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Linking strategic orientations and open innovation of Vietnamese ICT firms with sustainable business advantage: The role of green HRM practices

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ABSTRACT

The present research aims to assess the sustainable business advantage of ICT firms in Vietnam through market orientation, green entrepreneurial orientation, knowledge orientation, and open innovation. The mediating role of green human resource management (HRM) has also been assessed. Data was compiled from 400 employees in ICT firms and Partial Least Squares Structural Equation Modeling (PLS-SEM) was used in this study. Results declared a significant relationship between market orientation (MO), knowledge orientation (KO), green entrepreneurial orientation (GEO), open innovation (OI), and sustainable business advantage (SB). The mediation of green HRM between GEO and SB was significant whereas the mediating role of green HRM practices insignificantly mediates the relationship between MO and SB, OI and SB, and KO and SB. The study extends the growing body of literature regarding the relationship between strategic orientations and open innovation within the context of Vietnamese ICT firms, which has not been focused on in past studies. The study ensures beneficial practical insights for the managing authorities of ICT firms in Vietnam regarding the increment in sustainable business practices through MO, KO, OI, GEO, and OI. The research limitations are also addressed in the last section.

Contribution/Originality: The current study has a two-fold contribution. First, it utilizes the resource advantage theory to determine the relationship between MO, GEO, KO, OI, and SB in which the study also focuses on the mediating role of GHRM practices. Second, it adds the literature regarding the association between strategic orientations and OI within the context of ICT firms.

1. INTRODUCTION

The ongoing digital transformation in ICT firms serves as a benchmark for the sustainable advantage that can be achieved through innovative culture and green HRM practices. The progressive development and the room for sustainable innovation in the ICT firms of Vietnamese are evident from the revenue gained by top ICT companies in the year 2021 which was approximately $162,333b (VNA, 2022). The information technology (IT) startups and sustainability measures in these companies aim to achieve sustainable digital advancement in the coming years. However, concerning global IT trends and strengths, the internal work elements and practices are making a substantial impact on the sustainable status of these companies (Onetti, 2019). In the last decade, ICT sector developments accompanied a variety of sustainability concerns, placing the responsibility of sustainable responsibility on HRM. It is observed that green HRM has provided a competitive edge in regulating the performance of ICT companies in the contemporary technological era (Awwad Al-Shammari, Alshammrei, Nawaz,

& Tayyab, 2022). Therefore, the significance of internal organizational factors holds significance in determining the sustainable spaces of ICT firms. In the current dynamic environment, entrepreneurial behavior and innovation act decide the positioning of companies among global IT networks.

In gaining a sustainable business (SB) advantage, the role played by strategic orientation and open innovation cannot be subdued. Previous literature on entrepreneurial and HRM practices revealed that green HRM bridges the gap between sustainable development and innovation requirements. The prevalence of green HRM (GHRM) practices and green behaviors acts as a base for achieving sustainable objectives (Ojo & Raman, 2019). The linkage between HRM and the organization's strategic orientation marks the importance of these factors in leading local ICT in the global ICT sector. The green entrepreneurial orientation (GEO) has an impact on the ICT firms' performance by drawing on external resources and knowledge. Entrepreneurial encouragement is associated with sustainable financial benefits and is a strong source for experimentation, innovation, and dynamic learning (Jiang, Chai, Shao, & Feng, 2018). The marketing orientation has received enormous attention in driving sustainable performance as IT organizations are compelled to follow new strategic solutions, along with GEO. The use or transfer in ICT companies solely relies on market-oriented training (Masa'deh, Al-Henzab, Tarhini, & Obeidat, 2018). ICT firms must focus on marketing orientation and entrepreneurial orientation, whose current status is not satisfactory in the majority of medium ICT firms to hold a distinctive marketplace position.

Sustainability in modern times is marked by sustainable knowledge creation and transfer. Knowledge-oriented leadership and practices result in improved performance and organizational success based on the knowledge-based perspective (Latif, Afzal, Saqib, Sahibzada, & Alam, 2021). The knowledge orientation of the company enhances the ability to support and strengthen innovative practices as innovation requires the process and adoption of advanced knowledge. According to previous research, knowledge management in the context of sustainable advantage is linked to the main problems and gaps (Martins, Rampasso, Anholon, Quelhas, & Leal Filho, 2019). Thus, the problem shows the significance of knowledge orientation and how the green HRM of ICT affects it. The knowledge-oriented capability of the organization facilitated by HRM boosts the sustainable potential of the firms to innovate in a more feasible and practicable way. Moreover, the openness to knowledge sources, i.e., both internal and external ideas, to broaden the perspective and secure the sustainable development process in ICT spheres requires attention (Bigliardi, Ferraro, Filippelli, & Galati, 2021). ICT companies use human resources and procedures more receptive to contemporary IT developments and improvements because of their close relationship to sustainable commercial advantage. The insights from literature and relevant research contributions revealed that the sustainability business advantage in ICT companies is dependent on the organization's innovative capability and strategic orientation based on the aforementioned discussion.

The rapid progress in the ICT sectors of Vietnam which is evident from the revenue gained by top ICT companies in the year 2021, which was approximately $162,333b (VNA, 2022) captured the attention of sustainability business analysts to inspect the elements that can potentially boost the growth and performance of the companies to compete with the global IT world order. Based on identified gaps, the present study aims to examine the impact of strategic orientation, i.e., green entrepreneurial orientation, market orientation, knowledge orientation, and open innovation, on sustainable business advantage. Moreover, the mediating role of the green HRM is also examined between the strategic orientation and SB in the context of ICT firms in Vietnam.

The examination found that GEO, MO, OI, and KO have a significant impact on sustainable business advantage. Similarly, GHRM practices significantly mediate the relationship between GEO and sustainable business advantage. In contrast, the mediating role of GHRM practices insignificantly mediates the relationship between MO and sustainable business advantage, OI and sustainable business advantage, and KO and sustainable business advantage.

