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Big Data Analytics Capabilities, Green Intellectual Capital, Supply Chain Innovations and Sustainable Supply Chain Performance

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ABSTRACT

Based on the Dynamic Capability View and sustainable supply chains in multinational enterprises (MNEs), a theoretical framework is proposed to examine how big-data analytics capabilities affect MNEs' sustainable supply chain performance through green intellectual capital and supply chain innovation. 331 completed questionnaires were collected from IT, logistics, and supply chain managers. Using structural equation modeling (SEM), the study shows that big-data analytics capabilities positively impact the development of firms' green intellectual capital. Further, green intellectual capital contributes to sustainable supply chain performance, and supply chain innovations moderate the relationship. Moreover, green intellectual capital proves advantageous in mediating the influence of big-data analytics capabilities on sustainable supply chain performance when supply chain innovations moderate this influence. The findings provide novel insights into the big-data analytics capabilities, green intellectual capital, supply chain innovations, and sustainable supply chain performance nexus in the Gulf Cooperation Council (GCC) context. The managerial implications for promoting sustainable supply chain performance via green intellectual capital and innovations are critically examined.

Keywords: *big-data analytics capabilities, green intellectual capital, supply chain innovation, sustainable supply chain performance*

1. INTRODUCTION

"Sustainable supply chain" includes how businesses procure raw materials, create, store, deliver, and handle all transportation aspects of their products' life while considering people and the environment (Mentzer *et al*., 2001). The objective is to positively influence society while minimizing the adverse environmental effects of energy use, water use, and waste generation (Jadhav, Orr, & Malik, 2019). Recently, stakeholders have pressured businesses to exhibit better environmental stewardship and social responsibility (Jadhav *et al*., 2019). Many organizations have focused on supply chains since they use significant resources and money and are frequently a source of waste (Jadhav *et al*., 2019; Taghikhah, Voinov, & Shukla, 2019). Sustainability in the supply chain benefits businesses, stakeholders, society, and the environment.

MNEs have been criticized for their negative social and environmental impacts (Juettner, Windler, Podleisek, Gander, & Meldau, 2020). Much of their supply chain in emerging markets harms the environment (Juettner *et al*., 2020). Society expects firms to perform beyond the old economic metric of profit motivation and adapt to efforts to attain sustainability objectives (Das, 2023). Thus, MNEs are crucial to sustainable supply chains. This study examined GCC sustainable supply chain performance (SSC-P). The GCC is a thriving MNE hub. This region attracts global attention and profits from technology growth.

MNEs develop dynamic capability views to manage risks and achieve a competitive advantage by developing resources to deal with uncertainty (Laing & Moonsammy, 2021). The concern about hazards is especially pertinent now, as the environmental impact of MNEs' actions can result in reputational and financial consequences (Mio, Panfilo, & Blundo, 2020). BDA solutions can provide economic benefits and promote organizational advancement and organization efficiency (Mohammad et al, 2022; Rehman, S. U., 2023). BDA processes data at a high volume and velocity, leading to numerous improvements compared to traditional data processing systems (Mohammad Bahrami *et al*., 2022). Firms can leverage BDA capabilities (BDA-C) in business to make well-informed decisions in operational management. In the context of green intellectual capital (GIC), BDA capabilities provide a reliable source of

information that can enhance green intellectual capital, such as green human capital (GH-C), green structural capital (GS-C), and green relational capital (GR-C), as BDA capabilities have the potential to improve green intellectual capital (AL-Khatib & Shuhaiber, 2022). Through BDA capabilities, green intellectual capital helps businesses effectively manage risks, stimulate innovation, evaluate the environmental impact, forecast sustainability trends, and maximize resource utilization. Following earlier research, we used three constructs of green intellectual capital (GH-C, GS-C, and GR-C). First, Industry 4.0 revolution, BDA capabilities significantly develop GH-C by helping businesses drive sustainable practices by making data-driven decisions. Second, it helps companies optimize resource use, manage risks, improve supply chain transparency, and increase green structural capital (GS-C) (Waqas, Honggang, Ahmad, Khan, & Iqbal, 2021). Lastly, it helps organizations build strategic partnerships, involve stakeholders, and support local communities and customers, enhancing GR-C (Liu, Fang, Feng, & Gao, 2022; Waqas *et al*., 2021).

Green intellectual capital improves innovation, teamwork, risk management, and compliance, promoting sustainable supply chain performance (Yusliza *et al*., 2020). Green intellectual capital helps organizations achieve environmental goals while boosting efficiency and lowering supply chain parties (Wang & Juo, 2021; Rehman, *et al.*, 2024). Thus, green intellectual capital should improve supply chain sustainability. As previously suggested, green intellectual capital mediates BDA capabilities and sustainable supply chain performance (Liu *et al*., 2022; Waqas *et al.*, 2021). BDA-capable firms can use their green intellectual capital assets to improve supply chain sustainability (Jirakraisiri, Badir, & Frank, 2021). By understanding how green intellectual capital mediates interactions, organizations can effectively use BDA to enhance supply chain sustainability. Lastly, we propose the sequential mediation-moderation approach - examining the impact of BDA capabilities on SSC-P via the mediating role of green intellectual capital and the moderating role of supply chain innovativeness.

Our research has several contributions to the existing literature. It is the first study to examine how BDA capabilities affect MNEs' sustainable supply chain performance linkages in the GCC region. Our study examines BDA capability's impact on sustainable supply chain performance through green intellectual capital mediation to examine how firms may use data analytics for sustainability. This contributes to a deeper understanding of the role of BDA capabilities in driving sustainable practices within supply chains. Second, our study acknowledges that the influence of BDA capabilities on sustainable supply chain performance varies based on the degree of innovation within the supply chain processes by considering the moderating effect of supply chain innovativeness supply chain innovativeness (SC-I). This emphasizes how supply chain management is dynamic and how technology must be adjusted to have a competitive edge. Second, our study acknowledges that the influence of BDA capabilities on sustainable supply chain performance may differ based on the degree of innovation within the supply chain processes by considering the moderating effect of supply chain innovativeness (SC-I). This emphasizes dynamic supply chain management and how technology should be adjusted to fit cutting-edge methods. Third, our study offers insights into a regional context with potential supply chain management and sustainability challenges. This approach provides a detailed insight into the dynamics within the GCC region. Finally, this study acknowledges MNEs' cross-border impact on GCC economies. Due to their resources, knowledge, and influence, MNEs can affect regional adoption of BDA, green intellectual capital, and supply chain innovativeness (SC-I).

The rest of the article follows this format. We provide a theoretical framework and literature review to develop our hypotheses. Next, we provide the study design, survey sample and structure, statistical analysis, and findings.

2. THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 Theoretical Background

The study used the Dynamic Capability View as a theoretical framework for examining the impact of BDA capabilities and sustainable supply chain performance. BDA capabilities provide organizations a competitive edge by allowing them to establish and refine environmental response capabilities, according to Dynamic Capability View (Mandal, 2018). Thus, in industry 4.0 revolution, BDA capabilities serve as a crucial part of this context. BDA capabilities are crucial dynamic capabilities enabling real-time data processing and decision-making, ultimately leading to better sustainable supply chain performance which ultimately enhance the organization efficiency (Mohamad Bahrami & Shokouhyar, 2022; Rehman, S. U., 2023). The Dynamic Capability View views BDA capabilities as generating sustainable supply chain performance capabilities.

The mediation-moderation method also illustrates how BDA capabilities affect sustainable supply chain performance (Fantazy & Tipu, 2024). Through a mediation approach, research can explore the impact of BDA capabilities on sustainable supply chain performance. BDA capabilities lead to improved green intellectual capital, which may mediate the relationship between BDA capabilities and sustainable performance (Fantazy & Tipu, 2024). BDA capabilities enhance analytics capabilities, allowing firms' green intellectual capital to predict demand precisely and cut waste, directly improving sustainable supply chain performance (Tipu & Fantazy, 2023). Supply chain innovation moderated the relationship between BDA capabilities and sustainable supply chain performance. Supply chain innovation provides a strong technology framework that boosts BDA sustainability.

2.2 Literature Review and Hypotheses Development

2.2.1 BDA Capabilities and Green Intellectual Capital

BDA capabilities help companies collect, analyze, and interpret environmental resources and sustainability data. It also helps organizations make data-driven decisions rather than intuitive or historical (AL-Khatib & Shuhaiber, 2022). Data-driven environmental management and green resource allocation can improve green intellectual capital.

First, we used GH-C to construct green intellectual capital. We argue that BDA capabilities boost GH-C. Operational managers initially receive data-driven environmental information (Abdul Rahman, Lirn, Hamid, & AlKalbani, 2023; Mishra, Biswal, Behera, & Das, 2021). Data on environmental trends, patterns, and threats can help organizations understand sustainability concerns and build GH-C. Businesses can reduce their environmental impact and become more sustainable (Jaouadi, 2022). The insights promote environmental awareness and innovation in GH-C. Second, we used GS-C as our second green intellectual capital construct. BDA capabilities improve the efficiency, efficacy, and transparency of green projects and environmental management techniques, boosting GS-C. It assists firms with data-driven environmental and sustainability decisions. By analyzing large amounts of environmental data, organizations can identify energy, resource, emission, and waste management trends, patterns, and improvement opportunities (Mishra *et al*., 2021). This continuous development and innovation culture promotes GS-C by creating a sustainable and ecologically responsible learning environment (AL-Khatib & Shuhaiber, 2022). Lastly, we used GR-C as the third construct of green intellectual capital (Alkhatib, 2023). BDA capabilities help firms establish friendly and reciprocal relationships with suppliers, characterized by mutual trust and respect, which can incentivize suppliers to follow a manufacturer's lead in implementing green manufacturing (Darbanian, Brandtner, Falatouri, & Nasseri, 2024; Rehman, *et al*., 2024; Mishra *et al*., 2021).

Thus, BDA helps firms make better environmental investment and initiative decisions, affecting green intellectual capital. It aids businesses in environmental risk prediction and mitigation. Historical data and environmental indicators help companies predict climate-related incidents, legislation changes, and supply chain disruptions. We presented the following hypotheses:

H1a: *BDA capabilities (BDA-C) enhance firms' green human capital (GH-C) in the GCC context.*
H1b: *BDA capabilities (BDA-C) enhance firms' green structural capital (GS-C) in the GCC context.*
H1c: *BDA capabilities (BDA-C) enhance firms' green rational capital (GR-C) in the GCC context.*

2.2.2 Green Intellectual Capital (GIC) and Sustainable Supply Chain Capabilities (SSC-P)

Green intellectual capital improves environmental performance by comprehending green technologies, legislation, and practices. This improves sustainable supply chain performance. Also, sustainable supply chain performance requires a firm to integrate sustainable values into supply chain activities. Green intellectual capital helps firms promote sustainable supply chain methods. Green intellectual capital knows sustainable materials, transportation, and waste reduction, enhancing supply chain performance. We propose that green intellectual capital enhances companies' sustainable supply chain performance. Each construct of green intellectual capital has an impact on green intellectual capital. Mahmood & Nasir (2023) have outlined the essential capabilities vital for sustainability, including employees' value awareness, sustainable thinking, teamwork, and introspection. Thus, GH-C is an essential factor that increases sustainable supply chain performance. Wang & Juo (2021) emphasized the significance of company policies and structure in achieving economic, environmental, and social sustainability. Yusliza *et al.* (2020) confirmed that GS-C impacts sustainable supply chain performance, including process innovation, product quality, and product innovation. Organizational structure and structural capital are crucial to helping firms reduce environmental violations and expenses (Fatima, Abrar, & Shahbaz, 2024; Yusliza *et al.*, 2020; Rehman, *et.al.*, 2024). Furthermore, Jirakraisiri *et al.* (2021) find a strong association between GR-C (customer loyalty, customer satisfaction) and sustainable supply chain performance. Yong *et al*. (2019) suggested that researchers should explore each aspect of green intellectual capital in various contexts and examine sustainable performance. In addition, according to Yong *et al.* (2019), organizations can benefit from their green intellectual capital, resulting in a sustainable supply chain performance and, ultimately, superior performance (Tonial, Cassol, Selig, & Giugliani, 2019). This study aims to fill the gap in the literature by proposing the following hypotheses.

H2a: *Green human capital (GH-C) enhances firms' sustainable supply chain performance (SSC-P) in the GCC context.*
H2b: *Green structural capital (GS-C) enhances firms' sustainable supply chain performance (SSC-P) in the GCC context.*
H2c: *Green relational (GR-C) enhances firms' sustainable supply chain performance (SSC-P) in the GCC context.*

2.2.3 Moderating Role of Green Intellectual Capital (GIC)

Green intellectual capital is essential for matching BDA capabilities to sustainable supply chain performance through multiple strategies. Green intellectual capital provides the knowledge and ability to integrate BDA capabilities into sustainable supply chain performance (Ullah, Mehmood, & Ahmad, 2023). Green intellectual capital is crucial for interpreting and applying insights from BDA capabilities to enhance sustainable supply chain performance (Mahmood & Nasir, 2023). Encouraging collaboration among data analysts, sustainability experts, supply chain managers, and other stakeholders is a crucial focus of green intellectual capital (Haldorai, Kim, & Garcia, 2022; Ullah *et al.*, 2023). Utilizing green intellectual capital allows organizations to combine various viewpoints and skills to analyze BDA results, pinpoint chances for lasting enhancements, and create successful strategies to boost sustainable supply chain performance (Mahmood & Nasir, 2023).

