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Impact of Intellectual Capital on Sustainable Organizational Performance with Mediating Role of Human Resource and Moderating Role of Employee Engagement

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Keywords:
Intellectual Capital, Intellectual Capital Management, HR Management, Employee Engagement, Sustainable Organizational Performance, Science and Technology Sector.

ABSTRACT

The dynamic landscape of the global economy, propelled by technological advancements, necessitates a profound transformation in the Science and Technology (S&T) sector. However, Pakistan's S&T sector grapples with challenges stemming from limited research and development (R&D) organizations, mismanagement, and a disconnect between industry and S&T entities. This study aims to fill the existing research gap by examining the impact of Human Resource (HR) management on the relationship between Intellectual Capital (IC) and sustainable organizational performance within Pakistan's S&T sector. The research questions delve into the influence of ICM on organizational performance, the mediating role of HR management, and the moderating effect of employee engagement. Employing a quantitative research approach, the study utilizes a questionnaire to collect primary data from S&T organizations. However, the method section requires refinement for clarity and precision. The proposed research design, methodology, and analysis techniques, including the application of PLS-Structural Equation Modelling, are outlined. A pilot study is deemed necessary to assess the viability of the research design and gather preliminary insights before the main study. The results and implications, particularly in the context of HR management's mediating role and employee engagement's moderating effect, has been discussed comprehensively. In conclusion, this research seeks to enhance understanding of the intricate relationship between Intellectual Capital, HR management, employee engagement, and sustainable organizational performance in Pakistan's S&T sector. Through rigorous investigation, the study aims to provide actionable recommendations to foster a conducive environment for innovation and long-term sustainability.

INTRODUCTION

In the contemporary business landscape, organizations grapple with multifaceted challenges arising from global shifts such as globalization, technological advancements, an aging

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population, and intensifying competition (Fears & Canales,2023 ; Masa'deh et al., 2017). Traditional management paradigms are deemed insufficient, necessitating a paradigm shift towards sustainability to thrive in the dynamic market environment (Ruggerio, 2021). Sustainable performance, defined as the ability to consistently uphold processes enhancing long-term business viability, has become a focal point for modern organizations (Ruggerio, 2021).

The evolution of economies from material-intensive to reliant on intangible resources, particularly human capital with knowledge, skills, and cognitive strength, marks a significant transition (Russell, 2017). Intellectual capital, encompassing individual knowledge and experiences, emerges as a pivotal factor influencing organizational advantage (Dumay et al., 2020). Coined by John Kenneth Galbraith, intellectual capital serves as an intangible resource crucial for converting knowledge into dividends and competitive advantage (Nonaka & Takeuchi, 1995). The knowledge-based society of the '90s underscores the pivotal role of intellectual capital in future development (Gama et al., 2020).

In the digital era, economic transformation hinges on intellectual capital, specifically digital resources, forming the cornerstone of organizational sustainability through intellectual capital management (Matos et al., 2020). Intellectual capital not only ensures present organizational performance but also aligns with long-term goals, making it a linchpin for success (Alvino et al., 2020). The strategic fusion of innovation, technological disruption, and entrepreneurial culture catalyzed by intellectual capital yields sustainable competitive advantages for organizations (Anyogu et al., 2022).

Science, Technology, and Innovative Policies emerge as vehicles for socio-economic transformation and sustainable development, shaping a country's progress (Park, 2022). Acknowledging the challenges faced by organizations, sustainability, encompassing economic, environmental, and social dimensions, emerges as a guiding ideology (Ranjbari et al., 2021). Sustainability fosters an inclusive balance, steering organizations towards long-term advantages and continuous development (Ahmadi-Gh & Bello-Pintado, 2021).

In the context of Pakistan's Science and Technology (S&T) sector, the focus on human capital, infrastructure, and policy initiatives reflects a commitment to sustainable economic growth (Ikram et al., 2021). Despite historical challenges, the current S&T scenario in Pakistan emphasizes the pivotal role of S&T in the country's socioeconomic development (Razzaq et al., 2021). The policy direction underscores the importance of technological

competence, reversing brain drain, and fortifying indigenous innovation systems for sustainable growth (Raza et al., 2022).

However, Pakistan's economic journey has been tumultuous, grappling with structural issues, fiscal mismanagement, and stagnant growth (Aman et al., 2022). The persistent challenges of inflation, unemployment, and limited foreign direct investment underscore the urgency for sustainable economic strategies (Ishaque et al., 2022; Manzoor et al., 2022; Menhas et al., 2019). In this complex landscape, the interplay of intellectual capital, sustainability, and strategic policy decisions emerges as a critical nexus for shaping the future trajectory of organizations and the broader economy.

Over the years quite a number of economies have demonstrated that despite limited natural endowments, it is quite possible to make strategic economic progress and wealth maximization through Intellectual Capital Management (ICM) (Rietveld & Schilling, 2021). In the modern era, IC empowers organizations to boost workforce knowledge, innovative ideas, skills, abilities, experience, trainings, productivity, economic value and generate wealth (Pray & Rattan, 2019).

However, S&T organizations in Pakistan are in total despair. Limited number of organizations is engaged in active R&D and that too under the administrative control of Ministry of Science & Technology and Ministry of Defense Production. R&D is essential but risky and costly as well. However, in public sector these organizations are victim of mismanagement thus a notable gap exists between industry and S&T organizations. So, the S&T sector of Pakistan can't make progress and attain the level of self-sustainability without effective execution and implementation of ICM. ICM is the exigency of time. Therefore, Pakistan policy paradigm regarding S&T sector needs to be revisited by taking on board all stakeholders in the extended triple helix model (Altaf et al., 2019). For this, a robust mechanism for the implementation of ICM is required that play a significant role in the GDP growth indicators. The current study highlights the critical role of Intellectual Capital Management (ICM) in fostering sustainable organizational performance, particularly in the Science and Technology (S&T) sector of Pakistan.