2. LITERATURE REVIEW AND FORMULATION OF HYPOTHESES

2.1. Resource Advantage Theory

The Resource Advantage Theory (RAT) is considered to be a strategic management framework that particularly focuses on the capabilities and resources to further attain a competitive advantage. The theory posits that one of the most valuable and rare resource of a firm is market orientation. To improve the competitive advantage and enhance customer value delivery, it differentiates the resources (Wilburn Green, Toms, & Clark, 2015). Firms can attain the best performance by following proper management decisions and capturing market knowledge. This is to be done in more than one segment. However, through GHRM practices, it can be noted that GEO firms tend to implement decision-making strategies and capture market knowledge to further translate these competitive advantages from the comparative advantages. Organizations can attain environmental, economic as well as social performance through environmental practices as they differentiate the organizations from others (Frambach, Prabhu, & Verhallen, 2003). Moreover, thousands of competitors offer the product in this dynamic and globalized open market but it is pertinent to assert that only those companies that generally possess good knowledge related to the needs and wants of their customers and those who know how to fulfill the needs and requirements of their customers (Eltayeb, Zailani, & Ramayah, 2011). However, MO can satisfy the needs of customers by identifying them. In this study, the core aim is to identify the relationship between GEO, MO, OI, and SB while considering GHRM practices as the mediator. As customers, the growth of a dynamic environment can be observed due to the dynamic world tending to demand a friendly product. The market orientation improves the marketing pros through the affiliation of GHRM practices. Similarly, it utilizes the knowledge related to environmental products to further fulfill the needs of customers through various GHRM practices.

2.2. Green Entrepreneurial Orientation (GEO)

The ability of a firm to attain better performance than that of its competitors is characterized as a competitive advantage (Barney, 1995). It has been observed that firms need experience-based adoption to create a competitive advantage in dynamic environments. The demands and needs of the customer identify the relationship between these two variables and it is clear that they are dependent on tactical decision-making and entrepreneurial strategies (Pratono, Darmasetiawan, Yudiarso, & Jeong, 2019). Moreover, those firms that have a stronger intention to learn and integrate external knowledge have a market orientation. In terms of alliance relationships, those partners who have similar knowledge enhance the possibility of absorbing the knowledge. GEO generally covers the behavior of firms at competitive aggressiveness, innovation, risk-taking, and autonomy. Entrepreneurial actions have been considered in various research studies instead of considering the profit-earning phenomenon (Verma & Kumar, 2022). Product innovation is a significant factor in terms of entrepreneurial orientation as it affects sustainable competitive advantage positively. Moreover, it includes partnerships and networks (Ameer & Khan, 2023). Business opportunities are identified by the networks as valuable knowledge is generally gained by entrepreneurial orientation. As far as small firms are concerned, they utilize external knowledge to further cope with the limited resources to avoid the financial failure of green innovation (Shehzad, Zhang, Latif, Jamil, & Waseel, 2023). The traditional barrier-to-entry variables may not lessen the firm's competitive advantage in the dynamic and competitive markets where small firms generally operate.

Hence, it can be stated that

H_1: Green entrepreneurial orientation impacts SB positively.

2.3. Market Orientation (MO)

Market orientation is considered the main antecedent of innovation as discussed in various studies (Uncles, 2000). It has been observed lately that innovation performance is highly influenced by market orientation in terms of Chinese manufacturing firms (Zhang & Duan, 2010). The core factors involve customer demand as well as

competitor pressure to provide value-added benefits and further carry out green innovation to encourage the firms (Atuahene-Gima, 1996). Market demand for green products affects green processes and product innovation positively. However, inter-organizational learning may fail in terms of marketing orientation due to a lack of competitive differentiation from the status quo. Firms believe in the lack of ability to attain performance in terms of practice, but it has been noted that generally, they believe in the role of market orientation. Many scholars assert that market orientation is a vital concept as it acts as a guideline and makes knowledge for marketing practice (Narver & Slater, 1990). However, firms can attain superior performance to occupy distinctive marketplace positions and achieve a competitive advantage over their competitors. Market implementation plans are made to attain competitive advantages (Ruekert, 1992). Similarly, the market orientation of firms investigates the customer demands and needs to further influence customer satisfaction.

Hence, the second hypothesis of this study is as follows:

H_2: Market orientation impacts SB positively.

2.4. Knowledge Orientation (KO)

Knowledge orientation contributes a crucial part to attain sustainable business advantage. It not only creates, acquires, or disseminates the knowledge but it has also been observed that it improves as well as ensures the long-term success of the companies in this dynamic environment (Gess-Newsome, 1999). By Firms can further attain the best performance following proper management decisions and capturing market knowledge (Banmairuroy, Kritjaroen, & Homsombat, 2022). Moreover, several competitors offer the product in this dynamic and globalized open market but it is pertinent to assert that only those companies which generally possess good knowledge related to the needs and wants of their customers and those who know how to fulfill the needs and requirements of their customers (Eltayeb et al., 2011).

Hence, the third hypothesis of this study is as follows:

H_3: Knowledge orientation impacts SB positively.

2.5. Open Innovation (OI)

Open innovation has now become a popular issue in innovation management (Usman, Roijakkers, Vanhaverbeke, & Frattini, 2018). This topic has been covered in Chesbrough's (2003) book and has successfully reached over 2 million hits in just 7 years (West, Salter, Vanhaverbeke, & Chesbrough, 2014). Furthermore, many disciplines have shown great interest in this field. Disciplines like psychology, economics, and sociology are important in this regard. To open up an innovation process is the most common premise of "open innovation". Expanding the markets for innovation and utilization of purposive outflows and inflows of knowledge to accelerate internal innovation is referred to as " open innovation" (Chesbrough, Vanhaverbeke, & West, 2014). However, it is often contrasted with closed innovation as observed in various studies. The pattern of consumption and production of consumers has been transformed by stringent environmental regulations. As consumers tend to buy environmentally friendly products to enhance their environmental and social responsibilities, their companies generally move to a friendly market orientation (Ojo, Tan, & Alias, 2022). Thus, firms conducted green process innovation to fulfill the requirements of consumers. Open innovation plays a significant role in creating a competitive advantage in this modern era (Rauter, Globocnik, Perl-Vorbach, & Baumgartner, 2019). Furthermore, open innovation is linked to a firm's sustainable business advantage. They both also enhance social and financial performance and diminish negative environmental influence on the business. Product innovation and green processes are significant resources for organizations as firms utilize them to further earn goodwill among the key stakeholders and increase the performance of the environment.

