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Article

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ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

Eco-intellectual capital and sustainability performance of SMEs: The moderating effect of eco-dynamic capability

Cosmos Antwi-Boateng¹, Henry Kofi Mensah² and Sampson Asumah^{1*}

Abstract: The study investigates the moderating role of eco-dynamic capability which mainly involves the amalgamation, construction and reconfiguration of internal and external resources that relate to ecological protection in the link between eco-intellectual capital and sustainability performance of Small and medium-sized enterprises (SMEs). Primary data were solicited by resorting to the use of structured questionnaire from 500 employees and owner-managers of SMEs. Hierarchical multiple regression was applied to test all the hypotheses. The study exposed that the interactions of the moderating variable (eco-dynamic capability) and eco-intellectual capital show significant effects on the economic and environmental sustainability performance dimensions. However, on the occasion of social sustainability performance, this was not observed. Thus, eco-intellectual capital could empower organisations to adapt to strict global ecological conventions to fulfil increasing ecological awareness leading to green innovation. This study is among the rare studies that investigates the moderating role of eco-dynamic capability in the relationship between eco-intellectual capital and sustainability performance of an organisation.

Subjects: Environmental Management; Environment & Business; Environmental Economics; Business, Management and Accounting;

Keywords: eco-dynamic capability; eco-intellectual capital; economic sustainability; environmental sustainability; social sustainability; sustainability performance; SMEs

1. Introduction

The latest variations in the universal economy, comprising multifaceted, dynamic and competitive environment have resulted in a variance between the current method to value making and the old way of checking processes (Ting & Lean, 2009). The manufacturing part is a key regarding the principal backers of the nationwide economy; however, in addition it contributes greatly to the degradation of the environment. Increased anxiety related to green issues in contemporary times depicted the “go green” concept as a centre of attraction in companies. In a highly competitive period, success in business does not hinge simply on a prevailing strong financial eminence or producing state-of-the-art products but rather through human resources that are going green. This ensures efficiency and competitive gain (Yong et al., 2019).

According to Ren et al. (2018), the rising consciousness of conventions regarding ecological sustainability has involved the model of green human resource management (GHRM) towards the pursuit of ecological management (EM) in organisations. GHRM is presently seen clearly an actual arena of academic quest. It is capable of providing new intuitions in the conversion of the methods of administration, engagement and organising across the borders of Asia, to the global level. Sustainability has become a matter of concern and of much importance for scholars and practitioners. In the opinion of Sullivan et al. (2018), the financial gains of commercial undertakings have amplified fortune and circumstances of living internationally; it renders the environment impure and social disparity directly and indirectly. Erinos and Rahmawati (2018) evidenced the positive correlation between eco-intellectual capital and economic performance.

Evidence has shown that organisations with green HRM improve eco-intellectual capital, environmental performance and organisational performance (Jirawuttinunt & Limsuwan, 2019). From the point of view of Aboelmaged and Hashem (2019), sustainable human capital had an inconsequential influence on green invention. According to Yusoff et al. (2019), the undesirable effect of people's activities on the environment can be minimised and in the same vein, promote the wellbeing of the people while still accomplishing financial objectives. This study offers a basis upon which the correlation between eco-intellectual capital and sustainability performance of SMEs is comprehensible. According to Gong et al. (2018) many ecological devastations have ensued and that 60% of the ecosystems globally have been ruined. However, most organisations claim that these environmental ill happenings are not as a result of their business activities and think that issue should be discarded.

From the perspective of Teixeira et al. (2016) ecological exercise helps companies advance their green Supply Chain Management in the setting of additional sustainable HRM and sustainable administrative procedures. According to El-Kassar and Singh (2019), a direct correlation exists between environmental performance and GHRM practices and more balanced competitive advantage. Firmansyah (2017) established that two constituents of eco-intellectual capital (green structural capital, and green relational capital) had an association with green competitive edge. Yusoff et al. (2019) observed the link between the constituents of eco-intellectual capital (eco-structural capital and eco-relational capital) and sustainability performance.

Similarly, Yusliza et al. (2020) established that green intellectual capital is positively related to the economic, environmental, and social performance of business organisations. In contrast, some studies did not observe this positive relationship. Yusoff et al. (2019) for instance demonstrated that green human capital may not be related to business sustainability. In an attempt to examine the mediating role of green innovation in the relationships between green intellectual capital, GHRM, and environmental performance; Rehman et al. (2021) observed that green intellectual capital was not related to environmental performance of large manufacturing firms in Malaysia. These discrepancy results regarding the relationship between green intellectual capital and sustainability performance suggest that the relationships between these fundamental variables need to be revisited.

The inconsistencies in the findings in the various studies may be due to mechanism for the linkage between eco-intellectual capital and sustainability performance. This study saw the moderating effect of eco-dynamic capability on the connection between eco-intellectual capital and sustainability performance. Huang and Xiao (2023) asserted that as the environmental condition changes frequently, firms have to constantly renew resources and capabilities in order to sense and seize new opportunities, thus achieving sustainable competitive advantage. Thus, dynamic capabilities are essential for developing and reconfiguring necessary capabilities for sustainability, among which eco-dynamic capability is considered as a particularly relevant factor due to its sustainability-oriented characteristics (Da Giau et al., 2020; Gruchmann et al., 2021; Linde et al., 2021).