Green intellectual capital is essential for BDA capabilities and sustainable supply chain performance. Organizations can make educated decisions with BDA. BDA helps firms optimize processes, classify opportunistic improvement, and improve efficacy. Green intellectual capital drives sustainable practices through data-driven insights, improving supply chain performance. Green intellectual capital helps companies prioritize sustainability by identifying environmental threats and possibilities. Green intellectual capital also helps integrate sustainability criteria into decision-making, ensuring data-driven plans meet environmental goals (Rehman, *et.al.*, 2024).

Among the constructs of green intellectual capital, GH-C emphasizes a commitment to ongoing improvement in

sustainable supply chain performance through BDA capabilities to oversee performance, monitor growth, and pinpoint areas for additional improvement (Farooq, Yusliza, Muhammad, & Saputra, 2022). Further, GS-C allows firms to integrate BDA capabilities into existing sustainability efforts to continuously enhance supply chain sustainability, resulting in improved sustainable supply chain performance results (Farooq *et al.*, 2022). In addition, GR-C uses advanced capabilities to engage stakeholders and ensure transparency by collecting, analyzing, and communicating data on sustainable supply chain performance (Wang & Juo, 2021). Utilizing GR-C allows organizations to efficiently convey BDA-driven insights to stakeholders, accountability, and instill trust in their dedication to sustainable practices. Thus, we propose the mediating role of green intellectual capital in the association between green intellectual capital (GH-C, GR-C, and GS-C) and BDA capabilities.

H3a: *Green human capital (GH-C) mediates the impact of BDA capabilities (BDA-C) on a firm's sustainable supply chain performance (SSC-P) in the GCC context.*
H3b: *Green structural capital (GS-C) mediates the impact of BDA capabilities (BDA-C) on a firm's sustainable supply chain performance (SSC-P) in the GCC context.*
H3c: *Green relational (GR-C) mediates the impact of BDA capabilities (BDA-C) on a firm's sustainable supply chain performance (SSC-P) in the GCC context.*

2.2.4 Mediation-Moderation Effect

Green intellectual capital, supply chain innovativeness (SC-I), and sustainable supply chain performance must be examined through moderation and mediation to understand their relationships and effects. When two variables' relationship shifts based on a third variable's level, moderation takes place (Fairchild & MacKinnon, 2009; Yousaf, Rasheed, Kaur, Islam, & Dhir, 2022). In this case, supply chain innovativeness (SC-I) can moderate the relationship between green intellectual capital and the *firm's* sustainable supply chain performance. Firms with high levels of green intellectual capital influence sustainable supply chain performance, and the relationship might be amplified by the existence of supply chain innovativeness (Afraz, Bhatti, Ferraris, & Couturier, 2021; Fatima *et al.*, 2024). An organization that excels in green intellectual capital may be influenced by supply chain innovativeness (SC-I) to create and execute sustainable practices, resulting in enhanced sustainable supply chain performance. Therefore, we propose that supply chain innovativeness (SC-I) moderates the relationship between green intellectual capital (GHS, GRS, and GS-C).

H4a: *Supply chain innovativeness (SC-I) moderates the positive impact of green human capital (GH-C) on a firm's sustainable supply chain performance (SSC-P) in the GCC context.*
H4b: *Supply chain innovativeness (SC-I) moderates the positive impact of green structural capital (GS-C) on a firm's sustainable supply chain performance (SSC-P) in the GCC context.*
H4c: *Supply chain innovativeness (SC-I) moderates the positive impact of green relational capital (GR-C) GR-C on a firm's sustainable supply chain performance (SSC-P) in the GCC context.*

Lastly, we empirically tested the mediation-moderation effect. Green intellectual capital and supply chain innovativeness should mediate the effect of BDA capabilities on sustainable supply chain performance. Thus, supply chain innovativeness moderates between BDA capabilities, green intellectual capital, and sustainable supply chain performance, facilitating the influence of BDA capabilities and green intellectual capital on sustainable supply chain performance. For instance, companies with significant integrated BDA capabilities and green intellectual capital relationships might be influenced by supply chain innovativeness activities, like creating sustainable products and adopting sustainable manufacturing methods (Afraz et al., 2021; Fatima *et al.*, 2024). Thus, the relation between BDA capabilities and sustainable supply chain performance may not be direct but is mediated by green intellectual capital. Further, the mediation impact of green intellectual capital is moderated by supply chain innovativeness (SC-I). Supply chain innovativeness can strengthen the relationship between BDA capabilities, green intellectual capital, and sustainable supply chain performance. Thus, we proposed a mediation-moderation approach to investigate BDA capability's impact on GCC supply chain sustainability.

H5a: *In the GCC context, the impact of BDA capabilities (BDA-C) on a firm's sustainable supply chain performance is sequentially mediated and moderated by GH-C and supply chain innovativeness (SC-I).*
H5b: *In the GCC context, the impact of BDA capabilities (BDA-C) on a firm's sustainable supply chain performance is sequentially mediated and moderated by GS-C and supply chain innovativeness (SC-I).*
H5c: *In the GCC context, the impact of BDA capabilities (BDA-C) on a firm's sustainable supply chain performance is sequentially mediated and moderated by GR-C and supply chain innovativeness (SC-I).*

2.2.5 Research Framework

Figure 1 shows the research framework. We listed hypotheses and controls variables in the figure. Appendix A lists items and variables along with measurements.

3. RESEARCH METHODOLOGY

3.1 MNEs as a Context Selection

The survey data was gathered from logistics and supply chain managers working in MNEs in the GCC region. Recently, more MNEs have promised to engage with socially and environmentally responsible suppliers. Usually, MNEs expect their first-tier suppliers to comply with such requirements and ask their suppliers to do the same. They want to develop a sustainable practice cascade that flows smoothly along the supply chain or network. At the core of GCC's sustainability plan are environmental sustainability, climate protection, social responsibility, and economic sustainability for present and future generations. Working towards sustainable development and fair society has been a long-standing goal, although it has not typically been seen as a responsibility of MNEs. The SDGs have presented a framework prompting MNEs and governments to review their policies and strategies. Specialists in IB are currently

evaluating whether it is the responsibility of MNEs to contribute to these objectives.