Hence, the fourth hypothesis of this study is as follows:

H_4: Open innovation impacts SB positively.

2.6. Green Entrepreneurial Orientation, Green HRM Practices, and Sustainable Business Advantage

GHRM practices are expected to be sustainable performance which can be functionalized by GEO specifically (Arulrajah, Opatha, & Nawaratne, 2015). GHRM particularly suggests that firms need to implement green strategies that are dynamic and entrepreneurial efforts in terms of sustainable performance to attain a competitive advantage. Green practices tend to assist companies to become contemporary and more valuable (Rani & Mishra, 2014). It is significant to note that GEO is referred to as the combination of various entrepreneurial traits towards the strategy-making process. Moreover, many studies suggest that there exist several relationships between GEO and " sustainable business advantage" (Bleeker, 2011). In terms of both environmental and entrepreneurship literature, GEO is considered to be one of the most valuable researched topics. The competition in the organisational culture has emphasised the need to investigate a multitude of innovative opportunities. However, there is a missing mediation relation between these two variables. It was found that capability and organizational resources mediate between GEO and SB. For example, marketing capability mediates between green entrepreneurial orientation and organizational performance. Moreover, another study observed the association between entrepreneurial orientation and organizational performance was mediated by organizational learning capability (Liantono, 2020). Moreover, another study identified a positive relationship between market orientation and organizational performance and it was found that GHRM practices mediated the relationship (Ferreira, Fernandes, Kraus, & McDowell, 2021). However, the relationship between GEO and SB was found but the mediation by green HRM practices has not been done before. According to various studies, the role of GHRM practices has been found to be a mediator.

Hence, the fifth hypothesis of this study is as follows:

H_5: GHRM practices act as a mediator between green entrepreneurial orientation and SB.

2.7. Market Orientation, Green HRM Practices, and Sustainable Business Advantage

The relationship between market orientation and green HRM practices has been explored in various studies (Hameed, Khan, Islam, Sheikh, & Naeem, 2020). Firms tend to employ green HRM practices by manufacturing green products to meet consumers' demands. The customer wants and needs are prioritized by strong market orientation as observed in previous studies by developing green practices and analyzing the competitor strategies (Muisyo, Qin, Ho, & Julius, 2022). The relationship between green practices and sustainable business advantage is studied empirically in various studies. These HRM practices minimize waste generation by enhancing economic performance, reducing environmental accidents, and saving energy (Mehta & Chugan, 2015). Moreover, the evidence obtained from the top sustainable global companies identifies that internal environmental practices have a vital influence on the cash flows, return on total assets (ROA), profit, and sales growth of the firm. The economic performance also gets improved by eco-design as observed in various previous meta-analyses.

H_6: GHRM practices act as a mediator between market orientation and SB.

2.8. Knowledge Orientation, Green HRM Practices, and Sustainable Business Advantage

Many studies suggest that knowledge creation impacts the performance of organizations to a great extent. It has been observed that the most important competitive advantage for a company is knowledge orientation though an organization's performance is mandatory for the organization's survival (Wiklund & Shepherd, 2003). Moreover, a study also suggests that a good relationship between suppliers and employees is deployed through knowledge. It has been observed that good environmental policies, as well as regulatory standards are essential to build the competitive advantage and image of a firm (Muisyo et al., 2022). In terms of competitive advantage, one of the key factors that are widely observed in several studies is human resources. The HRM processes get improved due to green HRM practices. The collaborations and partnerships are facilitated by different green HRM practices. Green HRM practices leverage and collaborate with the external networks to further ensure knowledge sharing

and collaboration. However, the dissemination and acquisition are affected by green HRM practices (Claudy, Peterson, & Pagell, 2016). Knowledge in this regard can be improved by the provision of training.

Hence, the seventh hypothesis of this study is as follows:

H_7: GHRM practices act as a mediator between knowledge orientation and SB.

2.9. Open Innovation, Green HRM Practices, and Sustainable Business Advantage

The integration of environmental sustainability into HRM policies, strategies, and practices within an organization is generally characterized as green HRM practices. It has been observed that these practices promote various activities that are related to several environment-related practices (Ojo et al., 2022). These practices generally improve skills and awareness. Also, they align various processes with the main sustainable goals. Knowledge sharing along with collaboration is enhanced by the core concept of OI. It not only suggests solutions and ideas to further implement in the organization but it also introduces innovation. The most prevalent concept of OI is the innovation process. OI refers to the process of expanding markets for invention and utilizing purposeful outflows and inflows of knowledge to enhance internal innovation (Chesbrough et al., 2014). It is frequently contrasted with closed innovation, as found in much research. Furthermore, strict environmental rules have altered consumer consumption and manufacturing patterns. Similarly, it is considered quite challenging as it is not that easy to imitate competitors. It has been observed that organizational culture improved due to the introduction of innovation in the firms (Mehta & Chugan, 2015). These innovations are generally promoted and developed by the green HRM practices as they contribute to knowledge sharing along with collaboration in the firms.

Hence, the eight hypothesis of this study is as follows:

H_8: Green HRM practices act as a mediator between open innovation and SB.

The research model of this study is presented in Figure 1.