The concept of dynamic capabilities complements the Resource Based Theory by incorporating the dynamic view of firm capabilities (Oliveira-Dias et al., 2023; Teece, 2007). Thus, the dynamic capability's view can be used to understand the relationships between resources, capabilities, and performance. In line with dynamic capabilities theory, which advocates the ability of firms to continually integrate, build, and reconfigure competencies to sustain business growth (Blome et al., 2013; Teece, 2007), the sustainability performance is characterised by the capabilities of personnel to continually eliminate non-value-added activities to meet customers' individual needs (Iyer et al., 2019; Srinivasan et al., 2020).

Yet prior studies (example: Aboelmaged & Hashem, 2019; Erinos & Rahmawati, 2018; Jirawuttinunt & Limsuwan, 2019; Ren et al., 2018; Yong et al., 2019) have not considered the moderating role of eco-dynamic capability in the relationship between eco-intellectual capital and sustainability performance. This study response to the call from eminent studies by Forés et al. (2023) and Huang and Xiao (2023) that there is still a need for more empirical research on how dynamic capabilities, and their interaction with other managerial and organisational capabilities, impact environmental performance. Moreover, Chen (2008), and Oliveira-Dias et al. (2023) claim that little amount of consideration is given to eco-intellectual capital regarding SMEs paralleled to bigger organisations particularly in less endowed nations.

Moilanen et al. (2014) claims getting these holes filled remains very imperative for SMEs. The field is still infant and links between eco-intellectual capital, sustainability performance and eco-dynamic capability could set the pace regarding business stratagems. The stringent ecological conventions alone by various governments are not sufficient to execute viable business (Ogunkan, 2022; Xie et al., 2022). In order to be in line and cope with the environmental shift trend, it is increasingly paramount to devise new strategies that are no longer optional to all sorts of organisations (Ray & Grannis, 2015).

Against the backdrop above, our study aims to explore how the presence of eco-dynamic capability could strengthen the relationship between eco-intellectual capital and the three constituents of sustainability performance (Financial, Social and Environmental), particularly, among SMEs. Due to rare studies on the mechanism for the linkage between eco-intellectual capital and sustainability performance, there have been inconsistencies in the findings of prior studies. Thus, this study examined the moderating role of eco-dynamic capability on the connection between eco-intellectual capital and sustainability performance. In using a survey data from 500 employees and owner-managers of SMEs, hierarchical multiple regression was applied to test the direct and indirect effects of eco-dynamic capability and eco-intellectual capital on sustainability performance. The results provide empirical evidence to support the different roles of eco-dynamic capability and eco-intellectual capital in improving economic, social and environmental sustainability in today's erratic and cutthroat business climate.

The remaining sections of the study are structured as follows: Section two concentrates on literature review; Section three delves into the methodology of the study; while section four focuses on the analysis, results pertaining to the study, and an in-depth discussion of the results. The final part focuses on conclusions and implications.

2. Literature review

2.1. Sustainability performance

According to Meng (2015) sustainability represents balancing and sustaining societal comfort. Tien et al. (2020) argued that profitability is preferred to moral issues and being socially responsible. Previous scholars have asserted that just as it is important to attain profit, it is also imperative to reduce waste, recover and reclaim scarce assets to grow financial performance in fulfilment of one of the goals of sustainability (Chen, 2022; Costello, 2021). Certainly, the short-term and parochial outlook that concerns firm-specific economic value creation solely for shareholders is becoming

increasingly unsustainable (Dionisio & deVargas, 2020). Human-centred service design promotes interactive processes which recognise the complex interrelationships among the environmental, economic, and social aspects of sustainability (Khizar & Iqbal, 2021). In keeping with the most recognised perspective of sustainability performance by Elkington (1994); in this study, the dimension of sustainability performance was limited to economic (financial), social, and environmental. These dimensions are explained as follow:

2.2. Social sustainability performance

Essentially, social sustainability concerns the relationship between social circumstances like deprivation and ecological annihilation (Farazmand, 2016). It is against this background that the concept of social sustainability proposes that the mitigation of deprivation should neither necessitate unjustified ecological devastation nor economic volatility. It should aim to lessen deprivation within the prevailing eco-friendly and economic asset base of humanity (Kumar et al., 2014; Scopelliti et al., 2018). Social investment in the form of job facility is increasingly valuable for sustainability. Indigenous job design could bring widespread prospects in the ecological arena, such as upgrading energy proficiency and salvaging (Torjman, 2000).

