Decision Making Advances

Journal homepage: www.dma-journal.org
ISSN: 2956-2384

Towards Organizational Resilience: The Interplay of Green HRM, Circular Economy Capabilities, Sustainable Environmental Performance, and Green Technology Adoption

Mohammad Fakhrul Islam[1,2,*], Katalin Szabó[3], József Poór[4]

1 Faculty of Business and Economics, Széchenyi István University, Győr, Hungary
2 Doctoral School of Economic and Regional Sciences, Hungarian University of Agriculture and Life Sciences (MATE), Godollő, Hungary
3 Institute of Agricultural and Food Economics, Hungarian University of Agriculture and Life Sciences (MATE), Godollő, Hungary
4 Department of Leadership and Management, Hungarian University of Agriculture and Life Sciences (MATE), Gödöllő, Hungary

ARTICLE INFO

Article history:
Received 2 July 2026
Received in revised form 21 October 2026
Accepted 25 October 2026
Available online 30 October 2026

Keywords:
Organizational Resilience; Emerging Economy; Green Dynamic Capability; PLS-SEM; FsQCA; Circular Economy; Green Human Resource Management; Green Technology Innovation

ABSTRACT

Manufacturing firms in emerging economies like Bangladesh face significant environmental challenges and internal operational inflexibility due to resource constraints. In such a context, firms need to integrate sustainable practices to ensure sustainable environmental performance (SEV) and organizational resilience (OR). Drawing on the resource-based view and the green dynamic capability view, this study explores how green human resource management, circular economy capabilities, and green technology adoption interact within Bangladeshi manufacturing firms to enhance SEV and OR. The research collects questionnaires from 300 respondents at firms in Bangladesh to examine their perceptions of organizational resilience-building practices. It employs Partial Least Squares Structural Equation Modeling (PLS-SEM) and fuzzy-set Qualitative Comparative Analysis to examine both linear and configuration pathways to enhance OR at the firm level. The study contributes to the existing environmental sustainability and resilience literature by offering insights into how Bangladesh's resource-intensive manufacturing firms jointly shape resilience outcomes by utilizing sustainable human resources and circular economy capabilities, sharing contextual reality in achieving sustainable environmental performance and organizational resilience.

1. Introduction

The global manufacturing industry faces persistent challenges, including environmental uncertainty, resource constraints, and supply chain disruption. Besides, stakeholders and customers have growing expectations of firms to align with sustainability in both production processes and finished products. In addition, environmental regulatory authorities consistently create pressure to

* *Corresponding author.*
E-mail address: fakhrul.mate.hu@gmail.com

https://doi.org/10.31181/dma412026195

© The Author(s) 2026 | Creative Commons Attribution 4.0 International License

adopt sustainable and circular practices in production processes to enhance environmental performance and reduce environmental damage.

In Bangladeshi manufacturing firms, especially in the ready-made garments, textiles, and leather sectors, environmental challenges are frequent, and firms face operational hurdles due to their resource constraints [1-3]. As this country is a major manufacturing hub, international buyers, regulatory bodies, and stakeholders also consistently create pressure to improve environmental sustainability performance [4-6]. However, firms operating under resource-intensive conditions in Bangladesh have to face unique challenges in balancing operational adaptability and sustainability requirements. In this context, it has become important for them to develop dynamic capabilities, operationalize circularity, and orchestrate internal resources to enhance both environmental performance and resilience. Recent scholars increasingly recognize that the long-term organizational competitiveness of manufacturing firms may depend not only on economic performance but also on a firm's ability to adapt to external disruptions while pursuing sustainability objectives [7-9]. Although sustainability and resilience are being examined independently and as separate topics within existing literature, recent studies emphasize that these two concepts are interconnected within the contemporary manufacturing environment [10-12]

In the existing literature, studies prioritize building sustainable resources and capabilities to facilitate sustainable and resilience outcomes in manufacturing firms [13,14]. Among these, GHRM has attracted considerable attention considering its role in fostering eco-friendly behaviors among employees, creating environmental awareness, and facilitating operational adaptability [15-17]. Similarly, CEC, as circular-driven dynamic capabilities, are increasingly prioritized in recent research [18-20], enabling firms to identify environmental opportunities, mobilize internal resources, and transform operational processes towards circular and environmentally friendly outcomes [21]. In current literature, these sustainability-oriented resources and capabilities are increasingly viewed as strategic mechanisms to strengthen firms' ability to cope with environmental uncertainty and disruptions. Besides, GTA with technology-driven environmental potentials has gained prominent attention as a complementary organizational resource, facilitating sustainable innovation, cleaner production processes, and operational flexibility [22-24]. Collectively, these resources and capabilities may contribute to organizational resilience, especially within an increasingly volatile business environment.

Despite growing attention to these capabilities and resources, relational, mechanistic, configurational, and contextual questions on OR remain largely unresolved. First, prior studies have generally examined GHRM, CEC, SEV, and OR through separate relationships, rather than testing their direct, indirect, and complex associations in resource-intensive manufacturing firms of an emerging economy, using a single integrated framework [13]. Second, the literature remains limited on whether CEC are operationalized within dynamic capabilities' sensing, seizing, and transforming within emerging economies' manufacturing firms. Although scholars widely emphasize dynamic capability building in manufacturing firms, the literature remains limited in its investigation of the operationalization of circular-oriented capabilities to improve sustainable environmental and resilience outcomes. Third, existing studies on emerging economies' manufacturing contexts also provide limited insights into whether SEV statistically mediates the association between GHRM and CEC with OR. Fourth, literature on the manufacturing firms' environmental outcomes, especially in resilience development, remains very inconclusive, while some investigations report positive relationships between them; others suggest potential trade-offs of environmental outcomes on operational adaptability and flexibility. Fifth, the role of GTI remains insufficiently emphasized as a boundary condition in the association between GHRM and CEC with OR in the context [23]. These consistencies in the existing literature indicate the need to employ an integrated framework to

explore direct, indirect, and conditional pathways linking sustainable resources and dynamic capabilities to resilience-building in emerging manufacturing firms. These gaps are particularly relevant for the Bangladeshi manufacturing industry, which operates under resource constraints and faces consistent external environmental challenges and buyers' sustainability requirements. Accordingly, examines predictive associations and statistical mediating, moderating, and conditional associations between GHRM, CEC, GTA, and SEV, associated with OR outcomes by collecting data from manufacturing organizations in Bangladesh. It performs Partial Least Squares Structural Equation Modeling (PLS-SEM) and fuzzy-set Qualitative Comparative Analysis (fsQCA) analyses to explore both linear and non-linear associations between sustainable resources and circular capabilities and to improve organizational resilience outcomes.

1.1 Contributions

The study has made several contributions to the existing literature on environmental sustainability and organizational resilience. First, it develops an integrated framework, grounded in the RBV, GDCV, and ROT, examining the effects of GHRM and CEC on both SEV and OR. In this integration, RBV explains how GHRM and GTA constitute strategic organizational resources; GDCV explains how CEC enables manufacturers to sense environmental opportunities, seize those, and reconfigure operational processes; and ROT further explains how managers coordinate and deploy resources and capabilities to enhance environmental and resilience-related outcomes. The theoretical integration clarifies distinct roles of each perspective rather than treating the three theories as interchangeable explanations. Second, the research contributes by providing context-specific evidence of Bangladeshi manufacturing firms operating under resource constraints, regulatory hurdles, operational disruptions, and buyers' requirements. Examining the context enriches the existing literature on the sustainability and resilience of emerging economies by showing how environmental incentives operate within resource-intensive manufacturing firms in such economies. Third, it also provides methodological contributions by combining PLS-SEM and fsQCA to capture both symmetric relationships and configurational asymmetry among resources and capabilities, enhancing environmental performance and firms' resilience. The combination provides both net effects and reveals configurational pathways for high organizational resilience performance at firms. Finally, the findings contribute to the debate over whether improvements in environmental performance are invariably associated with strong organizational resilience. The observed negative, symmetrical relationship between SEV and OR suggests that environmental improvements in the resource-intensive manufacturing context may not lead to high firm resilience due to short-term coordination costs, resource-commitment issues, and operational rigidity. The finding also identifies several vital empirical relationships that may require longitudinal and qualitative investigation.

Moving forward, the study provides a critical literature review, including both theoretical grounding and hypothesis development, in Section 2. Next, Section 3 explains the data collection procedures and justifies the methodological integration. In Section 4, the research interprets the results. Moving forward, it critically discusses the results in Section 5. The research provides implications and future directions in Section 6, while conclusions are given in Section 7.

