.1362, $t$ = 12.62), HCE×RCE ($\beta$ = 0.1242, $t$ = 3.84) and SCE×RCE ($\beta$ = 0.1420, $t$ = 1.97), along with the coefficients of HCE, SCE, and CEE are the major driving factors that are statistically significant and positively associated with response variable. Noticeably, the adjusted $R^2$ substantially increases from 0.41 (model-5) to 0.54 (model-6), which indicates that

interaction variables play vital role in enhancing IC's impact on hotels' performance. Hence, the results support the application of interaction variables in the models.

**Table 7** Regression results of earning capability indicator, i.e., EBIT

| *Variables* | *Model-5* | | *Model-6* | |
|---|---|---|---|---|
| | *FE* | *RE* | *FE* | *RE* |
| Intercept | –0.0744*<br>(–2.4341) | –0.0784*<br>(–2.7089) | –0.0540*<br>(–2.0190) | –0.06184*<br>(–2.3595) |
| HCE | 0.0989*<br>(4.0347) | 0.0922*<br>(3.881) | 0.0722*<br>(2.5723) | 0.06147*<br>(2.2627) |
| SCE | 0.2029*<br>(13.1491) | 0.2026*<br>(13.3494) | 0.2371*<br>(18.4645) | 0.2284*<br>(17.7112) |
| RCE | –0.0279<br>(–1.5575) | –0.0147<br>(–0.8798) | –0.0529<br>(–1.6947) | –0.0538<br>(–1.8063) |
| CEE | 0.0623*<br>(3.4306) | 0.0731*<br>(4.2775) | 0.0632*<br>(4.2227) | 0.0723*<br>(5.0759) |
| HCE×SCE | – | – | 0.1407*<br>(12.6727) | 0.1362*<br>(12.6173) |
| HCE×RCE | – | – | 0.1189*<br>(3.5550) | 0.1242*<br>(3.8446) |
| SCE×RCE | – | – | 0.1096<br>(1.4642) | 0.1420*<br>(1.9749) |
| Age | 0.0001<br>(0.2721) | 0.0002<br>(0.4367) | –0.0001<br>(–0.0401) | –0.0001<br>(–0.1425) |
| Physical Capacity | –0.0315<br>(–0.7665) | –0.0393<br>(–1.0871) | –0.0849*<br>(–2.5141) | –0.0898*<br>(–2.9267) |
| $R^2$ | 0.5475 | 0.4298 | 0.6999 | 0.5477 |
| Adjusted $R^2$ | 0.4972 | 0.4053 | 0.6645 | 0.5401 |
| *F*-stats | 10.8695 | 44.5425 | 19.7459 | 72.6462 |
| Prob. (*F*-stats) | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| D-W stats | 1.8511 | 1.9348 | 1.9582 | 1.82264 |
| Hausman test ($\chi^2$) | 5.9058 (0.4338) | | 9.1073 (0.4274) | |

Note: * depicts level of significance 5%; *t*-values are in parentheses.

The empirical analysis of the results confirms a significant positive relationship between IC components and performance indicators of Indian hotels. Specifically, HCE, SCE and CEE assume substance for enhanced performance of hotel firms, which is the basis of service quality in the hospitality sector (Engström et al., 2003).

## 5 Conclusions and implications

Using a sample of 500 firm-years from the hospitality sector for the period 2012–2021, the study seeks to understand the nexus between IC and the financial performance indicators of hotel firms in India while considering the effects of interaction variables. The analysis of the results provides empirical evidence that the hospitality sector with higher IC efficiency yield higher profitability, productivity and earning capability. In

particular, the study postulated two components of IC, namely HCE and SCE as crucial strategic instrumentality. The findings suggest that Indian hotels would be benefited from creating and quantifying the IC coefficient. Thus, the results support the notion that spending on organisational manpower should be considered an investment rather than expenses. Furthermore, the results of the regression models recommend that IC components have a significantly positive association with the performance indicators and validate the Resource-Based View (RBV) in the context of the Indian hospitality sector.

**Table 8** Hypotheses testing

| *Hypotheses* | *Remarks* | | |
|---|---|---|---|
| | *ROA* | *ATO* | *EBIT* |
| $H_1$: HCE positively impact business performance. | Accepted | Accepted | Accepted |
| $H_2$: SCE positively impact business performance. | Accepted | Accepted | Accepted |
| $H_3$: RCE positively impact business performance. | Rejected | Accepted | Rejected |
| $H_4$: CEE positively impact business performance. | Accepted | Accepted | Accepted |
| $H_5$: HCE×SCE positively impact business performance. | Accepted | Rejected | Accepted |
| $H_6$: HCE×RCE positively impact business performance. | Accepted | Rejected | Accepted |
| $H_7$: SCE×RCE positively impact business performance. | Rejected | Rejected | Accepted |

*Source*: Authors' compilation.