Social sustainability performance, hence, is critical to improve and increase the goodwill of any organisation which in turn contributes to sustainable financial performance (Baah et al., 2021). Social performance looks at business events that give to humanity beyond acquiescence with rules, regulations, ideals and common procedures. Several studies have found that when businesses give beyond the constraints of the laws of the society—corporate social responsibility (CSR), it improves the value of the firms and decreases cost of capital (Cheng et al., 2013; Dhaliwal et al., 2014; Huang & Watson, 2015). CSR plays a good role in covering corporate tasks that caters for an establishment's charitable or discretionary associations with its conservational and societal patrons has been a key area of study for scholars (Enquist et al., 2007).

This novel dream has become a portion of globalisation and the internationalisation of markets, resulting it the advent of sustainability; divergent procedures and ideals to make daily life bearable and grasp the impacts on humanity, the nation and the ecology (Chase-Dunn & Almeida, 2020). CSR is essentially viewed as concepts and approaches that enable corporations to voluntarily assimilate social and environmental distresses in their commercial activities and stakeholder contact (Chitimira et al., 2022; Serfontein-Jordaan & Dlungwane, 2022). It is the concept that holds an organisation answerable for its influence on all appropriate stakeholders. Triple Bottom Line: pecuniary, social and ecological, as a green concept could presume equilibrium between those three themes and can craft a more universal goodwill of the convolution of ecological advancement.

2.3. Economic sustainability performance

Lobo et al. (2015) asserted that economic sustainability involves a scheme of manufacture that fulfils current and future needs. Traditionally, economists assume that natural resources were in short supply; unjustifiable accent was placed on the ability of the market to make judicious allocation of assets (Du & Kang, 2016). They also believe that economic growth would be augmented with technical progress to restock natural assets exhausted in the course of manufacturing (Cooper & Vargas, 2004). Financial sustainability performance thus depicts the continuing lucrativeness and financial survival of the organisation whose measurement is dependent on long-term operating value, cost effectiveness, output, retributions, return on investment and market value.

Studies advocate that financial sustainability performance goes a long way to maximise shareholder value by examining the value-relevance of financial information and its association with stock prices (Barth et al., 2008; Jain & Winner, 2016). In order to analyse and assess business monetary performance, it is crucial to embrace a great deal of several methods. To improve the firms' pecuniary performance; speedy and simple approaches remain the core desire that

financiers and owners of analogous corporations aspire. In their perspective, it is crucial to ascertain whether the firm has the capacity to improve its worth and thus achieve an acceptable return on their investments.

The basic aspirations of myriad of businesses translate into maximising and improving market worth on a continuing basis. Using orthodox or contemporary financial pointers of commercial pecuniary performance for sustainability evaluation is devoid of an adequate edifying worth. Kocmanová and Dočekalová (2014) suggest that resorting to non-financial indicators should not deviate from long-term goals and the stratagem of each individual establishment. There should be a direct association between non-financial indicators and lasting strategic goals as well as, fulfilling the indicators to attain the goals. Their definition should have the ability to make projections into the future irrespective of the level of change, anticipated or unwelcome. With this purpose, a problem of indicator measurability exists.

2.4. Environmental sustainability performance

From the point of view of Ekins (2011) environmental sustainability entails “the maintenance of important environmental functions and therefore, the maintenance of the capacity of the capital stock to provide those functions”. Khalfan et al. (2002) posit that the philosophy of ecological sustainability is to make the ecosphere an enhanced place for both present generation and those unborn. Thus, according to Khalfan et al., sustainability can only be registered when human undertakings reduce depletion of natural resources and rendering the ecology impure. The inference is that natural assets must be renewed as they are reaped not faster and waste must be released not earlier than adapted by the ecology (Diesendorf, 2000; Mensah & Ricart Casadevall, 2019). This traced to the fact that global structures have limits or frontiers for upholding equilibrium.

Environmental sustainability performance was defined by ISO (1999) as “the result of an organisation’s management of its environmental aspects”. It deals with a corporation’s effects on “living and non-living natural systems, including ecosystems, land, air and water”. Ritz and Ranganathan (1998) acknowledged four basic rudiments of ecological uprightness: material use, energy use, non-product output and toxin discharges. In contemporary times, when the company’s intention is to craft high market significance, its upper echelon must place emphasis on all the facets of the enterprise’s influences that will, subsequently provide a comprehensive opinion of the organisation.

Those effects comprise the corporation’s ecological performance in the meaning of obligation to the ecology, and that pecuniary advantages are attained through organisation’s it environmental ingenuities. Bringing on board cleaner technologies, improving technologies that lessen the need of assets, green management systems and other voluntary tools improve in the corporation’s green standing. In an attempt to assimilate quality and green management systems new prospects such as lesser use of assets, enriched associations with outside investors including local publics and authorities have been produced.