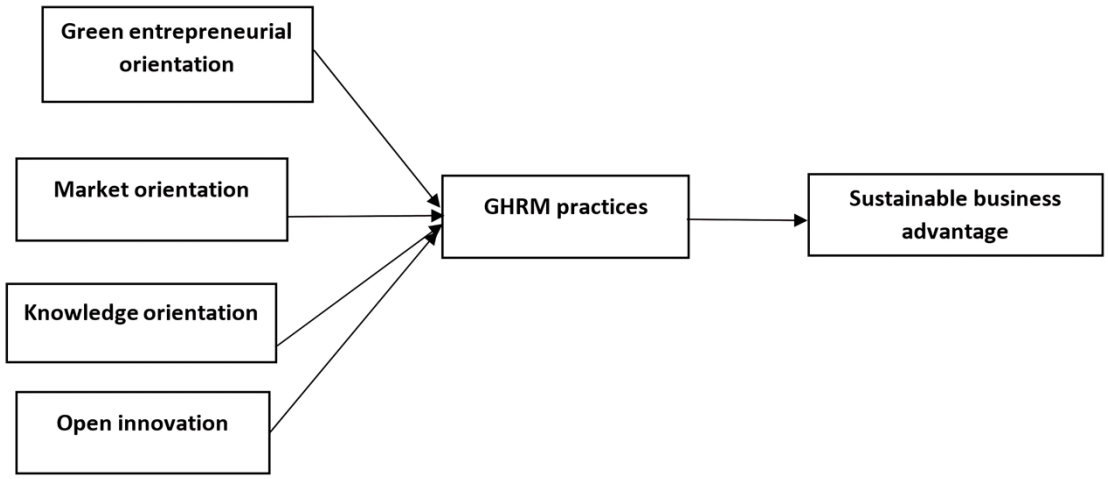

Figure 1. Research model.

3. METHODOLOGY

This section provides a critical explanation of the methods used in the present research to accomplish its goals. This study used a quantitative method in the form of a survey design to investigate the observed facts and offer strong reasons for the problems found. For this research, both the survey method and the quantitative character were considered essential. The questionnaire that was constructed used a closed-ended form. A quantitative research design was used in the present research to evaluate hypotheses and look at how variables relate to one another. Numerical data was gathered and analyzed to explore the relationships across strategic orientations, open innovation, green HRM practices, and sustainable business advantage in Vietnamese ICT enterprises. The study used a positivist study approach to identify associations between variables by gathering and analyzing numerical

data. Additionally, it offers important data promptly, like the time needed to conduct the survey and get the data. The cross-sectional snapshot's timing might not accurately reflect the group's behaviors as a whole (Sedgwick, 2014).

A structured questionnaire was created based on the theoretical framework's parameters. A standardized scale or item was included in the questionnaire to assess strategic orientations, open innovation, sustainable HRM procedures, and sustainable business advantage. The intended audience consisted of Vietnamese ICT companies that were active in a certain sector or area. Employees and senior managers of numerous ICT companies with operations in Vietnam made up the sample. In terms of industry segments, business sizes, geographical regions, and other relevant features, the population of Vietnamese ICT firms is probably diverse. The researcher used stratified sampling to guarantee that the sample included members from each group to provide a more accurate representation of the diversity of the population. The study used a stratified probability sampling method as it improves the accuracy of the estimates and enables more accurate population-wide generalizations. The researcher looked at variability and discrepancies in strategic orientations, open innovation, green HRM practices, and sustainable business advantage across industrial sectors, firm sizes, or geographical regions by choosing samples from various strata.

The data was collected by using questionnaires. Two sections of a questionnaire were created for this investigation. The first section includes details regarding the respondents and the surveyed firms, such as the respondents' gender, age, degree of education, and number of personnel. The second phase assessed the strategic orientation, open innovation, and green HRM practices of the businesses. The questionnaire uses anonymous testing and cross-arrangement of items to minimize the impact of common method bias and, ultimately, to increase the data's reliability as much as feasible by giving questionnaires to the managers of the surveyed organizations (Palacios-Manzano, León-Gomez, & Santos-Jaén, 2021). The sample size was 350 respondents in total. Before distributing questionnaires, the researchers performed a pre-test to check the reliability and accuracy of every indicator. A 5-point Likert scale was employed for the questionnaire to give the participant a level of intensity and opinion that could be expressed without any ambiguity. The measurement items for each construct size range from 1 (strongly agree) to 5 (strongly disagree).

This study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate the cause - and - effect interactions and moderating and mediating factors (Willaby, Costa, Burns, MacCann, & Roberts, 2015). PLS-SEM is valid for both big and small datasets and does not demand a particular distribution.

The study was voluntary, and participants were allowed to leave at any time without penalties. Participants' privacy and anonymity were protected. The required authorizations and approvals from the appropriate authorities were received. The study was carried out with integrity, respect and transparency. Appropriate regulatory boards or ethics panels were asked for their ethical authorization.

Before conducting the survey, the researcher asked eight industry experts and business owners to review and alter the questionnaire. They appropriately adjusted the measuring items to the Vietnam setting.

Knowledge Orientation: Knowledge orientation was based on the five items extracted from the studies of Attia and Essam Eldin (2018) and Habib et al. (2021).

Market Orientation: In the present study, five items of market orientation were used as used by Habib et al. (2021) in their research.

Green Entrepreneurial Orientation: Five items for GEO were used in the present study as used by Habib et al. (2021) in their study.

Open Innovation: Open innovation was based on the four items for inbound innovation from the studies of Huang, Lai, Lin, and Chen (2013) and Moradi, Jafari, Doorbash, and Mirzaei (2021).

GHRM Practices: Green HRM practices were based on green recruitment and selection, green rewards and pay, and green training constructs based on the green HRM practices identified by Tang, Chen, Jiang, Paillé, and Jia (2018). The construct was based on 9 items in total where each factor was based on three items.

Sustainable Business Advantage: Six items were utilized for SB in the current study as cited by Haseeb, Hussain, Kot, Androniceanu, and Jermsittiparsert (2019).

4. RESULTS

4.1. Descriptive Analysis

At the initial level, data was collected from 400 employees of Vietnamese ICT companies. There were 350 questionnaires finalized for data analysis after data cleaning and screening. Figures 2, 3, and 4 exhibit the graphical representation of employees' gender, working status, and age.