Pakistan is the first Muslim country proved to have its nuclear program. Regarding information technology, the country has rapid development in various fields. These contributions are solely efforts of the human capital in the IT field where the country has a large pool of IT professionals, state-of-the-art institutions and labs which help the IT experts to excel in the sector with an expected contributory rate. With the continued focus on the

S&T sector, Pakistan has the potential to play a leading role with innovative technologies and processes at par with global communities(Zubair et al., 2023). Hussain (2023) explains that under the banner of "Think Future", a mega program is initiated aiming at promoting S&T sector of Pakistan with seven key emerging disciplines viz 3D Printing, Artificial Intelligence, Augmented Reality, Block chain, Internet of Things, Intelligent Vehicles, and Smart Robots. The program envisages techno-savvy national projects with sound and sustainable S&T footprints for the socio-economic development of the country and competes at par with global emerging trends.

The science and technology sector plays a critical role in driving innovation and economic growth. In recent years, organizations within this sector have been increasingly emphasizing sustainable practices to enhance their long-term performance and environmental stewardship. Sustainable Organizational Performance is crucial in the face of increasing global challenges such as climate change, resource depletion, and social inequality. Organizations must actively manage their environmental impacts through efficient resource use, waste reduction, and pollution prevention (Linnenluecke, 2022). This involves adopting renewable energy sources, implementing energy-efficient technologies, and promoting sustainable procurement practices(Sharma et al., 2022).

Therefore, the purpose of the proposed study is to bridge this gap by conducting a comprehensive empirical investigation into the practical implementation of ICM in the S&T organizations of Pakistan.

By addressing this gap, the study seeks to provide actionable insights for policymakers, organizational leaders, and stakeholders in the S&T sector of Pakistan.

Intellectual Capital and sustainable organizational performance

Intellectual Capital is recognized as a valuable, intangible asset contributing to a competitive advantage (Binh An et al., 2023). Modern organizations consider Intellectual Capital as perpetual wealth, although its subjective nature hinders its placement on the balance sheet (Nama & Kanungo, 2023). The literature suggests that companies invest in training and skill development to enhance employee potential and competence, contributing to Intellectual Capital levels (Falcó et al., 2023). Wudhikarn and Pongpatcharatorntep (2022) proposed a novel approach to enhance executive decision-making strategies by addressing deficiencies in existing Intellectual Capital Management methods. The authors advocate merging Intellectual Capital Management with decision science techniques, specifically the analytic network process and quality function deployment. This integration is implemented through a process

model, utilizing Intellectual Capital as a strategic component. Habib and Dalwai (2023) investigate the role of intellectual capital (ICE) and working capital management (WCME) in the GCC industrial sector. Utilizing Standard and Poor's database (2015-2019) and employing data envelopment analysis (DEA), the study reveals a lag in effective utilization of intellectual and working capital investments among majority of firms. Regression analysis and robustness tests reinforce these findings. Dinu et al. (2023) explore the correlation between intellectual capital, technology management, and innovation in knowledge-intensive business services (KIBS). Human capital (HC), encompassing knowledge, skills, abilities, and other attributes, is crucial for organizational success (Lestari & Zulganef, 2023. Gupta et al. (2023) and Wabwire (2023) emphasize the pivotal role of human capital from top to lower management, highlighting the importance of expertise, experience, and skills. Masa'deh et al. (2018) investigate the relationship between Intellectual Capital Management, innovation, and Knowledge Management, revealing no direct impact of intellectual capital on innovation.

It is considered a modern strategy for motivating employees and promoting ethics, team spirit, and organizational disciplines (Burton and Vu, 2021). Spiritual Capital is viewed as essential for maintaining a healthy working culture and can be exchanged among individuals within an organization (Di Placido, 2023).

H1: *Intellectual capitals have positive impacts on sustainable organizational performance of S&T sector, Pakistan*

Human Resource and Mediator between ICs and sustainable organizational performance

The relationship and impact of IC variables on Human Resource (HR) Management is well-discussed in the literature. Human resource (HR) management plays a pivotal role in mediating the relationship between intellectual capitals and organizational performance. Becker and Huselid (1998) argue that HR practices can enhance organizational performance by aligning human capital with organizational goals. Additionally, Wright, Dunford, and Snell (2001) emphasize the mediating role of HR practices in translating intellectual capital into tangible outcomes. Given the established importance of HR management in mediating these relationships, it is hypothesized that HR management acts as a mediator between intellectual capitals and sustainable organizational performance in the S&T sector of Pakistan.

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Human resource management plays a pivotal role in harnessing and utilizing intellectual capital (Subramaniam & Youndt, 2005). Exploring the mediating role of human resource practices in the relationship between intellectual capital and SOP can help organizations in Pakistan to understand the mechanisms through which intellectual capital can be leveraged for sustainable performance.

H2: *Human Resource acts as a mediator between ICs and sustainable organizational performance of S&T sector, Pakistan.*

Employee Engagement as moderator in the relationship between Human resource and sustainable organization performance.

Employee Engagement has been considered a crucial factor for sustainable development and performance of an organization. Employee engagement is recognized as a critical factor in enhancing organizational performance (Macey & Schneider, 2008). It involves the emotional and cognitive commitment of employees to their work and organization. While the relationship between HR management and organizational performance is well-established, the moderating role of employee engagement in this relationship is underexplored. Employee engagement is a critical factor in driving performance in any organization (Saks, 2006). In Pakistan, where employee engagement levels can vary significantly across organizations, understanding how employee engagement moderates the relationship between intellectual capital and SOP is vital for designing effective strategies. The findings of this study can offer practical guidance to organizations in Pakistan on how to optimize their intellectual capital, improve HR practices, and enhance employee engagement for sustainable performance. Therefore, it is hypothesized that employee engagement positively moderates the relationship between HR management and sustainable organizational performance in the S&T sector of Pakistan.