Chen (2022); and Fukuda-Parr and Muchhala (2020) stressed the importance of integrating the objectives of environmental sustainability into a development strategy encompassing concerns for economic and social equity that includes an enabling international environment for development. However, environmental sustainability is unlikely to be achieved solely through socio-cultural aspects. Scientific research and quantitative measures are necessary tools of environmental conservation (Poort et al., 2021)

2.5. Moderating effect of eco-dynamic capability

Knowledge integration is associated with strategic values to an organisation. The method deployed by an organisation to leverage knowledge is critical to a corporation’s competitive strategy (Salunke et al., 2019). Thus, the capability of firms to rearrange resources to increase

cost effectiveness and adjust to changing processes enables the firm to produce new products that are competitively advantageous. Protogerou et al. (2012) evidenced in their work that effective allocation of resources goes beyond promotion of the firm's flexibility to provide optimum utilisation of resources. The effective performance of appropriate onuses through judicious coordination and integration of resources and processes could be possible through people, departments and teams.

In the study of Lin and Wu (2014), businesses' capability towards reconstruction or reposition of resources is valuable to develop fundamental competitive edges and boost their market locus through the analysis of one thousand Taiwanese firms. Firms are able to deal with ecological sustainability challenges (Dangelico et al., 2017). The complexity and dynamic nature of market and industry environment have caused an increase in competition among firms (Wilden et al., 2013). Green dynamic capabilities, that aid companies to accomplish green growth, echo corporations' empirical nature (Zahra et al., 2006), which aid them to leverage existing assets and information to apprise and exploit green organisational competencies to respond to dynamic commercial environs (Lin & Chen, 2017).

Accompanied by the behaviour and feedback of corporations in the method of seeking market prospects, green dynamic capability is gradually turning into an enduring research topic of concern. Firms have got to be vigilant and be able to identify favourable market opportunities in the external environment (Giniuniene & Jurksiene, 2015) and response must be just-in-time. Cho et al. (2019) did posit that the proximity of the prospect has a substantial impact on the activities of the environment. Thus, if the firm's insight about the environment is stronger, the firm better comprehends and imbibes green development-related backing guidelines. The development trend of the industry changes as well as green technology. Customers green demand changes and as a result it affects companies' strategic environmental alternatives (Sharma & Henriques, 2005).

Previous research has illustrated the role of dynamic capabilities in innovation aimed at achieving environmental outcomes both in manufacturing (e.g., Eikelenboom & de Jong, 2019; Felsberger et al., 2022; Huang & Xiao, 2023; Mousavi et al., 2018) and, recently, in the tourism sector (e.g., Duarte Alonso et al., 2020; Forés et al., 2023; Reyes-Santiago et al., 2019), which is the focus of analysis of this research. However, these studies do not reveal the interactions with other important managerial and organisational resources, such as Green Human Capital, Green Relational Capital and Green Structural Capital in the development of new, more environmentally friendly processes and products.

Drawing from the dynamic capabilities theory which complements the Resource Based Theory by incorporating the dynamic view of firm capabilities (Oliveira-Dias et al., 2023), the sustainability performance of a firm is characterised by the capabilities of personnel to continually eliminate non-value-added activities (Iyer et al., 2019; Srinivasan et al., 2020). Furthermore, prior studies did not give consideration to eco-intellectual capital and eco-dynamic capability regarding SMEs paralleled to bigger organisations particularly in less endowed countries. Meanwhile SMEs are not only important source of employment; they can also become a source of innovation and increased productivity globally (Adegboye & Iweriebor, 2018; Surya et al., 2021), making it essential to study the effect of these issues on sustainability performance of SMEs. Based on the above literature, these hypotheses are made:

H1: Eco-dynamic capability moderates the relationship between eco-intellectual capital and economic (financial) sustainability performance.

H2: Eco-dynamic capability moderates the relationship between eco-intellectual capital and social sustainability performance.

H3: Eco-dynamic capability moderates the relationship between eco-intellectual capital and environmental sustainability performance.

3. Methodology

The study employed quantitative survey research design. The study's unit of analysis is SMEs and the questionnaires were filled anonymously by the employees and owner-managers of the SMEs. The survey included Kumasi in the Ashanti region and Sunyani in the Bono region of Ghana. Simple random sampling technique was utilised for data collection. The study targeted 600 respondents; however, 500 valid questionnaires were retrieved. Thus, the response rate in our study was 83.33% which is considered appropriate.

3.1. Measures

3.1.1. Independent variables – Eco-intellectual capital (EIC)

To measure this construct, the study adopted the multi-dimensional measure of Huang and Kung (2011). Under this, three dimensions were incorporated in the measure. These are Green Human Capital (GHC), Green Relational Capital (GRC) and Green Structural Capital (GSC). A total of 17 items were originally included in the measure for this purpose of this study. For GSC, eight items were included in the measure. This included “The firm has superior managerial system of ecological protection”, “The firm investigates adequately in ecological protection facilities” amongst others. For GHC, four items were originally included in the measure. This included “The firm's employees are adequately competent towards ecological protection”, “The employees of this firm exhibit a positive productivity and contribution towards environmental protection” amongst others. For GRC, a total of 5 items were originally included in the measure. This included “Customers show satisfaction regarding the firm's environmental protection”, “There is stability in the relationship between the firm and its suppliers regarding ecological protection” amongst others. All items were valued on a scale of 1 (strongly disagree) – 5 (strongly agree) in this study. This measure was made composite in measuring Eco-Intellectual Capital.