2. Literature Review

2.1 Theoretical Grounding

This study is grounded in an integrated theoretical lens that combines the resource-based view (RBV), green dynamic capability view (GDCV), and resource orchestration theory (ROT) to explain

how circular economy capabilities and other sustainability-oriented resources transform into environmental and organizational outcomes. The three perspectives are complementary but non-equivalent, supporting that RBV explains the strategic value of GHRM and GTI, GDCV explains the adaptive role of CEC, and ROT explains how managers coordinate resources and capabilities in relation to SEV and OR. Although these theories share interest in organizational resources and adaptation, they may explain different stages through which firms' sustainability-oriented initiatives are translated into environmental and resilience performance. First, RBV explains that organizational competitive advantages can be sustained through processing and deploying valuable, rare, inimitable, and non-substitutable resources [25,26]. In this study, GHRM is represented as a human resource-based system that develops environmental values, competencies, and green behaviors established through training, performance evaluation, and rewards. In this logic, GHRM is expected to create the internal capital base required for implementing sustainability and resilience. Besides, GTA is treated as a valuable technology resource-based enabler, strengthening cleaner technology-based processes, environmental compliance, optimization, and innovation in products, processes, and services. Collectively, these resources constitute a configurational portfolio of firms' assets that provides the foundational conditions to achieve sustainability-oriented organizational capabilities. Accordingly, RBV primarily explains the direct associations of GHRM with SEV and OR because environmentally oriented knowledge, skills, appraisals, and reward systems may strategically constitute relevant human resources. It also explains why GTA can function as a complementary resource, although this view does not fully explain how these technology resources are continuously reconfigured and jointly shaped. However, RBV perspectives alone may offer only a limited explanation of how firms renew, reconfigure, and coordinate their resources, especially when ecological and operational conditions might change [27].

Second, GDCV further complements RBV by positing that the mere possession of resources may not always be sufficient to achieve sustainability performance. Rather, firms may need to enhance their capability of renewing, adapting, and reconfiguring green capabilities purposively to respond to external environmental dynamics. Therefore, this view addresses RBV's dynamic limitation and explains how firms modify and mobilize their resources rather than merely possessing valuable resources. In general, GDCV views the capability logic of the CEC formulation through classical micro foundations of dynamic capabilities [27-29], emphasizing that firms would systematically sense circular economy challenges and opportunities, seize them, and transform them into capability routines to enhance adaptability and to address external environmental conditions.

In this context, CEC by GDCV would represent the firm's capability to sense circular opportunities, seize innovations, and reconfigure operations into closed-loop systems. CEC is positioned here as an operational manifestation of green dynamic capabilities within manufacturing firms in emerging economies [18,19,21]. This view primarily explains the association of CEC with SEV and OR because sensing, seizing, and transforming should enable firms to identify circular opportunities and reconfigure resources and operations. Nevertheless, the view does not fully explain why firms may achieve different performance outcomes from sensing, seizing, and transforming resources and capabilities, when coordination and deployment may vary across firms. Within the framework, SEV is treated as neither an independent strategic resource nor a capability nor a final organizational or environmental outcome. Rather, these practices would play a central mediating role [13], representing intermediate environmental implementation outcomes through which GHRM and CEC could interplay to translate into OR outcomes. Within the process, SEV would systematically capture the extent to which firms can achieve concrete environmental improvements, including energy conservation, renewable upgrades, waste reduction, environmental cost reduction, environmental competitiveness, and reputation [30,31]. Through SEV, sustainability and circular initiatives are

expected to become visible within firms' operations, subsequently contributing to adaptability building. Overall, the view supports the indirect association of SEV by treating environmental improvements as an intermediate manifestation of successfully integrated and developed capabilities.

ROT further strengthens the framework by explaining how firms' managers orchestrate green resources and dynamic capabilities to create sustainable value [32]. ROT view in this research uniquely explains why the possession of GHRM, CEC, and GTA may not produce equivalent outcomes and performance of the firms. Rather, this view emphasizes coordinated and conditional relationships in the model, especially considering SEV as a mediator and GTA as a moderator because environmental and resilience performance may depend on how managers structure, bundle, leverage, coordinate, and mobilize the resources and capabilities. This view may complement other perspectives by shifting attention from resource possession and capability configuration to managerial processes of restructuring. In the resilience-building process, GHRM, CEC, and GTA may remain fragmented if these are not effectively coordinated and operated within manufacturing firms. Accordingly, managers may need to structure, bundle, and operate them to improve environmental and sustainability performance [33].

In this resilience pathway, managerial orchestration would align employee behaviors with environmental and circular objectives, operationalize circular-oriented dynamic capabilities through sensing, seizing, and transforming, and leverage GTA to improve environmental performance and resilience. Through this orchestration, sustainability initiatives would become mutually reinforcing activities rather than being isolated ones at firms. The orchestration is especially vital, as prior studies often examine sustainable resources, circular practices, dynamic capabilities, and technology resources separately [13,14,34], thereby limiting insights into their combined contributions in resource-intensive manufacturing firms. However, GTA is assumed to serve as a boundary condition in the model, playing a key moderating role in the process. The research assumes that the impact of GHRM and CEC on OR may vary with the extent to which firms adopt clean technologies to enhance their environmental and resilience outcomes.

In the end, organizational resilience (OR) is conceptualized as a strategic outcome that reflects a firm's capability to face external disruptions, adapt to changing operational circumstances, respond to immediate adverse conditions, and maintain situational awareness. The research does not assume that OR is an automatic outcome of possessing valuable resources and circular-oriented capabilities; rather, it would emerge when these are implemented and orchestrated in both direct, indirect, and non-linear ways to enhance organizational resilience in firms. Accordingly, the full process cannot be explained from a single theoretical perspective; rather, the combination of RBV, GDCV, and ROT is needed to explain resource processes, adaptive configuration, and managerial coordination for better environmental and resilience performance.

Taken together, the proposed theoretical integration accounts for OR through mediated and moderated sustainability mechanisms. The integration has moved beyond prior literature that dominantly examine these constructs on environmental performance and resilience separately. GHRM and CEC are positioned as two primary antecedents, influencing OR both directly and indirectly. Their indirect influence is mediated mainly through SEV, which serves as a mediator between them and organizational resilience. Whereas GTA operates as a moderating factor, determining the strength of the direct relationships between antecedents and OR. Therefore, the model explains not only whether GHRM and CEC enhance OR, but also the process by which OR happens, and GTA as a condition under which their influences either become stronger or weaker.

2.2 Hypothesis Development

2.2.1 Direct relationships

GHRM is widely discussed in the current literature as an important mechanism for creating sustainability values in firms' systems. Much of the empirical evidence in the GHRM literature suggests that integrating green human resources may positively enhance firms' environmental values in HR systems [13,14,34]. Besides, they may depend on contextual reality and implementation variations. However, much of the current literature emphasizes GHRM benefits without sufficiently distinguishing substantive implementation from symbolic orientation. At the same time, existing studies, especially those emphasizing RBV, suggest that GHRM constitutes firms' valuable human capital resources, embedded in recruitment, training, and performance and rewards systems practices [17,25]. Although these resources can shape employees' environmental behaviors, their effectiveness may depend on the extent to which firms internationalize them as organizational routines rather than merely adopt them symbolically. The distinction is theoretically vital because formal GHRM practices may even exist at firms without generating environmental improvement due to a lack of operationalization. Besides, symbolic and compliance-driven sustainability orientation at firms may increase administrative formality, rather than proportionally increasing equivalent operational and environmental improvements [13]. Extending this logic, GDCV suggests that GHRM may serve as a mechanism that facilitates a firm's learning and adaptive behavior, especially under environmental uncertainty [35]. Specifically, firms may translate their environmental intentions into more consistent sustainable operations. However, in the context of Bangladesh, sustainability alignment is widely reported as compliance-driven [36]. Besides, implementation may vary between firms due to firms' divergent implementation challenges. Amidst these constraints, GHRM can positively enhance SEV if effectively institutionalized at firms.

At the same time, GHRM is expected not only to facilitate SEV but also to improve resilience outcomes at manufacturing firms [37-39]. Nevertheless, prior empirical studies offer limited explanation of whether resilience effects emerge from possessing valuable resources, consistent adaptation, and managerial coordination. However, the context firms are widely reported to be subject to frequent external changes, compliance pressure, and buyer-driven sustainability pressure [40]. Under these circumstances, GHRM may act as an internal behavioral governance mechanism, aligning with stability and adaptability-building objectives within human resources [15]. These sustainability resources can facilitate organizational learning, coordination, and responsiveness, especially during times of uncertainty. Empirical studies also position GHRM as contributing to strengthening employees' sustainability awareness and capability to respond to changing contexts [41-43]. However, GDCV literature suggests that GHRM's performance may depend on whether these resources are dynamically operated through sensing, seizing, and transforming, facilitating adaptability building within the process [44,45]. Besides, existing literature suggests that resilience performance can depend on how effectively managers structure and leverage green human resources to coordinate sustainability actions rather than treating them as isolated resources [41], [46]. Accordingly, GHRM is significant in the Bangladesh context and may contribute to sustainable environmental performance and facilitate the improvement of resilience if internally coordinated, orchestrated, and linked with better adaptive capability building among the workforce.