H3: *Employee engagement positively moderates the relationship between Human resource and sustainable organization performance*

Conceptual Framework

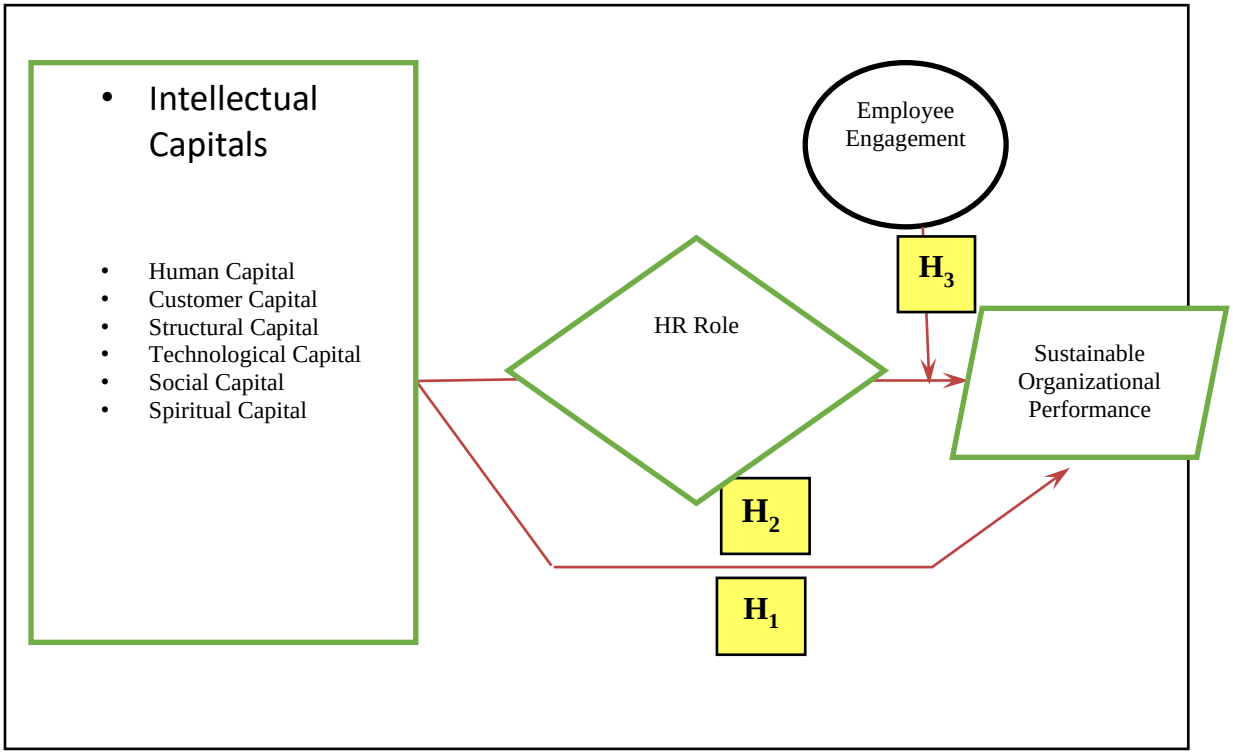

Figure: Concept Framework of Moderated Mediation Model (Khalique, Hina, Ramayah, & Shaari, 2020; Lu et al., 2021).

METHODOLOGY

Research philosophy is a critical aspect of any study, contingent upon the interplay between ontology and epistemology (Mason et al., 2022). In this research endeavor, a deductive approach aligned with a quantitative investigation was employed to achieve the overarching objectives.

The population under scrutiny comprised the three tiers of Pakistan's Science and Technology (S&T) ecosystem, categorized as (i) University-based S&T, (ii) Public sector S&T, and (iii) Strategic & Defense S&T. Sample size for this study 400 via convenience sampling technique.

The study's questionnaire encompassed variables related to Intellectual Capital (9 items), Customer Capital (11 items), Structural Capital (9 items), Social Capital (8 items), Technological Capital (8 items), and Spiritual Capital (7 items) as independent variables. The items for the independent variable were adopted from previous research (Khalique et al., 2020). Dependent variables included Sustainable Organizational Performance with Environmental Performance (5 items), Economic Performance (5 items), Social Capital (5 items), Human Resource (Mediating variable, 6 items), and Employee Engagement (Moderating Variable, 6 items). The items for dependent variables were drawn from

established sources in the literature (Yusliza et al., 2020; Gu et al., 2008; Khalique et al., 2020; Syed et al., 2020; Shrestha, 2019).

The data collection process encompassed the distribution of the adapted questionnaire to selected participants. Both electronic and physical means were employed, utilizing online survey platforms. Ethical considerations, including harm prevention, participant dignity, privacy, confidentiality, anonymity, avoidance of deception, affiliation, honesty, transparency, and avoidance of misrepresentation, were rigorously adhered to during the research.

Reliability Analysis: Reliability analysis is a statistical method used to assess the consistency, stability, and dependability of measurements or tests over time or across different conditions (Cortina & Nouri, 2020).

Table Reliability Statistics

Variables	Cronbach's Alpha	N of Items
HC	.896	9
CC	.905	10
SC	.866	8
TEC	.847	6
SC1	.869	6
SPC	.828	5
HRM	.893	7
SOP	.880	9
EE	.843	4

Variable: HC

ANALYSIS

Table Correlations

		SOP	CC	SC	TEC	STC	SPC	HRM	HC	EE
SOP	Pearson Correlation	1								
	Sig. (2-tailed)									
	N	400								
CC	Pearson Correlation	.493**	1							
	Sig. (2-tailed)	.000								
	N	400	400							
SC	Pearson Correlation	.489**	.461**	1						
	Sig. (2-tailed)	.000	.000							
	N	400	400	400						
TEC	Pearson Correlation	.390**	.380**	.382**	1					
	Sig. (2-tailed)	.000	.000	.000						
	N	400	400	400	400					
STC	Pearson Correlation	.469**	.442**	.460**	.326**	1				

	Sig. (2-tailed)	.000	.000	.000	.000					
	N	400	400	400	400	400				
SPC	Pearson Correlation	.316**	.321**	.363**	.283**	.360**	1			
	Sig. (2-tailed)	.000	.000	.000	.000	.000				
	N	400	400	400	400	400	400			
HRM	Pearson Correlation	.512**	.404**	.459**	.459**	.496**	.373**	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000			
	N	400	400	400	400	400	400	400		
HC	Pearson Correlation	.554**	.386**	.414**	.358**	.331**	.259**	.372**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		
	N	400	400	400	400	400	400	400	400	
EE	Pearson Correlation	.590**	.706**	.589**	.527**	.539**	.425**	.527**	.544**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	
	N	400	400	400	400	400	400	400	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

The results on the above table showed the Pearson correlation analysis which was employed to examine the relationship between study variables N= 400). According the findings, SOP was positively correlated with the CC (r = .493, p < .01), SC (r = .461, p < .01), TEC (r = .382, p < .01), STC (r = .326, p < .01), SPC (r = .360, p < .01), HRM (r = .373, p < .01), HC (r = .372, p < .01), and EE (r = .544, p < .01) respectively.