3.1.2. Dependent variables – sustainability performance

To measure this construct, the work assumed the multi-dimensional measure of Chow and Chen (2012). Under this, three dimensions were incorporated in the measure these are Economic (financial) Sustainability Performance (ESP), Social Sustainability Performance (SSP) and Environmental Sustainability Performance (ENSP). A total of 20 items were involved in the measure. For economic (financial) sustainability performance (ESP), five items were originally included in the measure. This comprised “The firm gains revenue from selling waste products”, “The firm minimises costs of inputs for equal level of outputs” amongst others.

For SSP, six items were originally included in measure. This comprised “The firm places employee or community health and safety first”, “The firm prioritises the need to fund community initiatives” amongst others. For ENSP, nine items were originally included in the measure. This comprised “The firm minimises energy consumption”, “The impact of the firm's operations on animal species and natural habitats are minimised” amongst others. For the direction of this study, these dimensions will be handled individually as dependent variables in the analysis. All the matters were graded on a scale of 1 (strongly disagree) – 5 (strongly agree) in this study. This measure was made composite in measuring Eco-Intellectual Capital.

3.1.3. Moderating variable – Eco-dynamic capability (EDC)

To measure this construct, the study adopted the uni-dimensional measure of (Pavlou & El Sawy, 2011). A total of six items were incorporated into this scale for the purposes of this study. This included “The firm has the ability to quickly monitor the environment to identify new eco-dynamic

capabilities”, “The firm’s routines are effective to identify and develop green technology” amongst others. All the items were rated on a scale of 1 (strongly disagree) – 5 (strongly agree) in this study.

3.2. Data analysis

The researchers used IBM SPSS Statistics version 24 and IBM SPSS AMOS (26.0) presented in structural equation model. Various logical measures were employed in this study. For the first aspects of the data collected, the demographics were examined using descriptive statistics. This highlighted the distribution and segmentation of respondents across gender, age, position etc. and their respective firms across type, size and age.

Following up to this, the objective related data (eco-intellectual capital, eco-dynamic capability and sustainable performance) were run through an exploratory factor analysis (EFA) in the IBM SPSS. From this the extracted components were based on the criteria of Eigen values greater than 1 or more. It was to ascertain the underlying factor structure of the data collected into eco-intellectual capital, eco-dynamic capability, economic (financial) sustainability performance (ESP), social sustainability performance (SSP), and environmental sustainability performance (ENSP).

This process was followed with a confirmatory factor analysis (CFA), using the IBM SPSS AMOS. This was done to validate the factors extracted and then examine the model fit indices of the different factor sets. The fit indices utilised a root mean square error of approximation (RMSEA), following the Hu and Bentler (1999) standard of 0.08 or lower. Also, the comparative fit indices (CFI) were set at thresholds of beyond 0.90 as endorsed by Kline (1998). Convergent and discriminant validity were assessed resorting to the acclaimed criteria by Fornell and Larcker (1981) with the set standard for convergent validity being composite reliability criteria of 0.70 and above and AVE threshold of 50% or more (Hair et al., 2016). For the discriminant validity criteria to be met, the square root of the minimum average variance extracted (AVE) must be higher than the highest inter-construct correlation (Fornell & Larcker, 1981; Hair et al., 2016).

After fulfilling all the requirements, the data was then carried through a multiple moderated regression in IBM SPSS Statistics. In the process, the interaction effects of eco-dynamic capability and eco-intellectual capital on the sustainable performance dimensions (economic, social and environmental) were determined. Control variables (firm type, firm size and firm age) were included.

4. Results and discussion

4.1. Validity, reliability and the issue of common method variance

Before conducting the factor analysis, there is the need to confirm sampling adequacy (Kissi et al., 2020). Kaiser-Meyer- Olkin (KMO) computation and Bartlett’s test were used to certify sampling appropriateness and in effect ensure reliability of the variables. The KMO outcome of 0.896 is greater than the agreeable frontier of 0.6 and the equivalent Bartlett’s test of all the measures produced an approximation of $X^2 = 4243.890$ and the estimate was significant at less than 0.05. The implications are that the data was adequate for factor analysis

The data was then subjected to EFA procedure and rotated through Varimax function as recommended by Hair (2015) and Yong and Pearce (2013). The rotation resolved 11 factors, accounting for a total variance of 61.50%. The first un-rotated factor captured only 9.85% of the variance in data. Per Harman’s Single-Factor Test, there is no problem of common method variance in the study (Chang et al., 2010; Podsakoff et al., 2012; Tehseen et al., 2017).

After establishing the factor structure, a further CFA was undertaken. This was done using the AMOS-SPSS (26.0) to investigate problematic variable loadings and determine the best model fits. Any problematic variable was eliminated to improve the model fits. Three subsets were estimated in total. In the first set, three components of EIC (GHC, GSC, and GRC) were used. In the second measurement, the three components of sustainable performance (ESP, SSP, and ENSP) were used. The third set of

measurement contained the EDC measure. Following purification, several items were removed from the models.