H1: GHRM significantly influences SEV;
H2: GHRM significantly influences OR.

In recent literature, CEC is being conceptualized within GDCV, rooted in sensing, seizing, and transformation logic rather than operational routines [20,29,47]. This conceptualization of CEC addresses weaknesses in prior studies that treat CE practices and activities as isolated, without requiring organizational capabilities of resource identification, reconfiguration, and adaptation for resilience building [28,48]. Based on GDCV, these capabilities are not isolated operational activities, but rather dynamic capabilities, embedded in the organizational learning environment. In the current literature, a stream of recent studies supports that circular economy practices, including eliminating waste, keeping products in use, and regenerating natural systems, can be rooted in sensing, seizing, and transforming capabilities to enhance not only circularity or environmental performance but also to ensure adaptability at firms [21]. In this capability logic, manufacturing firms identify circular opportunities through dynamic sensing, seize them, mobilize resources, secure stakeholder commitment to actualize the circular loop, and continuously adapt operational routines through transformation. Prior empirical literature suggests that circular principles can positively influence environmental outcomes, including resource efficiency, operational efficiency, and materials intensity reduction [49,50]. However, capability-performance gaps can persist, especially in an emerging-economy context, due to institutional constraints, limited absorptive capacity, technological infrastructural burden, and symbolic representation. Besides, a body of prior literature suggests that CE implementation may require managerial orchestration, resource allocation, and technological support to achieve better environmental outcomes [51]. Therefore, CEC may be necessary for environmental adaptation, and its performance may depend on complementary resource orchestration and managerial contribution. Nevertheless, as circular practices are operationalized as dynamic capabilities, this research assumes that CEC positively influences SEV.

At the same time, the relationship between dynamic capabilities and organizational resilience remains theoretically contested within contemporary literature. Based on GDCV, continuous reconfiguration may strengthen adaptability; however, based on ROT, the same capabilities may fail to improve OR when managers cannot align them with sufficient resources. One theoretical strand demonstrates that adaptive configuration may directly strengthen firm resilience performance, whereas a competing position in the current literature also argues that this direct influence may sufficiently depend on managerial coordination of resources and capabilities [33]. One segment grounded in GDCV argues that firms with stronger sensing, seizing, and transforming capabilities can respond more effectively to environmental challenges. This is because dynamic capabilities enable continuous reconfiguration of resources and continuous adaptation to the firm's environment. In this sense, these abilities should translate into OR through better responsiveness and structural adaptability. However, an opposing view suggests that these capabilities may not automatically generate resilience performance; rather, performance depends on how managers effectively structure, bundle, and leverage these capabilities through managerial actions [52,53]. This dependency is particularly evident in resource-intensive manufacturing firms of Bangladesh, where fragmented implementation and uneven managerial execution may hamper the transition. However, integrating these contrasting views, CEC are conceptualized not as direct guarantees of resilience, but rather as dynamic operational mechanisms that can be vital in facilitating the transition to resilience-building at firms. However, the unresolved debate may suggest that the possession or the development of capabilities should not be treated as equivalent explanations for OR. Although the contribution remains dependent on resource orchestration and contextual challenges, this research assumes that the operation of circular-oriented dynamic capabilities is significant for Bangladeshi manufacturing firms in supporting their resilience-building.

H3: CEC significantly influences SEV;

H4: CEC significantly influences OR.

The relationship between SEV and OR has been consistently investigated within existing literature. One key segment of the current empirical literature generally suggests that firms with higher levels of environmental performance may exhibit greater resilience [54]. This is because high environmental performance can reflect a firm has improved operational efficiency and flexibility, reduced resource dependence, and strengthened internal capabilities that are better aligned with environmental regulation. Accordingly, the efficiency mechanism may predict a positive association because low dependency on resources and strengthened internal capabilities can support firms' resilience, whereas the organizational rigidity mechanism may point towards a negative association when operational flexibility is constrained in the short term due to resource allocation pressure and operational standardization [30,57]. Although the efficiency-based explanation may hold a dominant position in the literature [54,55], these gains could often ignore resource mobilization and coordination [32,33]. At the same time, several prior studies argue that environmental performance may not always translate into enhanced resilience, or this performance may not always reflect improved adaptability [30,46,56]. While green environmental performance may indicate efficiency gains and success with environmental regulations, firms can reduce their operational flexibility by allocating resources towards sustainability alignment. In such situations, firms can tradeoff between environmental gains and adaptive responses, especially when they witness resource scarcity and operational volatility [57,58]. These trade-off perspectives may predict that environmental performance can constrain resilience when compliance requirements may reduce short-term operational discretion. This reality should be acknowledged, as trade-off perspectives may also indicate operational rigidity stemming from resource-allocation pressures and operational standardization. Moreover, existing literature suggests that the effect of SEV may also depend on the extent to which managers embed and sustain these gains into firms' consistent decision-making and operational processes [28,48]. However, existing literature does not sufficiently reconcile efficiency and rigidity mechanisms, especially in resource-intensive manufacturing environments. In this context, SEV is assumed vital for Bangladeshi manufacturing firms and can be associated with firms' resilience output. However, the direction of the relationships can be explained through either improving operational flexibility or increasing operational rigidity. Given the contextual reality that firms may require resources, standardization, and coordination, this research expects that the outcome could be associated with operational rigidity or reduced resilience performance.

H5: SEV may negatively associate with OR.

2.2.2 Mediating influences

Existing literature offers a vital theoretical debate on how resources and dynamic capabilities translate into a firm-level organizational resilience outcome. Previous literature commonly establishes direct associations between sustainability resources and firms' outcomes, but provides less evidence of their mediating associations, especially in a resource-intensive manufacturing context. The literature, especially grounded in GDCV, argues that the operations of circular-oriented dynamic capabilities may directly influence performance outcomes through creating circular dynamic operational routines [21,28,29]. However, existing studies also suggest that these capability streams could be indirect, requiring immediate operational improvements before translating into higher-order firm outcomes. However, the distinction is vital because possessing resources or building dynamic capabilities does not automatically convert into observable environmental improvements.

Although GDCV suggests that sensing, seizing, and transforming can enhance adaptability, they may not directly produce ultimate resilience outcomes without first generating observable operational manifestations of a firm's outcome, such as environmental performance [27,59]. In the process, SEV reflects environmental and circular improvements that are successfully embedded and translated into the systems. The visible success may reflect environmental improvements such as energy efficiency, resource optimization, and other environmental gains. However, ROT emphasizes that even if firms possess strong circular-driven dynamic capabilities, the impacts can be incomplete unless these capabilities are effectively structured, bundled, and leveraged into measurable performance outcomes [33,60]. It implies that SEV may function as a critical conversion mechanism through which resources and capabilities are operationalized in actual environmental values. Integrating these perspectives, SEV has been conceptualized as a mediator that can be significant in transmitting the actual sustainability values from GHRM and CEC towards OR.

H6a: SEV significantly mediates the relationship between CEC and OR;
H6b: SEV significantly mediates the relationship between GHRM and OR.

2.2.3 Moderating Influences

Prior literature widely emphasizes that the effectiveness of resources and dynamic capabilities in influencing sustainable environmental and organizational performance may depend on the firms' technology infrastructure. However, prior literature often emphasizes the technology determinant of environmental performance rather than as complementary resources [33,53]. GDCV views suggest that even circular-oriented capabilities are operationalized through sensing, seizing, and transforming; this operation may not effectively enhance firms' resilience performance in the absence of technological conditions [28,53,61]. From an RBV perspective, GTA represents the adopted technology resources that facilitate technology-enabled process and production efficiency, and environmental monitoring [62,63]. From this view, GTA are strategically valuable, while GDCV explains their operationalization through sensing, seizing, and transformation. The integrated resources are vital for GHRM and CEC to enable technology-equipped environmental and operational performance. Empirical and case-based studies suggest that even firms with well-developed sustainability, HRM, and circular capabilities may fail in the absence of advanced digital and technology resources [64,65]. However, the literature, especially from ROT perspectives, emphasizes that firms' sustainable performance depends on how managers restructure, bundle, and leverage technological resources into coordination, operation, and implementation. Besides, effectiveness would depend on how technology resources are integrated within managerial decisions. ROT perspectives further indicate that technology may create value when managers combine and operate them, integrating with competencies, circular routines, and operational priorities. In particular, technology-adopted flexibilities may not support the adaptability-building from sustainable HR resources and CE-enabled dynamic capabilities if managers do not orchestrate these technology resources into operation. Taken together, technology integration can moderate the process if effectively adopted and orchestrated within manufacturing firms' environment. As this research measures GTA as adopted technologies, it assumes that these technologies would significantly moderate or influence dynamic capabilities and resources to positively facilitate a sustainable environment and resilience outcomes at Bangladeshi firms, especially when supported by managerial orchestrations.