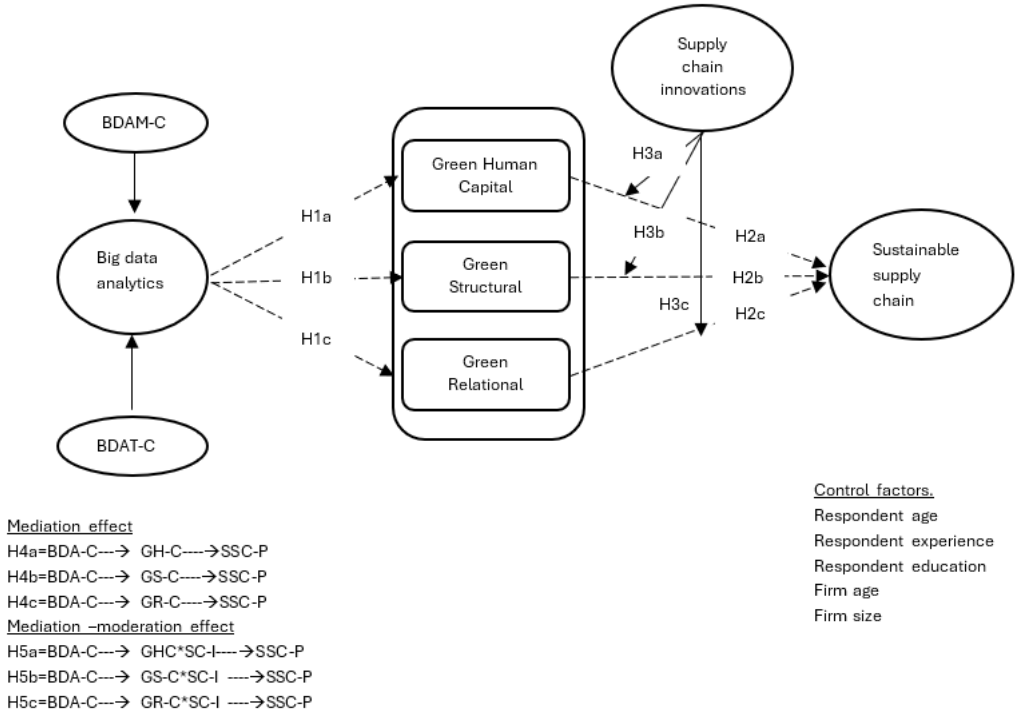

Figure 1 Structural equation modelling

3.2 Construct Operationalization

While designing the questionnaire, researchers followed the principles Sekaran & Bougie (2016) identified, such as question-wording, construct focus, question sequence, and content length. We kept a focus on the research objectives and operational definitions of each construct that promote the confidence and interest of respondents. Further, the questionnaire draft is constructed to obtain a suitable and accurate response from the respondents. The research utilized a 7-point Likert scale, with responses ranging from 1 for strongly disagree to 7 for strongly agree (Tarofder, Azam, & Jalal, 2017). In addition, a team comprising a professor, two logistics and supply chain managers, and three researchers in the relevant field analyzed the questionnaire to evaluate its content validity for this study. Following approval, the questionnaires were distributed for data collection (refer to Appendix A). Furthermore, big-data-analysis capability and green capital were assessed using a second-order formative scale that included key constructs and factors.

3.3 Data Collection, Sampling, and Analysis

Our questionnaire consists of three different parts that need to be answered by experts in the relevant field. The first part includes questions about BDA capabilities constructs relevant to IT experts. The second part consists of questions regarding HR that are required to be answered by HR managers. Third, the logistics and supply chain managers are the relevant respondents. The logistics and supply chain managers are those who have exposure during the last five years to manage logistics and supply chain green practices and sustainability practices (such as reducing carbon footprint, waste reduction, ethical sourcing, and recycling) within their current or previous organization through technology, such as Warehouse Management System (WMS) Transportation Management System (TMS) Inventory Management Software Supply Chain Analytics Platform.

We staged data collection. First, we contacted each sampled organization to explain the study's objectives and questionnaire content, then verified managers' job titles before sending them the necessary questionnaire. Overall, we contacted 598 regional firms. After finalizing the managers' list, we emailed the questionnaire to the necessary person to answer the highlighted questions. In the first round, we emailed 1794 relevant respondents (598 firms*3 managers each firm). The first stage yielded 358 questionnaires with 19.96% response. We followed up with a reminder email to the non-respondent, which increased the response percentage to 25.47%. We tailored the strategy to increase the response rate. We contacted managers who did not answer in the first two stages. It increased the response rate by 14.49%. A total of 1075 replies were received. We examined the responses and deleted incomplete ones with missing data, leaving 993 complete responses and 331 (993/3) firm-level responses (55.35%). The descriptions are provided in **Table 1**.

4. MAIN FINDINGS

4.1 Demographics of Respondents

The main characteristics of the respondents and their firms are outlined in **Table 2**. Overall, the participation rate in KSA is the highest at 30.21%, with UAE following closely at the percentage 26.89% and Kuwait at 12.39%. Participation in the GCC economies mirrors the trend in market size. Among the participants, 77.64% were male. Based on the data, 14.80% of the participants had one to three years of work experience at their superstore, 22.66% had four to six years of experience, 34.74% had six to ten years of work experience, and 27.79% had experience over ten

years. In addition, a large portion of the participants possess a high level of education: 9.97% have completed an undergraduate degree, 54.08% have pursued graduate studies, 22.36% have obtained postgraduate degrees, and the remaining 13.60% have other professional certifications such as diploma or professional education. We also classified companies based on their age and size. According to the findings, most companies fall within the 5 to 10-year age range (33.53%), with the highest percentage in the 10 to 15-year age range (27.19%). Likewise, 22.96% of firms fall in 100-200 employees, and 20.54% fall in 200-300 brackets.

Table 1 Data collection

Methods	IT professional		HR managers		Logistics and supply chain managers		Total	
	N	%age	N	%age	N	%age	N	%age
Emailed	598		598		598		1794	
First Response	116	19.40%	119	19.90%	123	20.57%	358	19.96%
Second response	149	24.92%	160	26.76%	148	24.75%	457	25.47%
Personally collected	82	13.71%	86	14.38%	92	15.38%	260	14.49%
overall	347	58.03%	365	61.04%	363	60.70%	1075	59.92%
Incomplete 1075-939)	16	4.61%	34	9.32%	32	8.8%	136	7.58%
Complete (1075-136)	331	95.39%	331	90.68%	331	91.2%	939	87.35%
Number of firms (993/3)							**331**	
Response rate (331/598)								55.35%