In order for reliability and validity matters to be addressed, the model's psychometric features were evaluated by considering construct reliability, indicator reliability, and convergent validity. Indicator reliability was appraised through factor loadings (FL). Values of 0.704 or greater representing FL or greater are agreeable (Benitez et al., 2020). Cronbach's alpha (CA) and composite reliability (CR) were used to ascertain construct reliability. CA and CR should be 0.70, 0.60 or more, respectively, and be qualified as minimum thresholds (Hair, 2015). Convergent validity was evaluated by the use of average variance extracted (AVE). The limit for AVE is 0.50 or higher (Hair, 2015). The findings on the CA, CR, AVE and FL are depicted in Table 1.

From Table 1, the approximations in lieu of CA (0.714–0.884) and CR (0.630–0.884) were in line with the threshold. In the study, all indicators regarding the constructs which documented less than 0.40 were taken from the model. From Table 1, it is depicted that the AVE values (0.500–0.657) agreeably encountered the threshold. Therefore, it can be suggested that our model was devoid of reliability and convergent validity concerns.

Fornell-Lacker criterion was used in the study to appraise discriminant validity. From the results in Table 2, our model's Fornell-Lacker criterion was adequately fulfilled because each construct's AVE square root surpassed the correlational values of other variables (constructs). Consequently, it can be settled that our model was devoid of discriminant validity.

Again, the bivariate correlations between the construct scores in Table 2 could be used to examine multicollinearity. Correlation score of 0.9 or higher signifies multicollinearity between constructs (Pallant, 2016). From Table 2, none of the correlation values was 0.9 or greater, hence, there is no is of multicollinearity in this study.

4.2. Model fitness indices

The exact model fit was examined with a chi-square test. Table 3 also highlights the additional model fit tests examined. The results showed good indices as the root mean square error of approximation (RMSEA), non-normed fit index (NNFI) and comparative fit index (CFI), standardised root mean square residual (SMRM) were all satisfactory with the recommended criteria of <0.08, >0.90, >0.90, and >0.05 respectively (Bagozzi & Yi, 2012). In aggregation, we can agreeably say that our model was excellent in validity and reliability standards; hence, we proceed to test the hypotheses of the study in the next section.

4.3. Hypothesis testing

The Model measured the moderating interaction effects of eco-dynamic capability on the relationships between eco-intellectual capital and all sustainability performance dimensions (economic, social and environmental). This was done by creating an interaction variable between eco-dynamic capability and eco-intellectual capital (EIC × EDC) and regressing it over all three dimensions of sustainability performance. The result of the multiple regression analysis for H1, H2 and H3 are presented in Table 4.

The results indicate significant interaction effect of EIC × EDC on economic/financial sustainable performance ($\beta = -.201$ ($p < 0.01$), and on environmental sustainability performance ($\beta = -.124$ ($p < 0.05$). This interaction was however not significant across the social sustainability performance dimension. Table 5 presents summary of the outcomes for all the hypotheses.

With the objective of the study investigating how eco-dynamic capability moderates the link between eco-intellectual capital and sustainability performance, the following hypotheses were posited; H1: *Eco-dynamic capability moderates the relationship between eco-intellectual capital and financial sustainability performance*; H2: *Eco-dynamic capability moderates the relationship between eco-intellectual capital and social sustainability performance*; H3: *Eco-dynamic capability moderates*

Table 1. Summary Statistics item validity and reliability measurements

Construct	CA	CR	AVE	FL
Eco-Intellectual Capital (EIC)			0.559	
Green Human Capital (GHC)	.716	0.685	0.521	
GHC1				.661
GHC2				.682
GHC5				.600
Green Structural Capital (GSC)	.741	0.742	0.500	
GSC1				.707
GSC6				.739
GSC8				.654
Green Relational Capital (GRC)	.884	0.884	0.657	
GRC1				.771
GRC2				.775
GRC3				.862
GRC4				.831
Sustainability Performance				
Economic Sustainability Performance (ESP)	.714	0.630	0.510	
ESP1				.510
ESP4				.595
Social Sustainability Performance (SSP)	.769	0.660	0.520	
SSP2				.549
SSP3				.487
SSP6				.449
Environmental Sustainability Performance (ENSP)	.827	0.832	0.653	
ENSP1				.696
ENSP2				.769
ENSP3				.671
ENSP4				.696
ENSP6				.579
ENSP7				.612
Eco – Dynamic Capability (EDC)	.799	0.799	0.544	
EDC1				.584
EDC2				.741
EDC4				.701
EDC5				.628
EDC6				.667

Source: Field Data (2022)

Table 2. Fornell-Lacker criterion of determining discriminant validity

Construct	EIC	ESP	SSP	ENSP	EDC
EIC	0.748				
ESP	.226**	0.714			
SSP	.268**	.365**	0.721		
ENSP	.529**	.405**	.336**	0.808	
EDC	.508**	.310**	.283**	.614**	0.738