Regarding IC determinants, the regression models distinctly display that HCE, SCE, and physical capital (CEE) have a significant positive influence on business performance, indicating that human and structural resources are the major driving forces, which are in tune with the results of Chen et al. (2005); Vishnu and Gupta (2014); Nadeem et al. (2018); Tiwari and Vidyarthi (2018) and Poh et al. (2018). Furthermore, interactions between IC constituents highlight their role in enhancing earnings capacity and profitability. Business performance, measured through ATO, distinctly indicates that hotels' productivity is reflected in all the constituents of IC. The reason why RCE is not significant (ROA and EBIT being dependent variable) is probably because investments in relational capital are not significant, and consequently, the overall IC coefficient is moderate. Thus, firms in the hospitality sector must prioritise their investments in IC components, particularly in RC, to enhance organisational performance and competitiveness. Moreover, to attain a high growth regime, the Indian hospitality sector must ensure that their future policies focus on stimulating investments in IC coefficient, which might lead to higher profitability (Chen et al., 2005; Tiwari and Vidyarthi, 2018).

Further, the introduction of interaction terms improves model explainability and moderates the impact of the predictor variables on the response variable. Kamukama et al. (2010) and Sardo et al. (2018) reported similar findings, whereas Tiwari and Vidyarthi (2018) reported a significant negative relationship of interaction variables with profitability. Such differences in the outcomes, while interaction variables are used, might be attributed to industry-specific features. However, future research is required to explore the impact of the interaction variables on firms' performance and to create a consensus.

Several managerial implications are derived in light of the aforementioned findings. First, the findings can assist management in visualising the influence of IC on the business performance of hotel firms. Second, component-wise coefficient analyses will

empower managers to recognise the key drivers of IC, which, in turn, will drive the overall IC coefficient. Additionally, interaction variables will contribute to better understanding as to what moderates the impact of the predictor variables on the response variable and accordingly change the focus so that performance improves. Furthermore, as the study is based on the Indian hospitality sector, the findings provide important implications for developing economies and support the notion that IC is a key driver of business performance (Chen et al., 2005; Joshi et al., 2013), which can potentially contribute to economic growth. In addition, the results may sensitise and encourage academicians and researchers towards the importance of quantifying the association of IC components and interaction effects on financial performance of hospitality sector for better generalisation of the results, particularly in developing economies.

However, this study presents certain limitations. It investigates only one nation and one sector; thus, the generalisation of results needs caution. Future research might be conducted considering multi-nations and multi-industries aspects for better generalisation of results. Further, Indian accounting and taxation system experienced slight changes in the last ten years, which may have influenced the results of the different firms.

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## Appendix 1

Several measurement models are developed by researchers and academicians to calculate the IC coefficient, which include:

| *Model* | *Propounded/ used by* | *Classification* | *Description* |
|---|---|---|---|
| Balance Scorecard | Kaplan and Norton (1992) | Internal business perspective, customer perspective, financial perspective, innovation & learning perspective | Provide management with multidimensional perspectives to regulate performance through financial and non-financial attributes. It assists in defining organisational strategies into objectives and evaluate the progress. |
| Technology Broker | Brooking and Motta (1996) | Human-centred assets, infrastructure assets, market assets, intellectual property | Calculated through quantitative review 20 audit questions, which assist in preparing the IC audit report. Three ways to measure monetary value of IC includes market approach, cost approach and income approach. |
| Skandia Navigator | Edvinsson and Malone (1997) | Focus on human, process, customer and development/renewal | Measures the composition of overall IC and calculates market value. Provides a detailed view of the intellectual and financial capital. |
| Intellectual Capital Index (IC-Index) | Roos and Roos (1997) | HC, organisational capital (process and renewal & development capital) and RC | Prepare a single index for all indicators describing IC and its components. This index keeps on changing with change in organisational market value. |
| Intangible Asset Monitor | Sveiby (1997) | Employee competence, external & internal structure of firms | Depicts the relevant indicators of intangible assets indicating firm's growth, efficiency, innovation and stability which lead to the generation of intangible assets. |
| Value Added Intellectual Coefficient (VAIC$^{TM}$) | Pulic (1998) | HC, SC and physical capital | Explains the magnitude as well as efficiency of firm's IC, measured from publicly available financial data. |
| Inclusive Valuation Method (IVM) | M'Pherson and Pike (2001) | Intrinsic, extrinsic and instrumental value | Hierarchies weighted indicators are required. Combined value added = (Monetary + intangible) value added. |
| Citation-weighted Patents | Hall et al. (2001) | Patents | According to this method, IC is estimated through the citations of patents, which include both patents and non-patent publications. |
| Intellectual Capital Dynamic Value (IC-dVal) | Bounfour (2002) | Processes, resources, outputs, building of intangible assets | Recognises the dynamic approach to measure sustainable and competitive edge in the market. |
| Modified Value-Added Intellectual Coefficient (MVAIC) | Cohen et al., (2014); Xu and Wang, (2018) | Human, structural, relational capital and capital employed | It is a modified version of VAIC$^{TM}$ model, originated as a result of the criticisms of original model based on structural capital. |