H7a: GTA significantly moderates the relationship between CEC and OR;

H7b: GTA significantly moderates the relationship between GHRM and OR.

Figure 1 presents the proposed conceptual overview of the relationships in this study. Drawing on the RBV, GDCV, and ROT perspectives, this study explores how green human resource management and circular economy capabilities interact in Bangladeshi manufacturing firms to enhance SEV and OR.

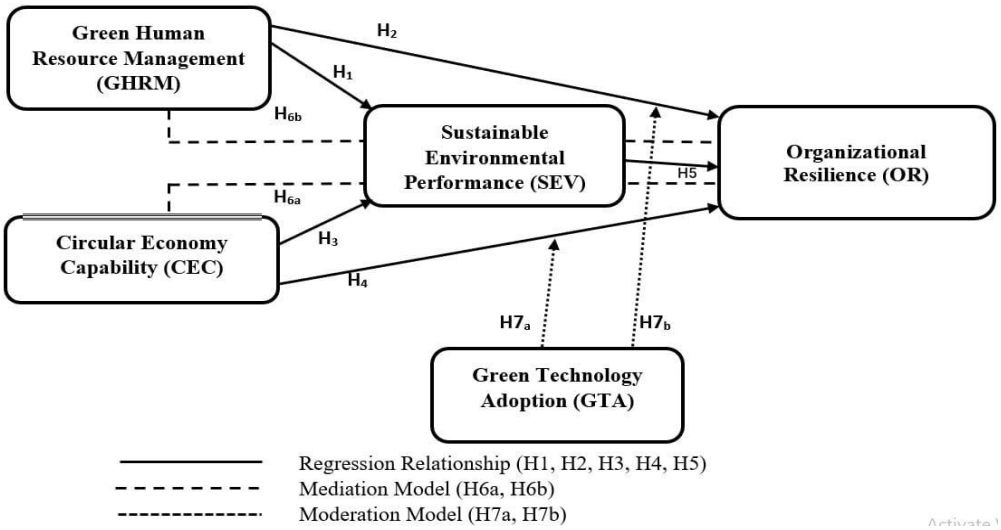


Fig. 1. Conceptual framework

3. Research Methodology

3.1 Sampling, Participants, Procedures, and Data Collection

Manufacturing firms operate within rapidly changing environmental and external conditions, where it is necessary to survive and perform consistently. In Bangladeshi manufacturing firms, these external dynamic conditions are more prevalent because firms operate within resource-intensive conditions [66]. Besides, firms face challenges in adapting to external changes due to the limited internal flexibility and adaptability within operations management [3]. Accordingly, the context offers an appropriate basis for examining how managers would configure resources and circular-driven dynamic capabilities to enhance environmental performance and resilience at firms. The study collects data from major manufacturing firms in different cities of Bangladesh. These cities include Dhaka, Gazipur, Narayanganj, and Savar. The research focuses on sampling major export-oriented manufacturing firms in the ready-made garments, textiles, and leather sectors that are required to meet the sustainability requirements of international buyers and regulatory bodies [67], [68]. These sectors also frequently face both resource constraints and rapid external environmental changes, requiring them to build adaptability within internal processes and enhance environmental performance.

The study uses a survey method, constructing structured questionnaires. The questionnaires were developed using validated measurement scales for each construct, especially following prior literature. These questionnaires were reviewed by two university professors and firm professionals, who carefully made them relevant and tailored to the study subject matter. In the sample, the researchers used a purposive sampling technique to select potential participants for the survey.

Sample size adequacy was determined using 2 approaches to cross-check for appropriate representation: statistical power analysis via G*Power [69], and the 10-times rule in PLS-SEM [70]. All approaches suggest around 200 samples are adequate; the current study was conducted with 300

samples, which is well ahead of these thresholds. It purposively selects full-time professionals who have sufficient knowledge of sustainability, circular economy practices, resources, capabilities, and firms' performance. As higher-ranked professionals, including senior executives, managers, directors, and CEO who offer the best insights into a firm's policies and performance, the study selects them purposively to generate better responses from the survey. The preference was appropriate because the research required knowledgeable respondents who have direct familiarity with firm-level sustainability and circular-oriented practices, technology adoption, and environmental performance. Each participant represents a manufacturing enterprise, and participants were considered at the firm level in the investigations. Top-level professionals were chosen as key informants because they hold sufficient expertise in firm-level policies, processes, and performance-oriented observations. Besides, it prefers higher levels of education and a reasonable monthly income of the participants to remain consistent with the selection. A total of 300 participants were recruited from 346 participants from Bangladeshi manufacturing firms. Data were collected between August and November 2025. The study does not use random sampling because lower-level professionals and workers do not inherently possess much information regarding firms' sustainability practices. To improve sample coverage, respondents were selected from the sectors based on industrial location, geographical intensity, and managerial orientation; however, the sample should not be interpreted as representing the entire population, as probability sampling was not achieved. After collecting the data, the study carefully screened the information by excluding several insufficient and non-targeted responses. After careful screening, the research employs PLS-SEM and fsQCA based on the screened responses. Other demographic information is shown in Table 1. It shows how different groups are presented in the study data. All the respondents were well informed regarding the aspects of the questionnaire contents; in most cases, they were briefed a bit before responding. Table 1 reports the participants' information.

Table 1
Demographic information

Particulars	Variables	Frequency	Percent
Gender	Male	219	73.0
	Female	81	27.0
Age	20-30	14	4.67
	31-40	83	27.67
	41-50	156	52.0
	Above 51+	47	15.67
Level of education	Bachelor Degree	76	25.33
	Master's Degree	219	73.0
	PhD or above	5	1.67
Position	Manager	177	59.0
	Senior Manager	96	32.0
	Director	24	8.0
	Chairman or CEO	03	1.0
Experience (in years)	< 5 years	119	39.7
	5–10 years	106	35.3
	11–15 years	39	13.0
	> 15 years	36	12.0
Participant's manufacturing industry	RMG	181	60.33
	Textiles	97	32.33
	Leather	22	7.33

3.2 Measures

The study used the Likert scale to measure the proposed relationships among exogenous variables, thereby achieving a particular outcome. The study used 22 items to measure five variables, including CEC, GHRM, SEV, GTA, and OR. The dependent variables entail six items, including SC disruptions, responsiveness, awareness, business planning, and operations [71]. The CEC contains four items, including eliminating waste, keeping products in use, and regenerating natural systems [72,73]. GHRM included four items, for instance, green training, management, appraisals, and rewards [42]. SEV defines five items, including energy usage, management, renewable materials, overall costs, marketplace, and reputation of the organization [74]. GTA includes three items, for instance, manufacturing and operational processes, improvement of products or services, and recycling practices [75,76].

3.3 Analytical Approach
3.3.1 PLS-SEM method

That particular study employed PLS-SEM to analyze the proposed research framework, as it is most effective for examining the dynamic, complex, and multidimensional relationships among the latent constructs [77]. As a variance-based analytical model, PLS-SEM tests the theory and model fit by explaining the direct and indirect prediction effects of variables [59]. That particular method offers principal component analysis, path modelling, and regression techniques to estimate direct and indirect causal relationships among variables simultaneously. For that particular study, the main objective is to test the predictive power, not theory validation.

In the PLS-SEM method, measurement and structural models are analyzed to validate the framework, as well as to predict the regression relationship among the variables. The measurement model uses a few metrics to validate the predictive ability of the research framework, such as AVE (Average Variance Extracted) for convergent validity, and the HTMT (Heterotrait-Monotrait ratio of correlations) & FLC (Fornell-Larcker criterion) for discriminant validity [78]. Also assess the internal consistency reliability through Cronbach's Alpha and factor loading for indicator reliability [79]. Following [80,81], predictive performance is evaluated by RMSE (Root Mean Square Error) and MAE (Mean Absolute Error) generated through PLS-Predict. For measuring the structural model, PLS-Predict (Q2), the coefficient of determination (R^2), and Hypothesis testing are commonly used models [80]. To leverage these benefits, the current study uses SmartPLS 4 for PLS path modelling. So, the analysis began with an evaluation of the measurement model, followed by an assessment of the structural model. First, we assessed the reliability and validity of the measurement model, then proceeded to the structural model assessment.