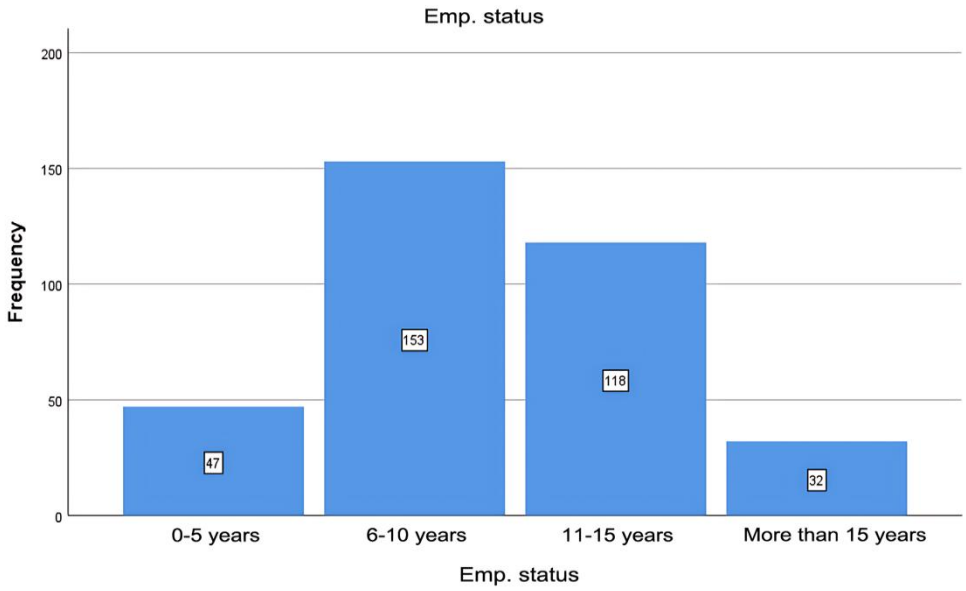

Figure 2. Working experience of employees.

Figure 3 explains that there were 153 employees in Vietnamese ICT companies who had a working experience of 6-10 years, and 118 employees had an experience of 11-15 years. This means that the ICT companies of Vietnam prefer to retain employees with sufficient working experience.

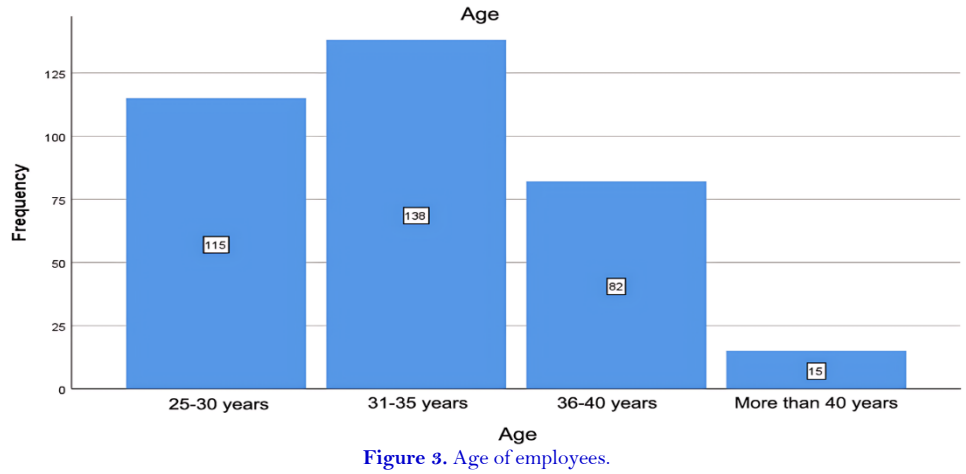

Figure 3. Age of employees.

The age of employees also differs because most were between 31-35 years and 36-40 years, respectively. Similarly, 115 employees were freshly recruited by Vietnamese ICT companies and were aged between 25 and 30 years.

Figure 4. Employee's gender.

The gender examination of employees declared that Vietnamese ICT companies recruit more male than female employees (see Figure 4).

After assessing the demographics of the respondents, the next test performed was to assess the descriptive summary of the data. The descriptive summary was examined to assess the data normality, the non-existence of an outlier in the data, and the identification of missing values (Kaur, Stoltzfus, & Yellapu, 2018).

Table 1. Descriptive of studied variables.

Variables	N	Minimum	Maximum	Mean	Std. deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. error
MO	350	1.000	5.000	3.248	1.059	-0.377	0.130
GEO	350	1.000	5.000	3.467	1.090	-0.502	0.130
KO	350	1.000	5.000	3.307	1.194	-0.295	0.130
OP	350	1.000	5.000	3.174	0.976	-0.434	0.130
GHR	350	1.000	5.000	3.532	1.134	-0.466	0.130
SB	350	1.000	5.000	3.329	1.041	-0.074	0.130

Note: MO= Market orientation, GEO= Green entrepreneurial orientation, KO= Knowledge orientation, OP= Open orientation, GHR= Green HRM, SB= Sustainable business advantage.

Results of Table 1 declared that against each variable, such as MO, GEO, KO, OP, GHR, and SB, the cases reported were 350 indicating no missing values in the data. The minimum and maximum values between 1-5 indicated the normality of response within the Likert scale and no outlier in the data. The data normality was assessed through values of skewness. The cut-off values for skewness fall between -1 and +1, resulting in values against each variable meeting the threshold criteria. Results of the descriptive summary confirmed data normality so other tests could be performed.

4.2. PLS Model Evaluation

The Kaiser–Meyer–Olkin (KMO) and Bartlett tests were performed to assess the sample adequacy, which is a predictor of adequate results of the factor loading. Threshold values for sample sufficiency in this test are assumed to be greater than 0.7. Table 2 confirms the sample sufficiency of the data because the significance value is less than the threshold range, which is .000. Furthermore, the KMO and Bartlett test are .955, confirming that the factor loading will yield significant results.

Table 2. KMO & Bartlett test.