Table 3. Model fit Statistics

Measure	Construct	χ^2	DF	RMSEA	NNFI	CFI	SRMR
A	Eco - Intellectual Capital	60.19	32	.059	.955	.968	0.0434
B	Sustainable Performance	67.09	41	.051	.955	.967	0.0400
C	Eco- Dynamic Capability	9.22	5	.058	.975	.987	0.0263

Measurement A – (Green Human Capital, Green Relational Capital, Green Social Capital)

Measurement B – (Economic, Social, and Environmental Sustainability Performance)

Measurement C – (Eco- Dynamic Capability)

χ^2 – Chi square, DF- Degree of freedom, RMSEA- Root mean square error of approximation, NNFI- Non-normed fit index, CFI- Comparative fit index, SRMR- Standardised root mean square residual, “Standardised estimates” Source: Field Data (2022).

the affiliation between eco-intellectual capital and environmental sustainability performance. As highlighted in the results of the regression, two of the hypotheses were confirmed. In the event of social sustainability performance, it was observed that, no significant moderating effect was existent. However, in the case of economic and environmental sustainability performance, significant moderating effects were observed.

Sustainability keeps gaining much traction and attention across all facets of life. As such much effort is being put in place to implement sustainability measure to every particular function, process or product which otherwise is currently “unsustainable” in its development/delivery. Many firms are continually committing to the sustainability agenda and keep optimising their processes to meet the set standards worldwide. Performance of a firm has largely been attributed to employees and thus improving their capacity remains increasingly significant. As such improving eco-intellectual capital of the firm, places it in a position of competitive advantage in terms of sustainability performance.

The extrapolation of the findings falls within firms having high levels of eco-intellectual capital alongside eco-dynamic capability in order to observe high levels of economic and ecological sustainability performance. Thus, the findings of our study side with claim by Ogunkan (2022), and Xie et al. (2022) that the stringent ecological conventions alone by various governments are not sufficient to execute viable business. In order to adapt to the continuously shifting market conditions and provide values of strategic intent, businesses must acquire, combine, and change physical (like financial resources) and intangible (like reputational) resources through the use of these dynamic capabilities (França & Rua, 2018). With the studies of Wilden et al. (2013) suggesting the dynamic features of modern markets. Giniuniene and Jurksiene (2015) went ahead to suggest the need for firms to be vigilant and be able to identify favourable market opportunities in the external environment. This expresses the need for incorporation of eco-dynamic capabilities and eco-intellectual capital in firms’ operations.

Table 4. Multiple regression of the moderating effect

	Standardised estimates								
	Model 1			Model 2			Model 3		
	ESP	SSP	ENSP	ESP	SSP	ENSP	ESP	SSP	ENSP
Independent variables									
Control effects:									
Firm type	.017	.077	.010	.038	.095	.049	.029	.089	.043
Firm Age (≤ 10 yrs. = 1, > 10yrs =0)	.056	.122	.009	.034	.094	-.048	.050	.105	-.038
Firm Size ($\leq 99 = 1, > 99 = 0$)	-.125	-.045	-.107	-.100	-.020	-.054	-.091	-.015	-.048
Research Unit (Yes = 1, No = 0)	-.002	.026	-.038	.014	.040	-.008	.001	.032	-.016
Main effects:									
Eco-Intellectual Capital (EIC)				.084	.148*	.296***	.080	.146*	.294***
Eco-Dynamic Capability (EDC) ^a				.261***	.209**	.465***	.214**	.181*	.436***
Interaction Effect:									
EIC x EDC ^b							-.201**	-.121	-.124*
Model fit indices:									
R^2	.029	.027	.014	.124***	.123***	.432***	.161***	.136	.462
ΔR^2				.098***	.095***	.434	.037***	.014	.014*
F of R^2	1.433	1.370	.674	4.900***	4.827***	28.051***	5.802***	4.748***	25.903***
F of ΔR^2				13.211***	13.128***	95.192***	10.731***	3.807	6.447
DF	244	244	244	242	242	242	241	241	241

Dependent Variable (Mean Centred): ESP, SSP, & ENSP.

a. Average Mean Centred (Eco-Intellectual Capital)

b. Product Mean Centred (Eco-Intellectual Capital x Eco-Dynamic Capability)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Field data (2022).

Our findings also confirm prior empirical studies which have proved the role of dynamic capabilities in innovation aimed at achieving environmental outcomes both in manufacturing (e.g., Eikelenboom & de Jong, 2019; Felsberger et al., 2022; Huang & Xiao, 2023; Mousavi et al., 2018) and in the tourism sector (e.g., Duarte Alonso et al., 2020; Forés et al., 2023; Reyes-Santiago et al., 2019). This study also expands the application of the dynamic capabilities theory which complements the Resource Based Theory by incorporating the dynamic view of firm capabilities (Oliveira-Dias et al., 2023). According to the theory, the sustainability performance of a firm is characterised by the capabilities of personnel to continually eliminate non-value-added activities (Iyer et al., 2019; Srinivasan et al., 2020). Detailed implication of the findings is expatiated in the next sub-heading.