Evaluation of Measurement Model:

Indicator Loadings: critical criterion in this evaluation is the standardized loadings, which should ideally have a minimum value of 0.708. By meeting or exceeding this threshold, the standardized loadings demonstrate a strong and meaningful relationship between the indicators and the construct they represent. By considering this criterion, researchers can ensure the reliability and robustness of their measurement models, contributing to the overall quality of their research findings.(Cain et al., 2017).

Table Indicator loadings

Constructs	Items	Outer Loadings
	CC10	0.757
	CC11	0.722
Customer Capital (CC)	CC2	0.796
	CC3	0.753
	CC4	0.794
	CC7	0.713
	CC8	0.738
	CC9	0.775
	EE1	0.777

Constructs	Items	Outer Loadings
Employee Engagement	EE2	0.766
	EE3	0.769
	EE4	0.727
	EE5	0.727
	EE6	0.751
SOP Environmental Capital	EEN1	0.778
	EEN2	0.761
	EEN3	0.859
	EEN4	0.774
	EEN6	0.781
Human Resource Management (HRM)	HRM1	0.772
	HRM2	0.713
	HRM3	0.873
	HRM4	0.741
	HRM5	0.825
	HRM6	0.767
	HRM7	0.749
	HRM8	0.798
Social Capital	SOC1	0.868
	SOC2	0.758
	SOC3	0.776
	SOC4	0.861
	SOC5	0.868
	SOC8	0.792
Sustainable Organizational Performance (SORGP)	SORGP10	0.777
	SORGP11	0.719
	SORGP12	0.761
	SORGP13	0.738
	SORGP14	0.736
	SORGP15	0.783
	SORGP4	0.837
	SORGP5	0.842
	SORGP6	0.765

Constructs	Items	Outer Loadings
	SORGP7	0.764
	SORGP8	0.777
	SORGP9	0.707
Spiritual Capital	SPC1	0.763
	SPC2	0.855
	SPC3	0.767
	SPC4	0.705
	SPC5	0.869
	SPC6	0.863
	SPC7	0.767
	SPC8	0.854
	STC1	0.758
Structural Capital	STC2	0.821
	STC3	0.756
	STC4	0.756
	STC5	0.752
	STC6	0.826
	STC7	0.878
	STC8	0.768
	STC9	0.798
Technological Capital (TEC)	TEC1	0.749
	TEC2	0.764
	TEC3	0.735
	TEC7	0.724
	TEC8	0.761

Internal Consistency Reliability

The most popular method for determining internal consistency is Cronbach's alpha and composite reliability, which gauges trustworthiness based on how the variables in the observed items interact. The values in PLS-SEM are arranged in accordance with the level of individual dependability of each indicator (F. Hair Jr et al., 2014). The numbers range from 0 to 1, and a greater number denotes a better degree of dependability. While levels of composite reliability/Cronbach alpha between 0.60 and 0.70 are acceptable in exploratory research, they must be greater than 0.70 in more advanced stages (F. Hair Jr et al., 2014).

Though, a score greater than 0.90 is not preferred, and a value of 0.95 or above is undesirable (Nunnally et al., 1994).

Table Internal Consistency Reliability

Constructs	Cronbach's Alpha	Composite Reliability
CC	0.848	0.853
EE	0.757	0.766
EEN	0.830	0.836
HRM	0.814	0.861
SOC	0.882	0.897
SORGP	0.909	0.919
SPC	0.875	0.891
STC	0.914	0.923
TEC	0.773	0.782

Convergent Validity:

To assess convergent validity, it is generally considered adequate for constructs to have an AVE value of at least 0.50 or higher. By adhering to these guidelines, researchers can ensure the quality and validity of their measurement models in structural equation modelling (Hair et al., 2012). The average variance extracted (AVE) values observed for each construct range from 0.518 to 0.820 surpassing the recommended threshold of 0.5. This indicates that a significant proportion of the variance in the latent variables is captured by their respective indicators, providing strong evidence of convergent validity. The obtained AVE values well above the threshold suggest that the measurement models effectively measure the underlying constructs, ensuring reliable and valid measurement outcomes.

Table: Convergent Validity

Constructs	Average variance extracted (AVE)
CC	0.820
EE	0.530
EEN	0.598
HRM	0.453
SOC	0.635
SORGP	0.506
SPC	0.564
STC	0.599
TEC	0.518

Evaluation of Measurement Model:

PLS-SEM analysis begins with the evaluation of the outer model (or measurement model). The objective is to assess how well the item (questions) rely on the hypothetically-defined construct. Analyzing the outer model entails identifying unidirectional predictive relationships between each latent construct associated with the observed indicator (Joe F Hair

et al., 2011). In PLS-SEM, there are typically two distinct measures of indicators, reflective and formative outer model (Hair et al., 2012).

Indicator Loadings : By considering this criterion, researchers can ensure the reliability and robustness of their measurement models, contributing to the overall quality of their research findings. (Cain et al., 2017). By meeting the threshold criteria, the loading items provide solid evidence of the construct's validity and contribute to the overall quality and integrity of the research findings.