Kaiser-Meyer-Olkin measure of sampling adequacy.		**0.955**
Bartlett's test of sphericity	Approx. chi-square	16826.653
	Df	561
	Sig.	0.000

Table 3 shows that each variable's scale items have appeared in their respective columns and it has been confirmed that there is no cross-loading or double-loading issue. No identity matrix was observed to be formulated. Therefore, the rotated component matrix also yielded significant results and indicated that Confirmatory Factor Analysis (CFA) could be performed.

Table 3. Rotated component matrix.

	Component					
Items	**1**	**2**	**3**	**4**	**5**	**6**
MO1			0.787			
MO2			0.789			
MO3			0.794			
MO4			0.782			
MO5			0.722			
KO1		0.860				
KO2		0.855				
KO3		0.862				
KO4		0.857				
KO5		0.862				
GEO1						0.811
GEO2						0.773
GEO3						0.702
GEO4						0.721
GEO5						0.732
OP1					0.807	
OP2					0.801	
OP3					0.805	
OP4					0.795	
GHR1	0.819					
GHR2	0.809					
GHR3	0.837					
GHR4	0.808					
GHR5	0.838					
GHR6	0.808					
GHR7	0.849					
GHR8	0.862					
GHR9	0.875					
SB1				0.871		
SB2				0.864		
SB3				0.888		
SB4				0.896		
SB5				0.877		
SB6				0.866		

Note: MO= Market orientation, GEO= Green entrepreneurial orientation, KO= Knowledge orientation, OP= Open orientation, GHR= Green HRM, SB= Sustainable business advantage.

Construct validity was determined through convergent and discriminant validity. Table 4 shows the results against both validities. The results of convergent validity assessed through composite reliability (CR) and average variance extracted (AVE), reported a significant internal consistency of the scale and the threshold against both the indicators of CR and AVE following the criteria (Carlson & Herdman, 2012). The resulting values are greater than 0.7 and 0.5, respectively. So the convergent validity has been established.

Table 4. Discriminant and convergent validity.

Variables	CR	AVE	MSV	Max R(H)	GHRM	KO	MO	SB	OI	GEO
GHRM	0.954	0.701	0.984	0.996	0.837					
KO	0.992	0.963	0.591	0.999	0.499***	0.981				
MO	0.929	0.725	0.591	0.950	0.499***	0.769***	0.852			
SB	0.800	0.444	0.984	0.998	0.992***	0.502***	0.509***	0.666		
OI	0.851	0.589	0.160	0.860	0.368***	0.400***	0.328***	0.375***	0.768	
GEO	0.891	0.620	0.913	0.894	0.956***	0.547***	0.523***	0.953***	0.399***	0.788

Note: MO= Market orientation, GEO= Green entrepreneurial orientation, KO= Knowledge orientation, OP= Open orientation, GHR= Green HRM, SB= Sustainable business advantage. ***: Significant at 1% levels, respectively. MSV: Maximum shared variance. Max R: Maximum reliability.

The second type of validity studied was discriminant validity which also confirmed a significant relationship among similar variables, and no other construct effectively explained the variable's phenomenon. Therefore, the high intra-construct correlation indicates that discriminant validity existed in the model (Zaiţ & Bertea, 2011). Construct validity is observed to be established as both convergent and discriminant validities existed in the measurement model.

CFA was performed to evaluate model fitness which clearly shows the threshold and observed values. Results therefore indicated that the CFA values meet the threshold criteria significantly against each indicator such as CMIN/df (minimum discrepancy of confirmatory factor analysis/degrees of freedom), Goodness of Fit Index (GFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) (Harrington, 2009) (see Table 5).

Table 5. CFA results of model fitness.

Indices	CMIIN/df	GFI	IFI	CFI	RMSEA
Threshold range	≤ 3	≥ 0.80	≥ 0.90	≥ 0.90	≤ 0.08
Observed	2.08	0.839	0.968	0.968	0.056

The structural equation modeling test was performed to evaluate the associations between variables (Ullman & Bentler, 2012). Table 6 and Figure 5 show the results for direct effects. A one-unit increase in MO impacts SB with 0.175 units with a p-value of 0.002. Therefore, the relationship between SB and MO has resulted as significant, and the hypothesis has been accepted. The relationship between GEO and SB has also been accepted with a p-value of .015. A one-unit increase in GEO influences SB with 0.242 units. KO and SB are also positively associated as the p-value is significant, i.e., 0.017, whereas the relationship between OP and SB has also resulted in being significant at 90% CI. Table 6 shows that a one-unit increase in OP influences SB through 0.071 units.

Table 6. Direct paths.

Hypothesized paths			Estimate	Lower	Upper	P
SB	<---	MO	0.175	0.081	0.280	0.002
SB	<---	GEO	0.242	0.087	0.403	0.015
SB	<---	KO	0.137	0.241	0.048	0.017
SB	<---	OP	0.071	0.008	0.125	0.069

Note: MO= Market orientation, GEO= Green entrepreneurial orientation, KO= Knowledge orientation, OP= Open orientation, GHR= Green HRM, SB= Sustainable business advantage.