3.3.2 fsQCA method

The fsQCA is an analytical configurational approach that combines fuzzy set theory and Boolean algebra, complementing the PLS-SEM by identifying sufficient combinations of conditions that jointly lead to the same outcome. It asserts that multiple pathways may produce similar outputs in business and management research. The fsQCA offers an alternative to conventional analytical methods [82]. While PLS estimates net regression effects, fsQCA reveals causal complexity by identifying different configurations of antecedents that are necessary to generate a given outcome [82,83]. That means fsQCA provides close insights into how causal conditions interact rather than operate independently [84]. The fsQCA helps to predict high or low levels of outcome based on necessary conditions [85]. In

fsQCA, data are transformed into fuzzy-set membership sets, commonly known as intermediate, complex, and parsimonious solutions, which are used to assess the sufficiency and necessity of causal conditions using consistency and coverage measures [86]. Each of the solutions produced from fuzzy sets creates multiple combinations, which allows a decision maker to think with various combinations to achieve the same outcomes [83]. It also asserts two sorts of combinations: core and peripheral conditions, where core conditions explain a better and more consistent contribution to the outcome and peripheral conditions tell the opposite [87,88]. It is noted that both types of combinations are required to reach an optimal outcome. In fsQCA, the first step is to calibrate the variables, which leads to fuzzy sets. Overall, fsQCA identifies meaningful combinations that cannot be traced plainly through using variable-centered approaches.

3.3.3 Combined methods

In the study, PLS-SEM and fsQCA are used simultaneously, as PLS-SEM only determines linear (symmetric) relationships and net effects among variables [89], thereby limiting its ability to capture complex, latent causal relationship structures and asymmetric relationships. To address that limitation, fsQCA is applied to uncover multiple causal configurations that may lead to the desired outcomes [83]. While PLS-SEM evaluates the independent contribution of predictors [90], fsQCA employs a configurational approach that stresses conjunctional causation and asymmetry [82], [83]. As a fuzzy-set approach, fsQCA integrates quantitative and qualitative perspectives where researchers can investigate different pathways to the same output [91-93]. FsQCA has been increasingly growing in applicability in organizational and sustainability studies for its ability to reveal the alternative routes and configurations in achieving the optimal outputs [87,88]. It is particular valuable approach in green manufacturing research as it suggests that firms may reach to different but equally effective configurations toward organizational sustainability and resilience. Overall, this combined methodological approach allows the study to evaluate both linear and non-linear relationships while preserving the strengths of both approaches [82].

4. Data Analysis and Results

4.1 PLS-SEM Results

To proceed with SEM analysis, a validated and reliable model is required as a prerequisite. Therefore, the study used composite reliability (CR) and Cronbach's Alpha (CA) to test the model's internal consistency. Convergent validity has been examined using AVE, cross-loading, and items' significance, while discriminant validity has been tested using FL criteria and HTMT ratio with reference to [94].

4.1.1 Measurement model

The study measured the reliability and validity of the research constructs. The research model's quality largely depends on the factor loadings of each item. The basic cut-off value of the observed item's factor loading is 0.7 [95]. According to Table 2, all items are well above the reliability threshold. The value of Composite reliability (CR) of each variable is 0.7 [96]. Some researchers suggested the CR value should range between 0.7 and 0.9. This research reported all the variables' CR values as 0.9, which indicated high reliability. From Table 2, we can see the scores of Cronbach's alphas (CA), which also indicate high reliability, as [97] suggested; CA should be greater than 0.7. Similarly, as per the suggestion of [98], the values for average variance extracted (AVE) should surpass the cutoff score of

0.5. All the scores for the AVE of all constructs have exceeded the 0.5 benchmark. These prerequisites (Table 2) indicate that the research framework meets the requirements for reliability and convergent validity.

Table 2
Construct reliability and convergent validity results

Likert scale constructs	Factor loading	Cronbach's Alpha (CA)	Composite reliability (CR)	Average variance extracted (AVE)
Circular Economy Capabilities (CEC)		0.832	0.899	0.748
CEC 2	0.861			
CEC 3	0.887			
CEC 4	0.846			
Green Human Resource Management (GHRM)		0.953	0.966	0.877
GHRM 1	0.908			
GHRM 2	0.954			
GHRM 3	0.943			
GHRM 4	0.941			
Green Technology Adoption (GTA)		0.952	0.968	0.911
GTA 1	0.960			
GTA 2	0.949			
GTA 3	0.955			
Sustainable Environmental Performance (SEV)		0.975	0.98	0.908
SEV 1	0.957			
SEV 2	0.930			
SEV 3	0.958			
SEV 4	0.959			
SEV 5	0.961			
Organizational Resilience (OR)		0.957	0.966	0.824
OR 1	0.908			
OR 2	0.885			
OR 3	0.931			
OR 4	0.932			
OR 5	0.894			
OR 6	0.898			

Discriminant validity, on the other hand, is tested using FLC and the HTMT [99]. From Table 3, we can confirm that the FL scores meet the thresholds for each construct regarding the validation criterion. The results of the FL criterion meet the threshold value of all constructs, as each latent variable's AVE (square root) is greater than the maximum coefficient of any other variable, except for the negative linkage for GHRM -> SEV [98]. Furthermore, HTMT results show that each construct's value was below the 0.85 threshold, except for the linkage between GHRM and SEV [99]. The high correlation between SEV and GHRM is theoretically significant because GHRM and SEV are generally regarded in the context of sustainability-centered observations. GHRM presents firm-level strategies and practices designed to cultivate professionals' environmental consciousness, green knowledge and skills, and contributions to green initiatives. Thus, a strong linkage between SEV and GHRM is predicted since GHRM components are often expected to promote and shape professionals' environmental behaviour. On the other hand, the negative association may deliberate a potential enforcement gap between GHRM and SEV. In emerging firm domains, firms may employ GHRM practices initially as compliance-based measures without adequately supporting professionals with the training, resources, or empowerment needed to transform these methods into actual green

behaviors. As a result, highly constrained GHRM practices may sometimes be revealed by professionals as further firm requirements rather than favorable environmental practices, which may demotivate personnel's voluntary commitment in sustainable environmental activities. Therefore, after meeting the criteria of all validity and reliability measures, the proposed research model.

Table 3
Discriminant validity

HTMT values					
Construct	1	2	3	4	5
Circular Economy Capabilities (CEC)					
Green Human Resource Management (GHRM)	0.530				
Green Technology Adoption (GTA)	0.608	0.747			
Organizational Resilience (OR)	0.262	0.539	0.196		
Sustainable Environmental Performance (SEV)	0.574	0.919	0.691	0.510	
FL values					
Circular Economy Practices (CEP)	0.865				
Green Human Resource Management (GHRM)	-0.472	0.937			
Green Technology Adoption (GTA)	0.539	-0.716	0.954		
Organizational Resilience (OR)	0.233	0.516	-0.193	0.908	
Sustainable Environmental Performance (SEV)	0.518	-0.887	0.672	-0.493	0.953

4.1.2 Structural model

After clearing the measurement model, the structural model is subsequently reported. To do that, the path coefficient (β), the coefficient of endogenous variables (R^2), predictive relevance (Q^2), and p-values (significance) and t-values (significance) are considered (Table 4). As per the detailed results, all hypotheses are accepted except the moderation hypothesis.

Table 4
Hypotheses and path coefficients

Hypothesis	**Path**	**Beta (β)**	**T Statistics**	***P* values**	**Decision**	f^2
H1	Green Human Resource Management (GHRM) -> Sustainable Environmental Performance (SEV)	-0.827	32.634	0.000	Supported	2.653
H2	Green Human Resource Management (GHRM) -> Organizational Resilience (OR)	0.857	15.237	0.000	Supported	0.167
H3	Circular Economy Capabilities (CEC) -> Sustainable Environmental Performance (SEV)	0.128	3.98	0.000	Supported	0.063
H4	Circular Economy Capabilities (CEC) -> Organizational Resilience (OR)	0.319	4.162	0.000	Supported	0.167
H5	Sustainable Environmental Performance (SEV) -> Organizational Resilience (OR)	-0.389	4.109	0.000	Supported	0.093

Table 4 shows that the GHRM has a negative and statistically significant association with SEV (β=-.827, t=32.635, p=.000). In contrast, GHRM has a statistically significant association with OR (β=.857, t=15.237, p=.000), supporting H2. Likewise, all other hypotheses that are direct relationship directional have been accepted, as the values of each criterion prove the relationship between CEC and SEV (b=.128, t=3.98, p=.000), CEC and OR (β=.319, t=4.162, p=.000), SEV and OR (β=-.389, t=4.109, p=.000), meaning that H2, H3, H4, and H5 are accepted. This finding aligns with the existing literature, which views green dynamic capabilities as critical antecedents of green innovation.