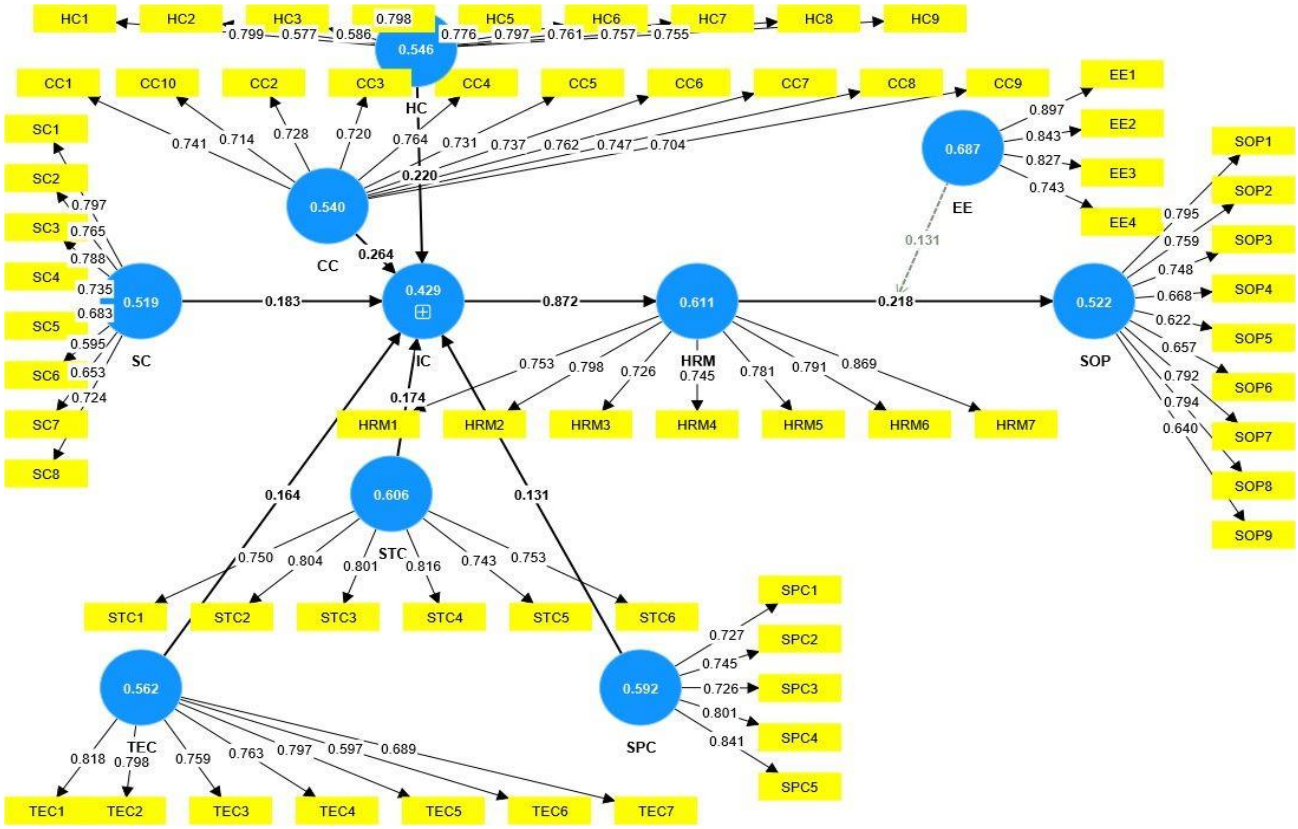

Figure: Measurement Model

Table : Indicator Loadings

Constructs	Items	Outer Loadings
Customer Capital	CC1	0.741
	CC2	0.728
	CC3	0.72
	CC4	0.764
	CC5	0.731
	CC6	0.737
	CC7	0.762
	CC8	0.747
	CC9	0.704
	CC10	0.714

Constructs	Items	Outer Loadings
Employee Engagement	CC11	0.741
	EE1	0.897
	EE2	0.843
	EE3	0.827
	EE4	0.743
Human Capital	HC1	0.799
	HC2	0.576
	HC3	0.586
	HC4	0.798
	HC5	0.776
	HC6	0.797
	HC7	0.761
	HC8	0.757
	HC9	0.754
Human Resource Management	HRM1	0.753
	HRM2	0.798
	HRM3	0.726
	HRM4	0.745
	HRM5	0.781
	HRM6	0.791
	HRM7	0.869
Social Capital	SC1	0.797
	SC2	0.765
	SC3	0.788
	SC4	0.735
	SC5	0.683
	SC6	0.595
	SC7	0.653
	SC8	0.724
Sustainable Organizational Performance	SOP1	0.795
	SOP2	0.759
	SOP3	0.748
	SOP4	0.668
	SOP5	0.622
	SOP6	0.657
	SOP7	0.792
	SOP8	0.794
	SOP9	0.640
Spiritual Capital	SPC1	0.727
	SPC2	0.745
	SPC3	0.726
	SPC4	0.801
	SPC5	0.841
Structural Capital	STC1	0.750
	STC2	0.804

Constructs	Items	Outer Loadings
Technological Capital	STC3	0.801
	STC4	0.816
	STC5	0.743
	STC6	0.753
	TEC1	0.818
	TEC2	0.798
	TEC3	0.759
	TEC4	0.763
	TEC5	0.797
	TEC6	0.597
	TEC7	0.689

Internal Consistency reliability:

The values in PLS-SEM are arranged in accordance with the level of individual dependability of each indicator (F. Hair Jr et al., 2014). The numbers range from 0 to 1, and a greater number denotes a better degree of dependability. While levels of composite reliability/Cronbach's alpha between 0.60 and 0.70 are acceptable in exploratory research, they must be greater than 0.70 in more advanced stages (F. Hair Jr et al., 2014). (Nunnally et al., 1994). The obtained values in the range of 0.905 to 0.847 demonstrate the consistency and stability of the measurement items. This indicates that the items consistently measure the intended latent constructs and produce reliable results. The high reliability levels observed for each item provide confidence in the accuracy and precision of the measurement instrument.

Table Internal Consistency reliability

Constructs	Cronbach's Alpha	Composite Reliability
CC	0.905	0.906
EE	0.847	0.855
HC	0.894	0.904
HRM	0.893	0.897
SC	0.867	0.875
SOP	0.885	0.888
SPC	0.828	0.837
STC	0.869	0.870
TEC	0.867	0.869

Convergent Validity:

Convergent validity is the measurement of the level of convergence between various indicators of the same concept. The indicator's factor loading, composite reliability (CR), and average variance extracted (AVE) all need to be taken into account in order to prove convergent validity (F. Hair Jr et al., 2014). When all of a construct's outer loadings are statistically significant, they may be used to calculate the average variance extracted as it is generally considered adequate for constructs to have an AVE value of at least 0.50 or higher.

Table Average Variance Extracted (AVE)

Constructs	Average variance extracted (AVE)
CC	0.540
EE	0.687
HC	0.546
HRM	0.611
SC	0.519
SOP	0.522
SPC	0.592
STC	0.606
TEC	0.562

It is evident that all of the constructs in the study exhibit a high level of convergent validity. The average variance extracted (AVE) values observed for each construct range from 0.875 to 0.519 surpassing the recommended threshold of 0.5. This indicates that their respective indicators, providing strong evidence of convergent validity, capture a significant proportion of the variance in the latent variables.