4.4. Theoretical and managerial implications

The study provides numerous advantages to practitioners and future researchers. The study's contribution to current body of knowledge is evidenced by investigating the moderating role of eco-dynamic capability in the relationship between eco-intellectual capital and sustainability performance. Thus, the study developed comprehensive conceptual model that tests moderating effect of EDC among EIC, ESP, SSP and ENSP. The uniqueness of this study is expounded in the intellectual capital-based and resource-based views that are meant to give a competitive edge to the organisation from the intangible resources it possesses (Youndt & Snell, 2004). Dynamic capability theory is built on the premise that corporations need to have a superior comprehension of market dynamics and then focus their attention on corporate's preparedness to embrace, build and reconfigure its inner and outside competencies to cope and survive in the dynamic environment and that the firm's capabilities should be continually greater than those of competitors (Prahalad & Hamel, 1990).

The work also depicts that a worker's talents, proficiencies and support of the upper echelon in SMEs in Ghana encompass ecological protection and result in gaining a competitive edge. There is the need for owner-managers of SMEs to observe and implement eco-friendlier measures and processes within their operations. Furthermore, this study extends the literature of organisational behaviour relating to ecological studies. The research on sustainability performance is extended through investigation of how eco-intellectual capital in SMEs leads to sustainability performance. Moreover, the study offers valuable administrative inferences. The study was carried out in the SMEs in Ghana that exhibit distinctiveness in terms of ecological defence and consciousness magnification.

The need for eco-dynamic and responsive firms in today's markets is also addressed by many. Having high level eco-dynamic capability thus allows the firm to be steps ahead of competition due to faster reaction and responsiveness to times and changes in market demand. Even better is the incorporation of the two concepts of eco-intellectual capital and eco-dynamic capability. The built up eco skills, aptitudes and processes of the employees and firms are channelled along eco-dynamic capabilities, to innovate and develop undistruptive products into the market. Thus, making the potential benefits to be achieved not only from a reaction standpoint but also a proactive one. Impliedly, it could be said that eco-dynamic capability is the way to go if we want to ensure green innovation.

5. Conclusion

The main objective was to analyse the moderating effect of eco-dynamic capability on the correlation between eco-intellectual capital and sustainability performance of SMEs. The findings showed a significant moderating effect across economic and environmental sustainability performance. With regard to social sustainability performance dimension, there was no effect. Dynamic capability incorporates and reconfigures firms' operations and processes to the ever changing and volatile market demands. As such, having both in places make a firm more likely to highly perform across all sustainability performance dimensions.

Thus, firms that want to contribute to the creation of key products, services, or processes to reduce the harm, impact, and deterioration of the environment at the same time that optimises the use of natural resources have to invest more into eco-dynamic capability. Consequently, embracing eco-dynamic capability will help achieve the 2030 Agenda for Sustainable Development Goals (SDGs), especially,

Table 5. Summary of hypotheses

Hypotheses	Findings	Evaluation
H1:EDC moderates the relationship between EIC and ESP	Significant (-)	Supported
H2:EDC moderates the relationship between EIC and SSP	Not Significant (-)	Not Supported
H3:EDC moderates the relationship between EIC and ENSP	Significant (-)	Supported

Source: Field Data (2022)

goal 12: “Ensure sustainable consumption and production patterns” and goal 15: “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”. This is largely because eco-dynamic capability also collects, identifies and forecast external information like green technology change, green demands and various policies related to ecological development of organisations (Lin & Chen, 2017). It explicitly comprises resource integration proficiency, resource reconfiguration ability and environmental insight proficiency.

5.1. Limitations and future research directions

Despite the significant contributions made by this study, there are several limitations that should be considered in further research. With respect to the measurement instrument, the scales were based on self-assessment. Undeniably, this technique has attracted criticism; notwithstanding, we believe our rigorous approach to data collection has helped address the problems associated with this methodology, as reflected in the reliability and validity measures. The study was conducted based on a dataset collected in Ghana. Similar studies set in other countries may arrive at different conclusions regarding the relationship between eco-intellectual capital, eco-dynamic capabilities and sustainability performance.

In addition, eco-intellectual capital was used in this study as a higher-order construct. Thus, we did not differentiate in this study between green human capital, green structural capital, and green relational capital. It is possible that green human capital, green structural capital, and green relational capital may be related to sustainability performance in their own particular ways. Furthermore, the moderating role of eco-dynamic capability may differ in the relationship between these different types of eco-intellectual capital and sustainability performance. Future research could therefore further differentiate between the different eco-intellectual capital types. Finally, the hypotheses were tested based on cross-sectional data. Given that the accumulation of eco-intellectual capital and the process of eco-dynamic capability may change over time, it is recommended that future longitudinal cases be used to verify the causal relationships.

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