Furthermore, the research model has mediation (H6a and H6b) and moderation directions (H7a and H7b). Additionally, f^2 scores ranged from 0.063 to 2.653, showing small (0.063, 0.093), medium

(0.167, 0.167), and very small (2.653) effect sizes. At the end of the results, the predictors significantly influence the model. GHRM is exhibiting a strong impact on the endogenous variable

In Table 5, Hypothesis H6a results (β=-0.05, t=3.031, p=.003) indicate that Sustainable Environmental Performance mediates the relationship between Circular Economic practices and Organizational Resilience. Likewise, hypothesis H6b results assert that Sustainable Environmental Performance also mediates (β=0.322, t=3.9, p=.000) the relationship between Green Human Resource Management and Organizational Resilience.

Table 5
Results for mediating effects

Indirect effects	Path	Beta/ OS (β)	T Statistics	*P* values	Decision
H6a	Circular Economy Capabilities (CEC) -> Sustainable Environmental Performance (SEV) -> Organizational Resilience (OR)	-0.05	3.031	0.003	Supported
H6b	Green Human Resource Management (GHRM) -> Sustainable Environmental Performance (SEV) -> Organizational Resilience (OR)	0.322	3.9	0.000	Supported

Table 6 shows the results of the moderating effects, where hypotheses H7a and H7b were formed after reviewing the literature. As per the results, Green Technology Adoption (GTA) moderates (β=0.322, t=5.51, p=.000) the relationship between Circular Economy Capabilities (CEC) and Organizational Resilience (OR), meaning that H7a is accepted. The key objective of this hypothesis is to determine the degree of effect of the GTA, which may lead to new development. Interestingly, Green Technology Adoption does not moderate the relationship between Green Human Resource Management (GHRM) and Organizational Resilience (OR), as per the results of H7b (β=0.062, t=1.051, p=.294). Table 6 also shows the f^2 value. f^2 is the effect size, which indicates how much a predictor (moderator in that case) influences the dependent construct. According to Cohen's guidelines, the moderation path indicated in H7a showed a moderate impact (f^2=0.227), supporting the presence of moderation. However, the second moderation expressed in H7b, representing a very weak effect size (f^2=0.006), falling below the cut-off value of 0.02, eventually asserts the absence of a meaningful moderating influence.

Table 6
Results for moderating effects

Indirect effects	Path	Beta/ OS (β)	T Statistics	*P* values	Decision	f^2
H7a	Green Technology Adoption (GTA) x Circular Economy Capabilities (CEC) -> Organizational Resilience (OR)	0.322	5.51	0.000	Supported	0.227
H7b	Green Technology Adoption (GTA) x Green Human Resource Management (GHRM) -> Organizational Resilience (OR)	0.062	1.051	0.294	Not Supported	0.006

Table 7 demonstrates sufficient explanatory power, as the results clearly stand for both of the endogenous constructs, with Organizational Resilience (R^2=0.684; Adjusted R^2=0.677) and Sustainable Environmental Performance (R^2=0.80; Adjusted R^2=0.798)**.** In addition to that, the positive Q^2 predict values (0.623 and 0.797, respectively) show the strong predictive relevance. RMSE and MAE values further assure the model's fit and predictive accuracy.

Table 7
Values for Stone-Geisser's Q^2, adjusted R-squared, and PLS-predict

Construct	R^2	R^2 Adjusted	Q^2 Predict	RMSE	MAE
Organizational Resilience (OR)	0.684	0.677	0.623	0.619	0.483
Sustainable Environmental Performance (SEV)	0.800	0.798	0.797	0.452	0.33

4.2 Fuzzy Set Qualitative Comparative Analysis

The fsQCA is used as a complementary approach to PLS-SEM findings. It mainly concentrates on exploring complex non-linear and asymmetric relationships among variables in a multi-dimensional model, leading to specific results. The fsQCA based on fuzzy set theory and Boolean algebra, examines the causal complexity of relationships and determines combinations of multiple pathways generating similar consequences, rather than focusing on individual effects of each variable [84]. Similarly, it reveals the necessary and sufficient conditions most effective for high output [89]. The fsQCA approach also enables this study to examine how multiple combinations of CEC, GHRM, GTA, and SEP contribute towards higher OR. In the first phase, fsQCA 4.0 software calibrates the raw dataset to identify different solutions resulting in the desired output, and then uncovers the necessary conditions for equifinality.

4.2.1 Calibration

In the calibration process, the raw data set used in PLS-SEM on a Likert scale is converted into fuzzy sets. Considering [87] recommendations, this process calibrates the data using fuzzy set scores from 0 to 1, indicating 0 as no-membership, 0.5 as crossover point, and 1 as full-membership. As a common and convenient calibration method, the study employed the direct calibration approach in the conversion of the raw dataset into fuzzy sets. The indirect calibration approach is neglected due to its transparency limitation in the context applied to choose fuzzy sets. Moreover, the possibility of its bias in recognizing the best solution to the expected outcome [83]. Thus, the study employed the recommended calibration scale [100]. The percentiles (95%, 50%, and 5%) were considered as cutoff values to form divisions in each condition and outcome. In calibrating the results, fuzzy membership scale 95% (full membership), 50% (crossover), and 5% (non-membership) were set to 4.250, 4.000, and 2.000 values, respectively. Accordingly, the constructs show the following results in Table 8: CEC (4.000, 2.750, 2.000), GHRM (5.000, 4.000, 1.750), GTA (5.000, 2.333, 1.000), OR (4.833, 4.333, 1.667), and SEV (5.000, 2.200, 1.800). Furthermore, a pilot study was also directed with alternative fuzzy sets (90%, 50%, and 5%) to compare the calibration results and justify the suitability of preferable fuzzy sets (95%, 50%, 5%). The pilot study and comparison validate the 95%, 50%, and 5% fuzzy sets as the most appropriate in detecting best configurations in this study. Table 8 highlights the fuzzy set calibration and statistical findings.

Table 8
Calibrations and descriptive statistics

Configurational Constructs	Fuzzy Set Calibration							
	Fully-in (95%)	Cross-over (50%)	Fully-out (5%)	Mean	SD	Min	Max	N Cases
Circular Economy Capabilities (CEC)	4.000	2.750	2.000	0.540	0.305	1.000	5.000	300
Green HRM (GHRM)	5.000	4.000	1.750	0.519	0.360	1.000	5.000	300
Green Technology Adoption (GTA)	5.000	2.333	1.000	0.459	0.304	1.000	5.000	300
Organizational Resilience (OR)	4.833	4.333	1.667	0.471	0.297	1.000	5.000	300
Sustainable Environmental Performance (SEV)	5.000	2.200	1.800	0.505	0.374	1.000	5.000	300

4.2.2 Necessary Conditions Analysis

Necessary condition analysis (NCA) is essential to determine if any independent construct is crucial for high or low levels of outcome [101]. In fsQCA, consistency and coverage are two vital metrics in assessing the necessary and sufficient conditions. Consistency refers to the degree of consistency between conditions and outcomes, indicating how consistent the configurations and the outcome are. High consistency finds the conditions 'almost always present' with the outcome, while low consistency shows a sufficient condition related to the outcome [91]. The considerable consistency values for necessary conditions are 0.90 [102]. The acceptable cutoff values from 0.80 to 0.90 for consistency are also considered [102]. The interpretation of values is as follows: ≥ 0.90 (strong necessary condition), ≥ 0.80 (acceptable consistency), and < 0.80 (not considered a necessary condition [83,102]. On the other hand, the coverage indicates how many cases or conditions are related to the causal configuration. With high coverage, the condition is responsible for higher output and vice versa. The exceeding values from 0.75 and above for coverage indicate 'almost always necessary'. In NCA, high consistency with high coverage stands for the most reliable and necessary condition for the outcome; high consistency with low coverage indicates the necessary condition, but in a few cases, low consistency and high coverage indicate the condition is common but not reliable, leading to the results.

Findings (Table 9) illustrate that none of the causal configurations is a necessary condition for sustainable organizational resilience; rather, the multiple combinations of conditions account for the Sustainable Environmental Performance (SEP). The negated values of the constructs (<0.60) illustrate that the absence of these factors is not responsible for low sustainable performance, which aligns with the principle of fsQCA that the desired result is generated by the combinations of configurations, rather than the presence and absence effects of variables [102].