Measurement of second-order construct:

However, to develop the second-order construct inside a reflective-reflective framework, the current research used a repeated indicator strategy. This strategy included moving all items from the first-order constructs to the overarching second-order construct, which included dimensions such as Human Capital, Customer Capital, Social Capital, Technological Capital, Structural Capital, and Spiritual Capital.

Table: Results for The Measurement of Second-order construct (Intellectual Capital)

Construct	Loading Items	CR	AVE
Intellectual Capital	0.875 0.939 0.878 0.831 0.924 0.801	0.920	0.658

Discriminant Validity Analysis:

The discriminant validity may be assessed using cross-loading of the indicator, the Fornell and Larcker criteria, and the heterotrait-monotrait (HTMT) correlation ratio (Cronbach & Meehl, 1955). This analytical framework contains a methodical process for determining how distinct constructs are in a multivariate research situation, strengthening construct differentiation and measurement fidelity in the process(Khan et al., 2019). Table shows all constructs under the square root of each construct's AVE and the correlations linked to alternative latent constructs.

Table Discriminant Validity Fronell- Larcker Criterion

Constructs	CC	EE	HC	HRM	SC	SOP	SPC	STC	TEC
CC	0.735								
EE	0.814	0.829							
HC	0.702	0.736	0.739						
HRM	0.724	0.734	0.739	0.782					
SC	0.558	0.696	0.674	0.705	0.720				
SOP	0.705	0.626	0.577	0.701	0.710	0.723			
SPC	0.732	0.712	0.674	0.719	0.606	0.634	0.769		
STC	0.650	0.709	0.668	0.705	0.774	0.724	0.715	0.778	
TEC	0.623	0.728	0.627	0.506	0.604	0.716	0.607	0.640	0.749

The heterotrait-monotrait (HTMT) correlation ratio is another measure of discriminant validity. Henseler et al. (2015) Argued that this technique outperforms the cross-loadings criteria (0.00%) and Fornell-Lacker (20.82%) using a Monte Carlo simulation analysis and discovered that HTMT has greater specificity and sensitivity rates (97% to 99%) than the cross-loadings criterion (0.00%) and Fornell-Lacker (20.82%). A lack of discriminant validity is shown by HTMT scores near to 1. The HTMT is used as a criterion by comparing it to a predetermined threshold. If the HTMT value exceeds this level, one might assume that discriminant validity is lacking. Some writers propose a cut-off of 0.85 (Kline, 2011). Furthermore, Ab Hamid et al. (2017) argued against it and offered a value of 0.90.

The results shown in Table demonstrate that all calculated ratios stay below the predetermined cut-off of 0.85, indicating a significant difference between the measured variables. The Intellectual capital (IC) is a second-order construct in the model used in this research that is defined by six underlying latent reflective constructs: CC, EE, HC, HRM, SC, SOP, SPC, STC, and TEC. In the context of performance evaluation, this structural arrangement depicts a thorough framework that captures the complex interaction and subtle connections among these many characteristics comprehensively.

Table: Discriminant Validity Heterotrait Monotrait Ratio (HTMT)

Constructs	CC	EE	HC	HRM	SC	SOP	SPC	STC	TEC
EE	0.58								
HC	0.882	0.884							
HRM	0.914	0.957	0.819						
SC	0.848	1.049	0.734	0.815					
SOP	0.859	0.921	0.822	0.811	0.81				
SPC	0.832	0.835	0.773	0.902	0.698	0.707			
STC	0.957	0.833	0.864	0.912	0.867	0.804	0.831		
TEC	0.809	0.971	0.69	0.795	0.949	0.775	0.704	0.728	

Structural Model Analysis:

A key element of Structural Equation Modeling (SEM) that explores the complex connections between latent variables and their accompanying measurement indicators is the measurement model (Kline, 2023) . According to Hair et al. (2013a), the R^2 coefficient is affected by the circumstances in which a research is conducted. According to Falk and Miller (1992), an R^2 value of 0.10 is likewise acceptable. Table shows, however, that R^2 for HRM is 0.760 and SOP is 0.704. These findings indicate that the model can explain 76% of the variance. Cohen (1988) defines f-square as effect size (>=0.02 is small, >= 0.15 is medium, and >= 0.35 is high). Table reveals that the f^2 values for HRM = 0.047 and SOP = 0.495 indicating large effect size.