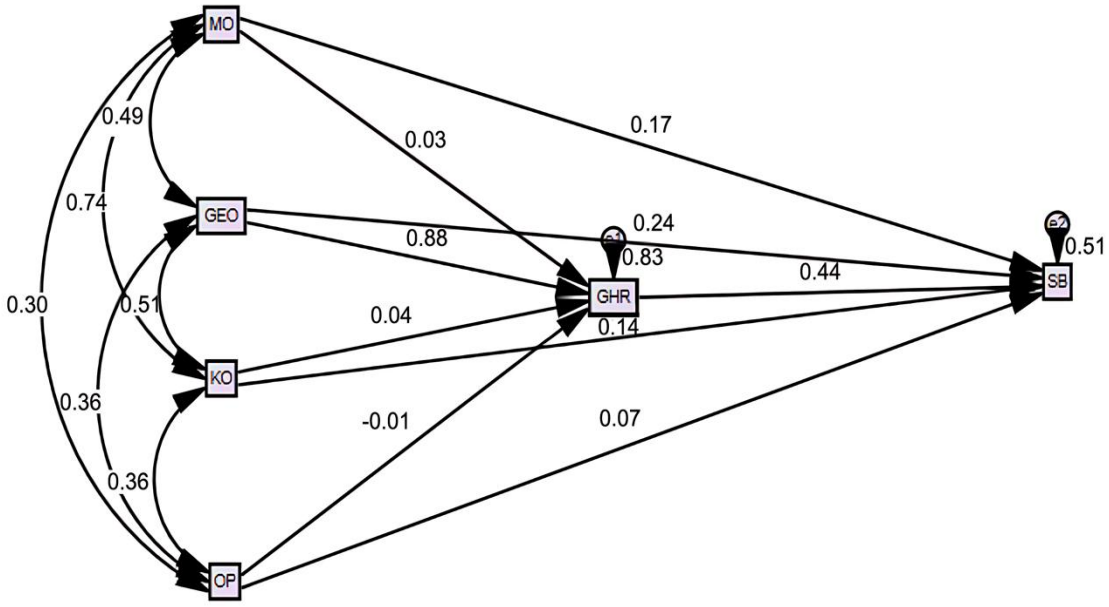

Figure 5. SEM.

Mediation results for GHR have been presented in Table 7. The mediation of GHR between GEO and SB has resulted in being signed with a p-value of 0.001. Therefore, the hypothesis has been accepted but the rest of the mediation of GHR between KO, OP, MO, and SB has been found to be insignificant with a p-value of 0.321, 0.708, and 0.289, respectively.

Table 7. Indirect effects.

Indirect path	Standardized estimate	Lower	Upper	P-value
KO --> GHR --> SB	0.017	-0.011	0.044	0.321
OP --> GHR --> SB	-0.003	-0.022	0.012	0.708
GEO --> GHR --> SB	0.382**	0.231	0.506	0.001
MO --> GHR --> SB	0.015	-0.009	0.051	0.289

Note: MO= Market orientation, GEO= Green entrepreneurial orientation, KO= Knowledge orientation, OP= Open orientation, GHR= Green HRM, SB= Sustainable business advantage. **: Significant at 5% levels, respectively.

5. DISCUSSION OF RESULTS AND IMPLICATIONS

5.1. Discussion of Results

The main aim of this study is to determine the impact of strategic orientation, i.e., green entrepreneurial orientation, market orientation, knowledge orientation, and open innovation, on the sustainable business advantage of the ICT firms in Vietnam. Eight hypotheses were built and tested using the SEM technique. The results were collected from 350 employees from different ICT firms in Vietnam. Thus, the results obtained from this study showed the acceptance of H_1 which states that *"green entrepreneurial orientation positively impacts sustainable business advantage."* This finding is in alignment with the results of Pratono et al. (2019). Therefore, the concept of sustainability is largely being incorporated in ICT firms. The concept of GEO has also become an essential part of different firms as it eventually leads to utilizing effective and valuable resources, which are crucial to achieving competitive advantage. H_2 was also found to be accepted as it states *that market orientation positively impacts sustainable business advantage ."* This finding aligns with Muangmee, Dacko-Pikiewicz, Meekaewkunchorn, Kassakorn, and Khalid (2021) and Habib, Bao, and Ilmudeen (2020) results. MO is considered an effective factor in influencing innovation within ICT firms. This helps improve the knowledge of the associated firms regarding competitive marketing strategies, which are crucial to achieving SB advantage.

However, H_3, which states *" knowledge orientation positively impacts sustainable business advantage"* and H_4, " open innovation impacts SB positively " were also accepted. These findings aligned with the results of Tjahjadi et al. (2020) and Banmairuroy et al. (2022). The sharing of knowledge and collaboration is also considered effective in promoting and implementing important innovative technologies to improve the sustainable performance of the firm, leading to positive outcomes. However, the role of OI in impacting the SB advantage is also inevitable. Therefore, this study has been effective in determining the association between OI and SB advantage within the context of ICT firms in Vietnam. However, H_5 stating *" green HRM practices act as a mediator between green entrepreneurial orientation and sustainable business advantage,"* was also accepted. This finding was also supported by the results of Pratono et al. (2019). With the increased public awareness regarding sustainable practices, firms have also incorporated the GHRM practices to promote SB advantage. The GEO also helps in determining effective GHRM practices in this regard.

In contrast, H_6 states that *" green HRM practices act as a mediator between market orientation and sustainable business advantage,"* and H_7 state that *" green HRM practices act as a mediator between knowledge orientation and sustainable business advantage,"* were found to be rejected. These findings were aligned with the results of Aboelmaged and Hashem (2019) and Muñoz-Pascual, Galende, and Curado (2019). The dynamic nature of MO often impacts the overall implementation of GHRM practices in the firm, directly influencing the SB advantage. At the same time, the KO is considered to be crucial to influencing the SB advantage to promote innovation. However, H_8 which states *" green HRM practices act as a mediator between open innovation and sustainable business advantage "* was also found to be rejected. This was aligned with the findings of Surya et al. (2021). OI is considered an important factor in influencing the firm's overall performance. However, incorporating innovation also helps promote the SB advantage of the firm, which is also beneficial in improving the financial performance of the firm leading to effective outcomes.

5.2. Implications

The present study also presents effective implications that help better understand the topic under discussion. First, this study has utilized the RAT to determine the association between MO, GEO, KO, OI, and sustainable business advantage from the theoretical perspective. At the same time, this study has also focused on the mediating role of GHRM practices which adds novelty to the study. Therefore, developing an effective conceptual framework in this study can help improve the knowledge of the associated stakeholders regarding the incorporation of GHRM practices to improve the sustainable business advantage of ICT firms. This approach can also effectively improve the current study's value. Moreover, the results obtained from this study can also effectively encourage future research to focus on other intrinsic and extrinsic factors that impact the SB advantage of ICT firms. Such studies can also utilize the findings from this study which can help continue the research within the context of SB advantage and other associated variables. However, this study has also effectively filled the gaps of past studies by focusing on the impact of GEO, OI, and MO on SB advantage to obtain effective outcomes. The current study has also been effective in adding literature regarding the association between strategic orientations and open innovation within the context of Vietnamese ICT firms, which has not been focused on in past studies. This has also improved the overall value and effectiveness of the current study, especially for the ICT firms' associated managers and other stakeholders.