Table 9
Analysis of the necessary conditions

Configurational Constructs	High OR		~Low OR	
	Consistency	Coverage	Consistency	Coverage
Circular Economy Capabilities (CEC)	0.747	0.652	0.655	0.639
~ Circular Economy Practices (CEP)	0.587	0.603	0.644	0.740
Green Human Resource Management (GHRM)	0.733	0.666	0.576	0.586
~ Green Human Resource Management (GHRM)	0.544	0.534	0.671	0.738
Green Technology Adoption (GTA)	0.623	0.640	0.624	0.718
~ Green Technology Adoption (GTA)	0.725	0.633	0.687	0.671
Sustainable Environmental Performance (SEV)	0.534	0.499	0.687	0.718
~ Sustainable Environmental Performance (SEV)	0.699	0.666	0.520	0.555

4.2.3 Analysis of sufficient conditions

A sufficient condition analysis is scrutinized to find the existence of a particular condition as per [103] conventions. Table 10 and Table 11 report the configurational results for high and low levels of organizational resilience; the blank spaces indicate 'Do not care', while crosses specify absence (low levels), and black circles indicate presence (high levels). Here, the "core condition" is denoted by larger circles, and smaller circles stand for peripheral conditions [87]. Every configuration results in similar output to a specific extent and reflects the idea of multi-equifinal solutions of fsQCA. Raw coverage, unique coverage, and consistency are used for model evaluation. Both the raw and unique coverage with the cutoff value of 0.26 illustrate the extent of causal configuration essential for certain consequences [104]. The consistency shows the degree of reliability of configurations leading to the

desired outcome, and the coverage indicates the level of significance of conditions and outcome. The acceptable consistency values are from 0.80 to 0.90, though a score higher than 0.80 is appreciable [104]. The overall solution consistency shows the degree to which the organizational resilience could be achieved by the presented configurations. The raw coverage points to the share of the results covered by only a certain substitute solution, whereas the unique coverage shows the portion of results explained by a specific alternative solution. Appendix A and Appendix B present the Boolean expression for all high and not-high OR configurations. Appendix A shows the high OR configurations. The high OR configurations combine intermediate and parsimonious solutions to identify the core, peripheral, and negation conditions that achieve an outcome. Appendix B shows the not-high OR configurations. The Boolean expression shows the core and negation conditions to identify the not-high conditions to achieve low levels of OR.

Four distinct configurations, MH1 to MH4, with consistency values ranging from 0.809 to 0.874 (Table 10) above the threshold, confirm a high level of operational reliability [104]. Among solutions, MH2 reflects strong explanatory relevance with high consistency (0.874), while MH4 uncovers the lowest raw coverage (0.278), continuing with a considerable consistency level. Solution MH2 claims that CEC and GHRM are the two prominent constructs in attaining a high level of OR, while the existence of GTA is found but is less significant. The MH1 solution with the highest coverage (0.491) and second-highest satisfactory consistency values (0.873) also finds CEC significant towards high OR. Surprisingly, GHRM and GTA are found to be insignificant in predicting high OR. Interestingly, MH4, with the lowest coverage, remains robust with a good consistency (0.809) and claims that only SEP can be significant enough to result in high OR, even if other variables remain absent in the model. In contrast, MH3, with 87.2% consistency, finds that GHRM and GTA are crucial variables in predicting high OR in some cases (0.308 raw coverage). However, the overall solution coverage (0.645) indicates that four solutions hold different satisfactory configurational paths, and the overall solution consistency (0.827) validates the configurational reliability.

Table 10
Configurations for achieving high levels of OR

Configuration	**Solutions for a high level of OR**			
Configuration OR = f (CEC, SEV, GHRM, GTA)	Solutions			
	MH1	MH 2	MH3	MH4
Circular Economy Capabilities (CEC)	●	●		⊗
Green Human Resource Management (GHRM)		●	●	⊗
Green Technology Adoption (GTA)		●	●	⊗
Sustainable Environmental Performance (SEV)	⊗		⊗	●
Raw Coverage	0.491	0.424	0.308	0.278
Unique Coverage	0.049	0.024	0.024	0.061
Consistency	0.873	0.874	0.872	0.809
Overall Solution Coverage	0.645			
Overall Solution Consistency	0.827			

Note: Black Circles (●) indicate the presence of a condition, and a cross circle (⊗) indicates its absence. Large circles indicate core conditions; small ones indicate peripheral conditions. Blank spaces indicate "don't care".

The four equifinal configurational solutions in the negation of OR (Table 11) display consistency ranging from 0.779 to 0.828, indicating considerably reliable solutions, and solution coverage of 0.704, pointing out that the configurations hold a considerable portion of low OR. The overall solution consistency (71.4%) highlights the moderate but relatively weak solutions. Here, solution ML4, with the highest consistency (0.828), explains that the high level of GHRM and GTA, with the low level of CEC and SEP, are sufficient variables to predict the low level of OR. But it applies in only 19% of cases. In solution ML2, 63% of cases state high Sustainable Environmental Performance with a low level of

GHRM, resulting in a low OR. Nevertheless, its consistency (0.779) indicates low reliability for the solution. With the second-highest consistency score of 0.823, the solution ML3 finds CEC and SEP as responsible for low OR in 59.7% of cases, while other variables do not matter. Another solution, ML1, shows high performance of CEC with a low level of GHRM, having a share of low organizational resilience in 58.1% of cases, where the consistency value of 0.820 validates the reliability of the ML1 solution, listed in Table 11.

Table 11
Configurations for achieving low levels of OR

Configuration	**Solutions for a Low level of OR**			
Configuration ~OR = f (CEC, SEV, GHRM, GTA)	Solutions			
	ML1	ML2	ML3	ML4
Circular Economy Capabilities (CEC)	●		●	⊗
Green Human Resource Management (GHRM)	⊗	⊗		●
Green Technology Adoption (GTA)		●	●	⊗
Sustainable Environmental Performance (SEP)				
Raw Coverage	0.581	0.630	0.597	0.190
Unique Coverage	0.011	0.063	0.029	0.021
Consistency	0.820	0.779	0.823	0.828
Overall Solution Coverage	0.704			
Overall Solution Consistency	0.714			

Note: Black Circles (●) indicate the presence of a condition, and a cross circle (⊗) indicates its absence. Large circles indicate core conditions; small ones indicate peripheral conditions. Blank spaces indicate "don't care".

5. Discussions

5.1 Discussion on PLS-SEM Results

5.1.1 Direct relationships of PLS-SEM results

This discussion, based on the findings of PLS-SEM and fsQCA, carefully analyzes the results, providing explanations and valuable insights for the context. First, PLS-SEM provides vital findings to test hypothesized direct, mediating, and moderating relationships. Considering the direct relationships observed in Table 4, the GHRM -> SEV path with β=-827, T=32.634, and P=0.000 remains significant, supporting H1. Although the direct influence of GHRM on SEV remains statistically significant in the context, its directional sign is negative. However, the negative direct effects may reflect a misalignment of GHRM with actual environmental performance. One possible explanation for the direct negative relationship could be that manufacturers in emerging economies often integrate GHRM as a symbolic mechanism within firms rather than an operational tool to satisfy only buyers' requirements and certification requirements from environmental regulatory bodies [105]. For sustainability alignment, firms could have formalized operations that did not translate into actual improvement due to operational lags. The path of GHRM -> OR with β=0.857, T=15.237, and P=0.000 supports H2, suggesting that GHRM has a significant direct influence on OR in Bangladeshi manufacturing firms. In addition, the positive sign indicates that GHRM is positively associated with SEV, suggesting that practices such as green training, green skill development, and sustainable behavioral attachment through performance appraisal may strengthen improvements in employee coordination, adaptation, and sustainability behavioral alignment to address dynamic challenges. This result is consistent with findings for Indonesian manufacturing firms [105], where green recruitment, selection, and training were found to be more likely to have direct influences on adaptive capabilities and long-run resilience. The result is also consistent with findings for Italian manufacturing firms [37], where green training is positively associated with internal working climate

flexibility, thereby facilitating improvements in firms' resilience. The finding implies that GHRM functions as a strategic human capital-based mechanism to enhance organizational resilience at manufacturing firms in Bangladesh. However, the combined findings on two of the GHRM may suggest that while GHRM is negatively associated with SEV, it is positively associated with OR.