Table 2 Respondents profile

Category		UAE	Bahrain	KSA	Oman	Qatar	Kuwait	Overall	
		N=89 26.89%	N=34 10.27%	N=100 30.21%	N=35 10.57%	N=32 9.67%	N=41 12.39%	N=331	100%
Gender	Male	68	26	78	28	24	33	257	77.64%
	Female	21	8	22	7	8	8	74	22.36%
Experience	Less than 4 years	12	8	13	5	8	3	49	14.80%
	4 to 6 years	21	7	21	8	9	9	75	22.66%
	7 to 10 years	34	8	39	12	6	16	115	34.74%
	Above 10 years	22	11	27	10	9	13	92	27.79%
Education level	Undergraduate	8	5	8	4	4	4	33	9.97%
	Graduate	48	16	60	16	15	24	179	54.08%
	Postgraduate	24	6	18	7	10	9	74	22.36%
	Other (Diploma/Professional education)	9	7	14	8	3	4	45	13.60%
Firm age	Less than 5 years	15	10	14	4	6	7	56	16.92%
	5 to 10 years	37	8	23	14	15	14	111	33.53%
	11 to 15 years	22	9	32	9	7	11	90	27.19%
	Above 15 years	15	7	31	8	4	9	74	22.36%
Firm size	Less than 100 employees	17	6	15	7	6	8	59	17.82%
	100-200 employees	20	8	19	9	4	8	68	20.54%
	201-300 employees	15	7	25	8	12	9	76	22.96%
	301-400 employees	22	8	20	6	3	7	66	19.94%
	above 400	15	5	21	5	6	9	61	18.43%
Total respondent=331									

Source: author's compilation

4.2 The Empirical Results

4.2.1 Measurement Model

Convergent validity evaluates how effectively indicators within a structure correlate (Hair *et al.*, 2019). Convergent validity was verified using Smart-PLS v3's confirmatory factor analysis (CFA). The reliability and convergent validity results of this study are shown in **Table 3**. All constructions have Cronbach's alpha values between 0.827 and 0.922, exceeding the cutoff. This study compared concept definitions and applications. CR ranged from 0.884 to 0.930 and AVE from 0.712 to 0.805. AVE should be above 0.5 and Cronbach's alpha and CR above 0.7 to establish an instrument's validity and reliability (Cheah, Sarstedt, Ringle, Ramayah, & Ting, 2018). Based on the findings, this study's data appears accurate and consistent, supporting structural analysis.

4.2.2 Discriminant validity

Discriminant validity measures how well variables can be discriminated in practice. We follow a standard practices assessing discriminant validity when studying parameter relationships (Hair, Risher, Sarstedt, & Ringle, 2019). The study assessed discriminant validity using three approaches. We examined the components' correlations and AVE's square root first. We checked survey item loadings and cross-loadings to confirm linkages. One method to assess the discriminant validity of the study involves utilizing the Heterotrait e Monotrait Ration (HTMT) method suggested by Hair *et al.* (2019). The instrument's validity was evaluated by analyzing the correlations between different constructs and the square root of AVE, as per the Fornell-Larcker criterion provided in **Table 4**. The values in **Table 4** indicate that the square root of AVE is greater than the coefficients of the correlations between all variables. This shows solid discriminant validity (Fornell & Larcker, 1981).

The HTMT ratio criteria were created to emphasize the limitations of the Fornell-Larcker and cross-loading criteria. When the HTMT ratio is near 1, it indicates a potential issue with discriminant validity in the analysis. HTMT involves calculating the correlation between different components, explicitly emphasizing the maximum value. When comparing the two components, the HTMT value is recommended to be below 1 (Henseler, 2018). After analyzing the HTMT ratio, the HTMT value falls below the threshold, suggesting that the study's discriminant validity is adequate.

Table 3 Convergent validity and reliability analysis

Variables	A	Rho_A	CR	AVE
BDAM-C	0.869	0.872	0.917	0.805
BDAT-C	0.899	0.901	0.924	0.780
GH-C	0.891	0.892	0.915	0.712
GS-C	0.827	0.829	0.891	0.748
GR-C	0.922	0.908	0.930	0.796
SC-I	0.856	0.860	0.906	0.781
SSC-P	0.859	0.860	0.884	0.786

BDAM-C = BDA management capability, BDAT-C=BDA talent capability, GH-C=green human capital, GS-C= green structural capital, GR-C= green relational capital, SC-I= Supply chain innovations, SSC-P= sustainable supply chain performance, Rho_A (the Dijkstra-Henseler's rho) is a composite reliability ≥0.70

Source: Author's creation

Table 4 Discriminant validity

	BDAM-C	BDAT-C	GH-C	GS-C	GR-C	SC-I	SSC-P
Fornell–Larcker criterion							
BDAM-C	**0.895**						
BDAT-C	0.361	**0.881**					
GH-C	0.378	0.402	**0.841**				
GS-C	0.336	0.452	0.422	**0.862**			
GR-C	0.407	0.369	0.424	0.427	**0.890**		
SC-I	0.453	0.383	0.412	0.411	0.406	**0.882**	
SSC-P	0.413	0.391	0.429	0.394	0.445	0.487	**0.884**
	BDAM-C	**BDAT-C**	**GH-C**	**GS-C**	**GR-C**	**SC-I**	**SSC-P**
HTMT ratio criterion.							
BDAM-C	—						
BDAT-C		0.418					
GH-C		0.438	0.459				
GS-C		0.403	0.536	0.503			
GR-C		0.467	0.419	0.482	0.505		
SC-I		0.537	0.448	0.481	0.498	0.471	
SSC-P		0.488	0.455	0.503	0.479	0.515	0.553

BDAM-C= BDA management capability, BDAT-C=BDA talent capability, GH-C=green human capital, GS-C= green structural capital, GR-C= green relational capital, SC-I= Supply chain innovations, SSC-P= sustainable supply chain performance

4.2.3 Common Method Bias and Multicollinearity

Common method bias (CMB) could potentially impact the validity of our research. Survey participants are advised in the instructions that there are no rights or wrong answers and that their responses will be kept anonymous and confidential. This could potentially impact the validity of our research findings. Harman's single-factor test is frequently used to evaluate the presence of common method bias in a study (Min, Park, & Kim, 2016). We used Harman's single-factor test in SPSS v26 software to detect CMB. Based on the results, the first component explains 34.26% of the variability, falling short of the 50% threshold value (Min *et al.*, 2016). In addition, the inner variance inflation factor (VIF) is utilized to address the common method bias issue in Smart-PLS v3. The range of results from 1.29 to 1.75 suggests that CMB was not a significant factor in this study. We also used outer VIF to evaluate multicollinearity for the survey items in Smart-PLS v3 software. Multicollinearity is not a concern if the VIF values in research are below 10 (Rahim *et al.*, 2023). Our findings indicate a maximum VIF value of 3.66, indicating the absence of significant multicollinearity concerns. Thus, our model is free from concerns related to CMB and multicollinearity. This suggests that the substantial differences among the constructs may be utilized in the structural model.