Second, from a practical perspective, the results obtained from this study can effectively encourage the management of ICT firms to incorporate GHRM practices to improve their SB advantage. This study can also effectively promote developing and implementing sustainable strategies in ICT firms to achieve a competitive advantage. This process can also encourage other sectors to introduce GHRM practices to promote environmental sustainability, leading to effective outcomes. This study can also be efficient in encouraging the ICT firms to formulate and implement effective training sessions to improve the knowledge of the employees regarding the

significance of sustainable practices, encouraging them to play their role in improving the overall the SB advantage of the associated firm, leading to effective outcomes. The present study can contribute to social implications as it can improve public knowledge regarding the importance of GHRM practices in achieving the SB advantage. This study can also effectively influence the MO and GEO to promote SB advantage, resulting in adequate outcomes. Thus, the present study can also effectively motivate policymakers to develop and implement important GHRM policies to promote SB advantage within the context of ICT firms.

6. CONCLUSION

The ICT firms have played an important role in promoting digital transformation which is considered an effective approach to promoting sustainable practices crucial for ensuring sustainable business advantage. In this regard, MO and GEO are also considered important. OI in ICT firms has also encouraged the promotion of effective GHRM practices to promote SB advantage. Thus, the present study focuses on the impact of different variables, including OI, KO, GEO, and MO, on SB advantage, considering the mediating role of GHRM practices within the context of ICT firms in Vietnam. For this purpose, the data was gathered from the employees of ICT firms in Vietnam via a survey method. The results showed that GEO, MO, OI, and KO have a significant impact on SB advantage. Similarly, GHRM practices significantly mediate the association between GEO and SB advantage. In contrast, the mediating role of GHRM practices insignificantly mediates the association between MO and SB advantage, OI and SB advantage, and KO and SB advantage.

However, the current study also has some limitations. First, the present study only focused on the sustainable business (SB) advantage within the context of ICT firms in Vietnam, limiting the focus to other associated sectors. This approach was used due to the easy accessibility of data. Second, this study was cross-sectional due to limited resources. Third, this study did not focus on a detailed analysis of the concepts and beliefs of the respondents regarding green HRM practices within the context of sustainable advantage of ICT firms due to researcher bias. Finally, this study did not include any moderating variables due to limited research, which influenced the findings.

Future researchers can take different measures to fulfill the current research's limitations. For instance, the association between SB advantage and GHRM practices can be observed in other sectors, including technology and manufacturing, broadening the concept of SB advantage in different fields. Moreover, more longitudinal studies can also be conducted to determine the association between GHRM practices and SB advantage. Semi-structured interviews can also be conducted with the relevant respondents to better understand the role of GHRM practices in promoting SB advantage. However, the incorporation of effective moderating variables, such as organizational culture can be used to better understand the association between the variables of this study.

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APPENDIX

Table 1A presents the list of item questions refered to variables in the analysis.

Table 1A. Questionaire.

Item	Adapted from	Original source
Sustainable business advantage *"My organization gives attention to develop discovered ideas into new services, processes, and procedures."* *"My organization introduces services that are new to the market it serves."* *"Preferred market positioning can contribute to competitive advantages in the marketplace."* *"Access to superior limit resources can contribute to competitive advantages in the marketplace."* *"Exploiting unlimited resources can contribute to competitive advantages in the marketplace."* *"Access to superior competencies and capabilities can contribute to competitive advantages in the marketplace."*	(Haseeb et al., 2019)	(De Villiers, 2006)
GHRM practices "We attract green job candidates who use green criteria to select organizations." "We use green employer branding to attract green employees. "Our firm recruit employees who have green awareness." "We develop training programs in environment management to increase environmental awareness, skills and expertise of employees." "We have integrated training to create the emotional involvement of employees in environment management." "We have green knowledge management (Link environmental education and knowledge to behaviors to develop preventative solutions)." "We use green performance indicators in our performance management system and appraisals." "Our firm sets green targets, goals and responsibilities for managers and employees." "In our firm, managers are set objectives on achieving green outcomes included in appraisals."	(Tang et al., 2018)	(Tang et al., 2018)
Open innovation "Part of our company profits are contributed from external licensed technology." "Generally, our company will try to commercialize (License, sell) all of our technology." "The sale or license of our company technology is limited to relatively mature technology." "The sale or license of our company technology is limited to our non-core technology."	(Moradi et al., 2021)	(Huang et al., 2013)
Green entrepreneurial orientation "We have given priority to green practices, such as research and development, product, and process innovation." "In an uncertain environment, our firm adopts a proactive attitude to accept provable green opportunities." "Our firm typically takes a green initiative to respond to the competitor's actions." "Our firm always introduces green products, services, or technology first than our competitors to become the leader of this sector." "To compete with our competitors, we adopt a competitive posture."	(Habib et al., 2021)	(Habib et al., 2021)

Item	Adapted from	Original source
Market orientation "Our firm collects the customer's wants and needs better than our competitors." "We regularly and systematically collected our customers' information." "Customers' information is a critical tool for our organization to make technological improvements." "We regularly and systematically collected our competitors' information." "The sales and marketing department give more effort to exchange information on strategies of competitors."	(Habib et al., 2021)	(Habib et al., 2021)
Knowledge orientation "We have clear rules for categorizing product knowledge." "We have clear rules for categorizing process knowledge." "Employees of our organization always use technology to cooperate." "Our organization inspires us to exchange knowledge across functional boundaries." "Our organization has the opportunity to communicate with its judgment also other departments."	(Attia & Essam Eldin, 2018; Habib et al., 2021)	(Habib et al., 2021)