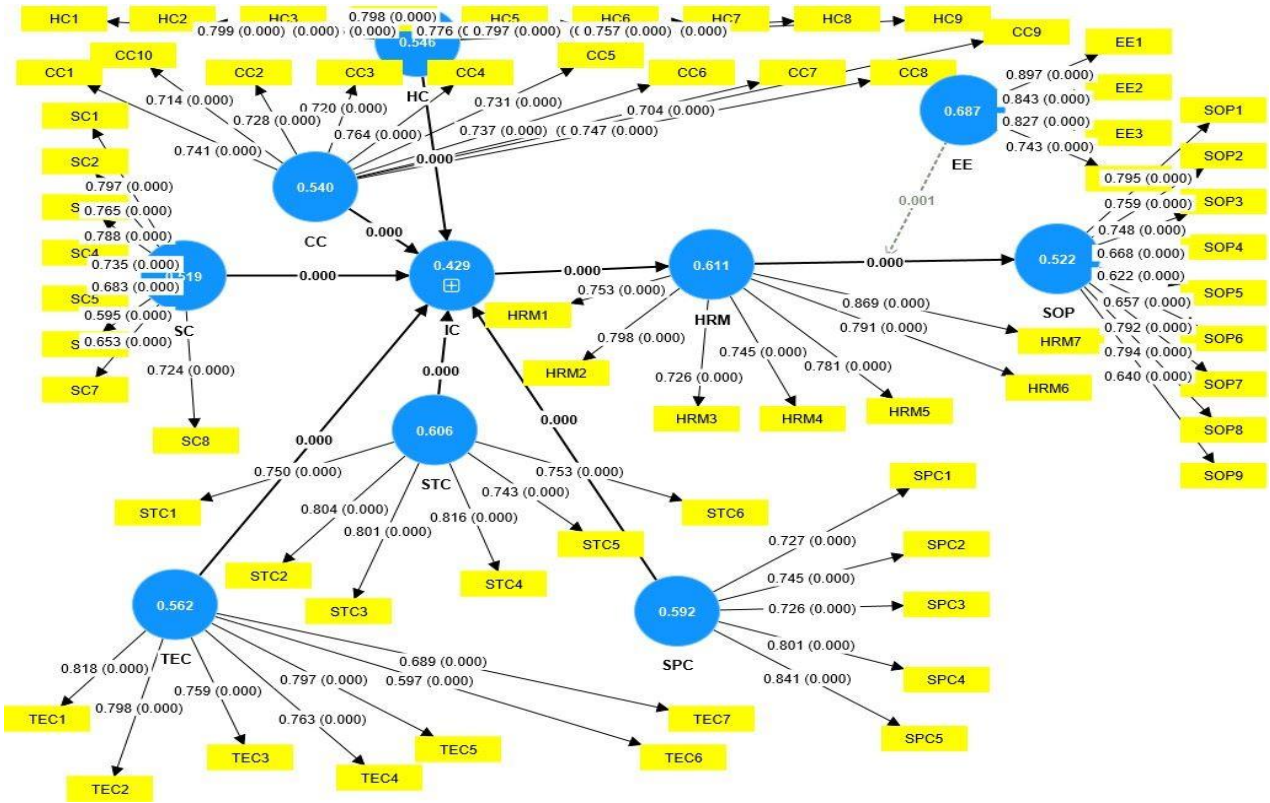

Figure: Evaluation of Structural Model

Predictive relevance PLS path model

Taking into consideration the responsiveness of the measurements, this study employed a cross-validation redundancy metric, Q^2, to assess the model in accordance with Ringle et al. (2012) guidelines. It denotes the model's out-of-sample predictive power or predictive relevance as determined by the Q^2. According to Geisser (1974) Q^2 value of the particular reflection endogenous latent variable in the structural equation model is larger than zero, demonstrating the predicted relationship between the path model and the specific dependent construct. Furthermore, relative measures of predictive significance (Q^2 values of 0.02, 0.15, and 0.35, respectively) show that the predictive relevance of the exogenous construct is minimal, average, or substantial for an endogenous construct. As demonstrated in Table, Q-square values for HRM 0.757 and SOP 0.689 that are greater than zero imply that the model has significant predictive significance.

TABLE: Measurement of R^2, F^2 and Q^2

Endogenous Variable	R^2	f^2	Q^2	Decision
HRM	0.760	0.047	0.757	Supported
SOP	0.704	0.495	0.689	Supported

Testing of the Hypotheses:

Table provides a complete summary of the hypotheses testing results, demonstrating the the standardized path coefficient indicated positive effects among the constructs in the structural model. Notably, the analysis show that Intellectual Capital has a positive and statistically significant effect on human resource management (β = 0.872, T= 70.887, P=0.000), confirming Hypothesis-1.

Likewise, the study uncovers a notable mediation effect, in which Human Resource Management strongly mediates the link between Intellectual Capital and sustainable organizational performance (β = 0.190, T= 3.770, P=0.000). This supports the validity of Hypothesis-2. The analysis also reveals that the relationship between human resource management and sustainable Organizational Performance is significantly moderates by employees' engagement (β= 0.131, T=3.445, P=0.001), adding empirical support to Hypothesis-3.

In essence, the empirical evidence presented in Table not only lends empirical support to the study's hypotheses but also elucidates the complex interplay and effects of Intellectual Capital, Human Resource Management, employee engagement, and Sustainable Organizational Performance.

Table Path coefficients and hypotheses testing

Relationship	Beta	Standard deviation	T statistics	P values	Remarks
IC -> HRM	0.872	0.012	70.887	0.000	Significant
Mediating Tests					
IC -> HRM -> SOP	0.190	0.050	3.770	0.000	Significant
Moderating Tests					
EE x HRM -> SOP	0.131	0.038	3.445	0.001	Significant

DISCUSSION

The current study aimed to investigate the effect of Intellectual Capital on Sustainable Organizational Performance with Mediating Role of Human Resource and Moderating Role of Employee Engagement. The findings show that human resource management has a positive effect on sustainable organizational performance. Human resource management and sustainable organizational performance, on the other hand, have been the focus of the previous study Mirčetić et al. (2022), indicating the large beneficial influence of good HRM practices on long-term sustainable organizational performance. These studies make the case that HRM plays a critical role in boosting employee engagement and happiness, which leads to greater work performance and commitment. Bashar et al. (2022) discovered that organization with high-quality HRM policies had reduced turnover rates and more employee engagement, leading in increased productivity and, ultimately, contributing to long-term success. This link emphasizes the vital role of HRM in cultivating a work environment that matches with the organization's beliefs and objectives, resulting in long-term success.

The present study's findings revealed that HRM methods might have a direct impact on an organization's capacity to adapt to changing conditions and stay competitive, both of which are critical characteristics of long-term success. According to Guest et al. (2003), strategic HRM techniques such as effective workforce planning, talent management and skills development help to produce a flexible and adaptable workforce. This flexibility helps businesses to react more quickly to market developments, technology breakthroughs, and other difficulties, ultimately improving their ability to achieve long-term success. Furthermore, Dahiya et al. (2023) underline the significance of human resource management in promoting a culture of continuous learning and development, which contributes to the development of workers' talents and resilience, hence supporting long-term organizational success. According to the findings of this thesis, the impact of HRM on sustainable organizational performance extends to the improvement of corporate social responsibility efforts and stakeholder relationships. Analysis of the current study specifies that Human

Resource Management mediate the relationship between Intellectual Capital (IC), and sustainable organizational performance. According to Ullah et al. (2023), effective human resource management strategies are critical in allowing the translation of Intellectual Capital resources, such as knowledge and skills, into concrete outputs. HRM serves as a link between the intangible parts of Intellectual Capital and employee capabilities, eventually influencing organizational success.