4.2.4 The Empirical Findings

In the above sections, the study confirms that the measurement model exhibits a satisfactory fit index and is deemed reliable and valid, and the SEM is evaluated. The results exhibit strong fitness of the data for analyzing the main model: $\chi^2 = 501, \chi^2/\mathrm{df} = 188, \mathrm{p} < .01$, TLI = .95,RMSEA = 0.054, SRMR = 0.053. The findings from the study outline the standardized path coefficients and the percentage of variance (R-Square) attributed to the exogenous constructs (see **Table 5**). Fifth, the study proposed three hypotheses for a direct association between BDA capabilities and green intellectual capital (GH-C, GS-C, and GR-C). The findings exhibit a strong association between firms' BDA capabilities and green intellectual capital (GH-C, GS-C, and GR-C), as the path coefficients are statistically significant at p<0.001 (see **Table 5**).

Second, the impact of green intellectual capital (GH-C, GS-C, and GR-C) on SSC-P is also tested. Likewise, path coefficients of three constructs of green intellectual capital (GH-C, GS-C, and GR-C) are statistically significant at p<.05 (see **Table 5**). Thus, our hypotheses (H2a, H2b, and H2c) are also accepted at a moderate significance level (1% level of significance for GH-C and 5% for GS-C and GR-C). We also used the second-order construct of green intellectual capital for comparison. The coefficient estimate of green intellectual capital is positive and statistically significant (β = 0.202, t=2.148 and p<.05; see **Table 5**). In comparative terms, GH-C has higher coefficient estimates and level of significance than green intellectual capital and its other two constructs (GS-C and GR-C) in its association with SSC-P. Our analysis indicates a significant relationship between green intellectual capital and SSC-P. Utilizing green intellectual capital allows companies to adhere to strict international environmental regulations, cater to the growing environmental consciousness among consumers, and enhance SSC-P. Green intellectual capital also leads firms to sustainability in their supply chain. MNEs in the GCC region can generate SSC-P through green intellectual capital, thereby creating a competitive advantage. These firms' ability to utilize green intellectual capital improves their SSC-P. They are also better at complying with the host country's stringent environmental rules. More importantly, the role of GH-C is more pronounced than that of the other two constructs of green intellectual capital.

Table 5 Direct and moderation effect

Path	Estimates	S.E	t-value	R-squared	Results
H1a= BDA-C→GH-C	0.244***	0.037	6.522	27.84%	Accepted
H1b= BDA-C→GS-C	0.199***	0.036	5.467	26.49%	Accepted
H1c= BDA-C → GR-C	0.160***	0.026	6.086	24.91%	Accepted
H2a= GH-C → SSC-P	0.179**	0.057	3.161	28.82%	Accepted
H2b= GS-C → SSC-P	0.124*	0.057	2.190	26.94%	Accepted
H2c= GR-C → SSC-P	0.110*	0.048	2.315	29.23%	Accepted
GIC →SSC-P	0.202*	0.094	2.148	28.24%	
Moderation effect of SC-I					
H3a= GH-C*SC-I → SSC-P	0.332***	0.042	7.868	57.33%	Accepted
H3b= GS-C*SC-I → SSC-P	0.171***	0.027	6.235	52.91%	Accepted
H3c= GR-C*SC-I → SSC-P	0.179***	0.017	10.606	55.84%	Accepted

S/E= standard error, BDAM-C= BDA management capability, BDAT-C=BDA talent capability, GH-C=green human capital, GS-C= green structural capital, GR-C= green relational capital, SC-I= Supply chain innovations, SSC-P= sustainable supply chain performance

In addition, the moderation effect of SC-I is explored. The interaction between GIC (GH-C, GS-C, and GR-C) and SC-I is introduced. The results exhibit a stronger moderating effect of SC-I on the association between GIC (GH-C, GS-C, and GR-C) and SCCP. We observed increased coefficient estimates and significance levels (see **Table 5**). Findings exhibit that the hypotheses for the moderation effect of SC-I are strongly accepted. Including SC-I as an interaction term augments the model's explanatory power since we observed a significant R-square value increase.

SC-I involves alterations to the supply chain's components to generate more value for stakeholders. These might include innovative technology, process improvement, communication, and enhanced cooperation. SC-I influences the connection between GIC and SSC-P by assisting organizations in lean manufacturing, agile processes, integration, and supplier relationship management. SC-I enhances efficiency, minimizes waste, and promotes teamwork and overall performance.

4.2.5 Mediation Effect

In this stage, we analyzed BDA-C's indirect impact on SSC-P through GIC (GH-C, GS-C, and GR-C). For this purpose, we utilized Hayes (2018) PROCESS macro model 80 with 10,000 bootstrap resampling. First, the direct effect of BDA on SSC-P is analyzed. The study finds an insignificant impact of BDA-C on SSC-P. This implies that firms such as BDA-C do not directly affect SSC-P in the GCC region. We used GIC (GH-C, GS-C, and GR-C) as a mediating factor to further investigate the association between BDA and SSC-P.

An effect is considered statistically significant if the 95% confidence interval (CI) does not contain zero. The coefficient estimate for the mediating role of GHS is positive (β = 0.2, 95% CI = [0.144, 0.188]) and statistically

significant at the 1% level. Similarly, the coefficient estimates for the mediating role of GH-C, GS-C, and GR-C are (β = 0.211, 95% CI = [0.144, 0.188]), (β = 0.169, 95% CI = [0.105, 0.137]) and (β = 0.148, 95% CI = [0.088, 0.115]), respectively. Thus, the impact of BDA-C on SSC-P through GIC (GH-C, GS-C, and GR-C) is found to be significantly positive and significant, indicating support for H4a, H4b, and H4c, as the confidence interval does not contain zero. Notably, the value of the R-square has also improved. This shows that including GIC as a mediator significantly improves the explanatory power of our model. Thus, BDA-C has notable and positive indirect impacts on SSC-P through GIC (GH-C, GS-C, and GR-C), confirming the hypotheses H4a, H4b, and H4c.

Next, we proceeded to test the hypothesized mediation and moderation effects. Our final hypotheses suggest that the impact of BDA-C on SSC-P will be mediated and moderated by GIC (GH-C, GS-C, and GR-C) and SC-I. The findings indicate that the mediation effect of GIC (GH-C, GS-C, and GR-C) is also moderated by SC-I, ultimately affecting SSC-P and supporting mediation-moderation hypotheses. The findings indicate that BDA-C has a positive sequential indirect impact on SSC-P through a series of steps: BDA-C → GIC (GH-C, GS-C, and GR-C)*SC-I→ SSC-P, providing full support for H5a, H5b, and H5c. In addition, the value of the R-square has significantly improved. This justifies the fitness of our model as the inclusion of SC-I as a moderator improves the explanatory power of our statistical model. Our findings indicate that the BDA-C can indirectly impact SSC-P via GIC (GH-C, GS-C, and GR-C), and SC-I moderates the impact in the GCC context.

Table 6 Bootstrap indirect effects of BDA-C on sustainable performance

Hypotheses	**Coefficient**	**S/E**	**95% CI**		
			LICI		**ULCI**
Direct effect					
BDA-C → SSC-P	0.084		0.118	28.86%	0.268
Mediation effect	**Coefficient**	S/E_{boot}	$\mathbf{LICI}_{boot}$		$\mathbf{LICI}_{boot}$
H4a= BDA-C → GH-C→ SSC-P	0.223**	0.067	0.144	48.95%	0.188
H4b= BDA-C → GS-C→SSC-P	0.169**	0.056	0.105	49.08%	0.137
H4c= BDA-C → GR-C→ SSC-P	0.148**	0.046	0.088	49.51%	0.115
Mediation and moderation effect					
H5a= BDA-C → GH-C*SC-I→ SSC-P	0.318***	0.035	0.148	63.58%	0.192
H5b= BDA-C → GS-C*SC-I→ SSC-P	0.275***	0.035	0.107	61.48%	0.141
H5c= BDA-C → GR-C*SC-I→ SSC-P	0.253***	0.039	0.090	59.99%	0.117

BDAM-C= BDA management capability, BDAT-C=BDA talent capability, GH-C=green human capital, GS-C= green structural capital, GR-C= green relational capital, SC-I= Supply chain innovations, SSC-P= sustainable supply chain performance

4.3 Endogeneity Test

We also addressed the endogeneity concern. The endogeneity can arise due to sample selection bias. For this purpose, we used the two-stage Heckman model (Rabbi *et al.*, 2019). Firstly, the sample is divided into two groups by BDA-C. Using median split criteria, the firms with scores equal to or above the median GIC (4.96) were coded as 1, and those with scores below the median were coded as 0. The process is meant to calculate lambda (inverse-mills ratio). We regressed the Probit model to examine the effect of control factors on estimating lambda. Secondly, we retested by simultaneously entering the inverse Mills ratio of BDA capabilities and control factors. The findings depicted that the lambda variable was not statistically significant for GH-C (β= 0.082, p= 0.558), GR-C (β= 0.113, p= 0.701), GS-C (β= 0.089, p= 0.626) and SSC-P (β= 0.082, p= 0.488). Therefore, our research was not exposed to endogeneity concerns from sample selection biases.

5. CONCLUSION

According to the research objectives, the study's hypotheses positively impact BDA capabilities on green intellectual capital (GH-C, GS-C, and GR-C) and are statistically validated. These hypotheses align with earlier studies (Yusliza *et al*., 2020; Yusoff, Omar, Zaman, & Samad, 2019). Thus, our findings confer that BDA capabilities significantly improve firms' green intellectual capital by providing adequate capabilities that enhance three types of green intellectual capital. In comparative terms, its impact on GH-C is more pronounced. Further, the hypotheses proposing the positive impact of green intellectual capital (GH-C, GS-C, and GR-C) on sustainable supply chain performance are also empirically supported. Thus, it shows that green intellectual capital leads to sustainable supply chain performance in MNEs in the GCC context.

Moreover, supply chain innovativeness (SC-I) moderates the positive impact of green intellectual capital on sustainable supply chain performance. The findings support

the RBV views as firms with better green intellectual capital research and involvement in supply chain innovativeness (SC-I) will likely exhibit better sustainable supply chain performance. In the next stage, we tested the mediating role of green intellectual capital for a positive association between BDA capabilities and sustainable supply chain performance in MNEs. We proposed an insignificant direct correlation between BDA capabilities and sustainable supply chain performance, which is empirically supported. Therefore, we proposed an indirect association between BDA capabilities and sustainable supply chain performance through the mediation effect of green intellectual capital (GH-C, GS-C, and GR-C). The findings also support the mediation effect of green intellectual capital. (Jirakraisiri *et al*., 2021). The findings are consistent with prior research indicating the crucial role of green intellectual capital in addressing sustainable supply chain performance. Further, the mediation-moderation effect empirically tests the indirect effect of BDA capabilities on sustainable supply chain performance. The empirical findings support our hypotheses, showing a mediation-moderation solid effect of green intellectual capital and supply chain innovativeness (SC-I) for a positive association between BDA capabilities and sustainable supply chain performance.

In brief, we demonstrate that green intellectual capital mediates the relationship between BDA capabilities and sustainable supply chain performance. Supply chain innovativeness (SC-I) moderates green intellectual capital mediation. According to our analysis, high green intellectual capital in MNEs is associated with higher sustainable supply chain performance in the GCC. These findings support the dynamic capability and N-RBV Views theories that green intellectual capital is essential to MNEs' BDA capabilities-sustainable supply chain performance relationship.

6. RESEARCH IMPLICATIONS

Our findings have numerous theoretical implications for BDA capabilities and sustainable supply chain performance. This study is one of the pioneering works that analyzes the influence of BDA capabilities on sustainable supply chain performance via the mediation of green intellectual capital (GH-C, GS-C, and GR-C) and moderation of supply chain innovativeness (SC-I) in the GCC context. While a substantial amount of information is available on BDA capabilities (Kim *et al*., 2012) and sustainable supply chain performance (Kim *et al.*, 2011), there is limited research on combining the two concepts. The significance of BDA capabilities is evident from the existing literature. One aspect that requires further investigation is the role of BDA capabilities in influencing sustainable supply chain performance. Therefore, our investigation examined the mediating effect of green intellectual capital in the association between BDA capabilities and sustainable supply chain performance. Further, we combined the mediation and moderating role of green intellectual capital and supply chain innovativeness (SC-I) in a unified model. We resolved what was previously thought to be separate concepts. The existing literature has limited research on the combined effects of green intellectual capital and supply chain innovativeness (SC-I). After breaking down green intellectual capital into three constructs (see **Figure 1**), we clarify that it can be used to improve sustainable supply chain performance. Our case is built on MNEs in the GCC region, as there are several reasons for the flocking of MNEs. The region has emerged as a lively and thriving hub for BDA advancements, attracting global attention and profiting from a rise in supply chain activities. Our research has several practical implications for managers and consultants implementing BDA capabilities in companies. We highlight the significance of green intellectual capital in utilizing BDA as a competitive advantage to address sustainable supply chain performance in the region. Our results indicate that BDA capabilities can enhance sustainable supply chain performance via green intellectual capital and supply chain innovativeness (SC-I). Therefore, the management involved can enhance green intellectual capital to optimize its competitive edge in the region as it provides a way to satisfy its sustainability challenges. This also offers a viable solution to firms suffering from sustainability issues. Specifically, green intellectual capital is the most advantageous factor that mediates the insignificant relationship between BDA capabilities and sustainable supply chain performance. The empirical evidence is the constructive solution for firms that lag in sustainability, specifically in the supply chain. They can focus on developing green intellectual capital as the evidence suggests they can emerge as sustainability drivers in the region. Supply chain innovativeness (SC-I) is also an essential measure in this path as it moderates the mediation effect of green intellectual capital.