Furthermore, strategic alignment of human resource management methods with intellectual capital development may greatly improve long-term organizational performance. Moreover, Putra et al. (2023) argue that organization that strategically invest in HRM to foster Intellectual Capital have greater levels of employee satisfaction, engagement, and retention. As a result, a competent and motivated staff fosters innovation and operational excellence, therefore contributing to long-term sustainable success. According to studies such as Putra et al. (2023), this is consistent with the view that Intellectual Capital is a process of accumulation and application rather than a store of resources. As HRM fosters the intellectual growth of workers, it adds to the organization's capacity to produce, distribute, and use information efficiently, impacting long-term performance results. On the other hand, previous research Haldorai et al. (2022) provides solid evidence for the function of Human Resource Management as a mediator in the link between Intellectual Capital and sustainable organizational performance. HRM serves as a channel for Intellectual Capital to be harnessed, developed, and transformed into practical outputs, eventually influencing the organization's capacity to achieve and sustain long-term success.

Results reveal that the relationship between Human Resource Management and sustainable organizational performance moderated by the employee engagement that has received considerable attention in academic research(Raza et al., 2021; Yu et al., 2020). Previous research indicates that employee engagement plays a critical role in modulating the link between HRM practices and long-term organizational success. According to Dawwas (2022), engaged workers are more likely to react favorably to HRM programs like training and development, resulting in improved skill acquisition and performance. Results of the current study argued that this positive moderating impact strengthens the organization's potential to produce long-term sustainable results by ensuring that HRM procedures are successfully translated into employee behaviors that drive performance and contribute to organizational success. Furthermore, employee engagement has an important role in determining the success

of HRM practices in building a culture of innovation, flexibility, and continual improvement, all of which are major drivers of long-term organizational performance.

According to studies such as Danilwan and Dirhamsyah (2022), engaged workers are more likely to participate in decision-making, exchange information, and provide new ideas. Employee engagement functions as a catalyst for translating Intellectual Capital into practical solutions that promote innovation and agility when HRM procedures are structured to empower and include them. This technique produces a dynamic organizational climate that matches with changing market needs, favorably affecting long-term performance. Furthermore, Employee Engagement plays a moderating function in the formation of a positive feedback loop between HRM practices and sustainable organizational success.

Conclusion

This study provides a comprehensive and in-depth investigation into the impact of intellectual capital on sustainable organizational performance. The research emphasizes the intricate relationships between intellectual capital, human resource management (HRM), employee engagement, and long-term organizational success. The findings of the study shed light on critical processes within the organizational setting, revealing deep linkages that drive an organization's functioning and success. The study's hypotheses have been empirically validated, highlighting the significant role of intellectual capital as a catalyst for improving HRM procedures. This research confirms that intellectual capital positively influences HR practices, enhancing talent acquisition, development, and retention initiatives. Moreover, the study underscores the crucial importance of HRM in predicting long-term organizational performance. Well-structured and strategic HR practices can act as propellants for sustained excellence in organizational outcomes.

The research unveils the mediating function of HRM in the relationship between intellectual capital and sustainable organizational performance. HRM acts as a vital intermediary channeling the positive effects of intellectual capital towards performance outcomes. Additionally, the study reveals that employee engagement serves as a positive moderator in the link between HRM and sustainable organizational performance. Engaged employees amplify the positive impacts of HR practices on overall performance, emphasizing the strategic imperative of cultivating employee commitment and enthusiasm.

In a rapidly changing business landscape, this study provides organizations with a strategic roadmap to leverage their intellectual capital, optimize HR practices, and cultivate engaged

employees. By embracing these multifaceted dynamics, organizations can navigate challenges and opportunities, ultimately achieving lasting greatness and sustainable success.

Implications:

The findings encapsulated in this research, examining the Impact of Intellectual Capital on Sustainable Organizational Performance with an emphasis on the Mediating Role of Human Resources and the Moderating Role of Employee Engagement, carry profound implications for contemporary business practices. Firstly, these findings underscore the imperative for organizations to acknowledge Intellectual Capital as a linchpin for enduring success. Secondly, the implications transcend HR policies and employee management, extending to the realm of HR strategy enhancement via the Mediating Role of Human Resources. Proactive talent acquisition, effective training and development initiatives, and strategic succession planning can all be recalibrated to expedite the transformation of Intellectual Capital into tangible outcomes. Simultaneously, the Moderating Role of Employee Engagement underscores the significance of nurturing a motivated and dedicated workforce. Organizations can harness the amplifying effect of engaged employees on the relationship between Intellectual Capital and performance by prioritizing employee well-being, granting opportunities for autonomy and decision-making, and fostering an enabling work environment. Lastly, the findings advocate for a comprehensive and strategic approach to organizational management. By embracing the transformative potential of Intellectual Capital, recognizing the Mediating Role of Human Resources, and fostering Employee Engagement, organizations can cultivate a synergistic ecosystem that maximizes the utilization of knowledge and creativity, culminating in sustained high performance.

Recommendations:

Organizations may promote an atmosphere favorable to Intellectual Capital accumulation by promoting a culture of continual learning and creating venues for cross-functional cooperation. Organizations should invest in strong Human Resource processes that enable the translation of Intellectual Capital into real outputs. Organizations may maximize the exploitation of their Intellectual Capital by ensuring that their personnel have the essential skills, knowledge, and motivation. This improves operational efficiency, competitiveness, and overall performance. Encouraging Employee Engagement has emerged as a critical need for firms seeking to enhance their long-term success. Policies and practices that improve employee happiness, well-being, and participation should be prioritized by organizations. Possibilities for autonomy, decision-making, and professional advancement may all lead to

greater levels of Employee Engagement. Science, Technology and Innovation (STI) policies are an integral part and essential engine for the sustainable development of human society to address modern-day global challenges. Presently, the global community is grappling with profound known and unknown challenges which have the potential to disrupt the regular societal fabric. To address such perplexing challenges, there is a dire need to implement intellectual capital management at a larger scale to ensure close cooperation, sharing and learning of STI policies to have a valid solution to socio-economic and environmental issues in a peaceful manner to the global community.

Limitation and Future Research

More study across other industries and geographies is required to determine the wider relevance of the found links between Intellectual Capital, Human Resources, Employee Engagement, and long-term organizational success.

Other variables influencing the connections under research include leadership styles, company culture, and external environmental conditions. Future study might look at the interconnections between these characteristics and their influence on long-term organizational success.

Using a combination of qualitative and quantitative methodologies, as well as longitudinal data, might give a more thorough picture of the connections under investigation.

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