Likewise, our results reveal significant policy implications. Stringent green intellectual capital development regulations can help address the region's sustainability issues. Local firms should be encouraged to develop green intellectual capital to benefit from BDA capabilities. Further, supply chain innovativeness (SC-I) should also be incentivized so that firms can adopt the process for a win-win situation.

The critical foundation of the relationship between BDA capabilities and sustainable supply chain performance is green intellectual capital and supply chain innovativeness (SC-I). To enhance these aspects of Dynamic Capability View (BDA, GIC, and SC-I), there needs to be a focused effort on developing technical expertise, green intellectual capital, and supply chain innovativeness (SC-I) We understand that suggesting that organizations adopt the BDA capabilities, a three-pillar strategy of green intellectual capital may seem very theoretical. Nevertheless, this conclusion stems from our analysis of the data.

7. LIMITATIONS AND FUTURE RESEARCH

We are confident in the robustness of our model, which is well-supported by theory and has been validated through rigorous testing using reliable survey instruments and data. However, some limitations and questions still need to be resolved. First, the study was conducted on the relationship between BDA capabilities and sustainable supply chain performance. Despite variations in the analytics industry, applying the conceptual model in different contexts could enhance its applicability. Further, we tested our model with cross-sectional data, suggesting that reassessment of the results with panel data could yield its stability. Our study did not include organizational culture and managerial commitment in our analysis. Future researchers may

consider these factors as moderators in the relationship between BDA capabilities and sustainable supply chain performance.

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APPENDIX A QUESTIONNAIRE'S CONSTRUCTS

Indicators	Constructs
You are requested to specify by tick (√) the level of importance the following BDA management capability (BDAM-C) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent)	
BDAM-C1	Examines the innovative green opportunities for the strategic use of BDA
BDAM-C2	Enforces adequate plans for the introduction and utilization of BDA
BDAM-C3	Performs BDA planning processes in systematic and formalized ways
BDAM-C4	Adjusts frequently BDA plans to better adapt to changing environmental conditions.
BDAM-C5	Business analysts and design people meet frequently to formally and informally discuss important issues.
BDAM-C6	Shares information widely between business analysts and line people so that those who make decisions or perform jobs have access to all available know-how
You are requested to specify by tick (√) the level of importance the following BDA management talent (BDAT-C) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent).	
BDAT-C1	Our analytics personnel are competent in terms of programming skills.
BDAT-C1	Our analytics personnel are competent in terms of managing project lifecycles.
BDAT-C2	Our analytics personnel are competent in data and network management and maintenance.
BDAT-C3	Our analytics personnel are capable of handling data and managing and maintaining networks.
BDAT-C4	Our analytics personnel show a superior understanding of technological trends.
BDAT-C5	Our analytics personnel are very knowledgeable about the critical factors for the success of our organization.
BDAT-C6	Our analytics personnel understand our organization's policies and plans very well.
BDAT-C7	Our analytics personnel are very knowledgeable about the business environment.
BDAT-C8	Our analytics personnel work closely with suppliers to provide valuable input for developing innovative green products.
BDAT-C9	Our analytics personnel work closely with customers and maintain productive user/client relationships.
You are requested to specify by tick (√) the level of importance the following Green Human Capital (GH-C) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent).	
GH-C1	The contribution of the environmental protection of employees in our firm is better than that of our major competitors.
GH-C2	Our firm's employee competence concerning environmental protection is better than our major competitors.
GH-C3	The product and service qualities of environmental protection provided by the employees of this firm are better than those of our major competitors.
GH-C4	The amount of cooperative teamwork concerning environmental protection in our firm is more than that of our major competitors.
GH-C5	Our managers fully support our employees in achieving their goals concerning environmental protection.

You are requested to specify by tick (√) the level of importance the following Green Human Capital (GS-C) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent).	
GS-C1	Our firm's management system for environmental protection is superior to that of our major competitors.
GS-C2	Our firm is more innovative regarding environmental protection than our major competitors.
GS-C3	The profit earned from our firm's environmental protection activities exceeds our major competitors.
GS-C4	Our firm's ratio of investments in R&D expenditures to sales for environmental protection is higher than that of our major competitors.
GS-C5	The ratio of employees to the total employees in our firm engaged in environmental management is more than that of our major competitors.
GS-C6	Our firm invests more in environmental protection facilities than our major competitors.

APPENDIX A QUESTIONNAIRE'S CONSTRUCTS (CON'T)

Indicators	Constructs
GS-C7	Our firm's competence in developing green products is better than our major competitors.
GS-C8	Our firm's overall operational processes for environmental protection work smoothly.
GS-C9	The knowledge management system for environmental management in our firm is favorable for the accumulation of the knowledge of environmental management.
You are requested to specify by tick (√) the level of importance the following Green Relational Capital (GR-C) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent).	
GR-C1	Our firm designs products and services in compliance with the environmental desires of our customers.
GR-C2	Customer satisfaction concerning the environmental protection of our firm is better than that of our major competitors.
GR-C3	The cooperative relationships concerning the environmental protection of our firm with our upstream suppliers are stable.
GR-C4	The cooperation relationships about the environmental protection of our firm with our downstream clients or channels are stable.
GR-C5	Our firm has well cooperative relationships concerning environmental protection with our strategic partners.
You are requested to specify by tick (√) the level of importance the following Supply chain innovativeness (SC-I) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent)	
SC-I1	Our organization frequently tries out new ideas in the context of the supply chain.
SC-I2	Our organization seeks new ways to do things in supply chain.
SC-I3	In our organization, innovative ideas that work for supply chain promotion are rewarded.
You are requested to specify by tick (√) the level of importance the following Sustainable supply chain performance (SSC-P) best reflects in your firm. (Seven-point scale: 1 =Not at all,2=Very minimally,3=Minimally, 4=Moderately,5= Significantly, 6=Very much and 7=To a great extent)	
SSC-P1	Our organization has visibility of supply chain dynamics in the network.
SSC-P2	Our organization manages risks in the supply network proactively.
SSC-P3	Our organization has proper control over supply chain costs.
SSC-P4	Wastages in our supply chain network have been reduced significantly.
SSC-P5	Our organization's primary supply chain can supply final customers with timely, complete orders.
SSC-P6	Our organization can adhere to environmental standards as per customer requirements.
SSC-P7	Our organization has minimized buffer stocks at all levels throughout the supply chain.
SSC-P8	Our organization's supply chain can respond faster than competitors in a volatile business environment.

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