The path CEC->SEV with β=0.128, T=3.98, and P=0.000 supports H3, suggesting that circular-driven dynamic capabilities have a significant direct influence on SEV in Bangladeshi manufacturing firms. In addition, the positive sign of β indicates that these capabilities significantly improve SEV, suggesting that operationalizing circular capabilities through sensing, seizing, and transformation can achieve better environmental outcomes such as energy savings, reduced environmental costs, resource efficiency, and enhanced environmental performance or reputation. The result is consistent with Ghana in the research of [20], who examine circular economy capabilities in sensing, seizing, and reconfiguring, and find that this operationalization directly facilitates improvements in environmental performance, especially through sensing and seizing. The path of CEC -> OR with β=0.319, T=4.162, and P=0.000 strongly supports H4, suggesting that circular principles operating as dynamic capabilities have a significant direct and positive influence on OR in Bangladeshi manufacturing firms. It aligns with the foundational logic of dynamic capabilities [27], that dynamic capabilities enhance firms' adaptability through enabling them to sense, seize, and transform in response to environmental uncertainty. The finding aligns with research on South African manufacturing firms, as evidenced by [51], which finds that implementing circular economy practices improves firms' adaptability. However, the finding implies that CEC acts as a foundational dynamic capability, directly strengthening firms' resilience through improving adaptability, responsiveness, and transformation. The path of SEV -> OR with β=-0.389, T=4.109, P=0.000 supports H5, suggesting that SEV has a significant direct influence in the context. However, the negative β implies that it does not positively impact OR in Bangladeshi manufacturing firms. This negative association may reflect a tension with short-term resource allocation, in which investments in compliance alignment, environmental certification, monitoring, cleaner production, and reporting might otherwise support rapid operational responses, especially during disruption. The result may also suggest that firms achieving higher environmental performance, including energy efficiency, environmental cost reduction, and environmental reputation, may not translate into strong resilience in Bangladesh. Even higher SEV may trade off operational adaptability, with improved environmental outcomes achieved at the cost of short-term operational responsiveness due to the requirements of standardization and coordination [22,57]. Environmental improvements may also require standardized procedures and stages, along with managerial coordination to facilitate long-term sustainability development. These may also temporarily reduce operational response speeds, undermine managerial discretion, increase operational burdens, reduce flexibility, and increase firms' rigidity. This is also consistent with [106], which suggests that environmental governance imposes administrative and operational burdens, thereby reducing responsiveness and flexibility in Chinese manufacturing firms. Therefore, the negative output should not reflect that environmental performance is harmful; rather, the result should reflect that environmental gains are not fully integrated with operational responses, flexibility, and overall resilience.

5.1.2 Indirect relationships of PLS-SEM results

In the mediation effects, the path CEC -> SEV -> OR with β=-0.05, T=3.031, and P=0.003 supports H6a due to statistical significance. Although this mediation is statistically significant, it does not indicate a positive directional influence between the variables. This result suggests that although CEC has direct positive influences on OR, its direct influences, especially through SEV, are negative,

indicating reduced or trade-off effects earlier seen in the results for H5 (SEV has direct negative influences on OR). Possibly, firms here may have to trade off environmental gains through operational rigidity and inflexibility due to additional operational pressure in implementing dynamic capabilities and circular practices. A similar reason is shown in [107], where sustainability achievements and resource allocations create inflexible, rigid operations, especially due to additional operational pressure with circular implementation. At the same time, another mediating path of GHRM -> SEV -> OR with β=0.322, T=3.9, P=0.000 supports H6b, suggesting that GHRM has not only direct but also indirect significance in influencing OR in Bangladeshi manufacturing firms. This finding implies that GHRM is a key mechanism of transformation for resilience outcomes in the context. However, the mediation results suggest that while SEV does not generate positive mediation effects between CEC and OR, possibly due to sustainability trade-offs, it strongly generates a positive mediating influence between GHRM and OR, implying that these sustainability trade-offs may not hamper resilience performance, especially when GHRM focuses on operational flexibility and adaptability. This finding is another key for resource-intensive firms, suggesting that when these firms' environmental performance is facilitated by sustainable HRM, the system can generate resilience performance due to operational involvement to achieve flexibility. In contrast, these operational flexibilities may not be achieved through CEC to SEV, thereby generating a strong influence on resilience building (H6a).

In the moderation results in Table 5, the path of GTA x CEC -> OR with β=0.322, T=5.51, and P=0 strongly supports H7a, suggesting that GTA has a strong positive influence in moderating the relationship between CEC and OR in Bangladeshi manufacturing firms. This result indicates that the positive effects of CEC on OR strengthen as firms adopt more green technologies. In firms, sensing and transforming CE operations may not be sufficient; the operational infrastructure, like GTA, enables firms to convert dynamic capabilities into resilience outcomes. This result aligns with the proposition in [27], which asserted that dynamic capabilities generate superior firm outcomes when firms possess complementary assets, such as GTA, to strengthen the effectiveness of circular economy capabilities. This finding is consistent with manufacturing firms in Brazil in the research of [53], where the technology enabler acts as a key mechanism to influence circular-oriented dynamic capabilities to enhance firms' resilience. The path of GTA x GHRM -> OR with β=0.062, T=1.051, and P=0.294 does not support H7b, indicating that GTA does not significantly moderate the relationship between GHRM and OR. The finding suggests that the positive effect of GHRM on OR remains relatively stable regardless of the level of GTA's moderating influence. In Bangladeshi manufacturing firms, OR may primarily come from GHRM practices rather than technological support mechanisms.

5.2 Configurational Discussion of fsQCA Results

The study finds several configurations that lead to both high and low organizational resilience performance. Table 10 presents four high-OR configurations: MH1, MH2, MH3, and MH4. The first, MH1, with the highest raw coverage of 0.419, becomes the dominant and sufficient pathway when CEC is present, SEV is absent, and others are irrelevant. This configuration suggests that the majority of Bangladeshi firms achieve high OR through CEC even in the absence of SEV. This finding is interesting as it indicates that OR may stem from firms sensing, seizing, and transforming circular capabilities rather than achieving SEV.

In the MH2, with raw coverage of 0.424, CEC and GHRM are core conditions, and GTA is peripheral. This configuration suggests that a large number of firms in the samples achieve high resilience when GHRM is combined with CEC, with GTA playing a supporting role for this transition. This finding further points to a conditional pathway through combining circular capabilities and

human resources for managers who prioritize circularity, dynamic capabilities, and GHRM, especially when leadership and organizational resources support the sustainable transition. This finding is consistent with the industrial sectors of Brazil in the research of [53], where circular capabilities integrated into HRM are found to be fundamental for resilience, and technology has helped operationalize these capabilities. In MH3, with raw coverage of 0.308, GHRM and GTA are core conditions, and SEV is absent. This result suggests that firms that combine GHRM and GTA are sufficient to enhance OR even when SEV is absent. It reinforces the idea that achieving green environmental performance is not necessary when firms rely on the combination of people-oriented sustainability systems and technology resources. This result is consistent with Bangladeshi manufacturing firms in [55], who also argue that resilience may stem from the combination of several human capital capabilities and technological resources, but not from a single performance outcome. In MH4, with a comparatively smaller raw coverage of 0.278, CEC, GHRM, and GTA are absent, while the presence of SEV sufficiently leads firms to high resilience. This is one of the most surprising pathways, which indicates that firms achieve resilience through strong environmental performance despite a lack of circular-oriented dynamic capabilities, green HRM, and technology adoption. This finding demonstrates the logic of equifinality, which argues that multiple combinations can lead to the same outcome. The finding strongly supports the conclusion that SEV can independently contribute to resilience-building in the context.

The low configuration models additionally provide insights into what conditions absence can make the configuration lead to low organizational resilience. In the first ML1 model with raw coverage of 0.581, GHRM's absence from the configuration leads to low performance, even when CEC is present in the condition. This suggests that firms, even with high CEC, may not be able to ensure high performance due to the absence of a sustainable HRM infrastructure. This finding reinforces the view that GHRM is a key instrument in Bangladesh's resource-intensive manufacturing environment to facilitate the transition to organizational resilience. It typically refers to circular capabilities without employee support, which may not support resilience transitions in resource-intensive firms in Bangladesh. Similarly, ML2, with the most extensive raw coverage of 0.630, also indicates a similar understanding, showing that firms with SEV can still fail to generate high resilience due to the absence of GHRM. The higher raw coverage of ML2 reflects the nature of Bangladesh manufacturing firms, where the absence of sustainable human resources can prevent them from incorporating adaptability into their processes. This finding aligns perfectly with PLS-SEM, where SEV exhibits a negative relationship with OR. In ML3, CEC and SEV are present, yet the model still yields low performance, suggesting that firms possessing CEC can achieve green environmental performance but can still experience low OR. It suggests that green environmental performance from circular-oriented dynamic capabilities alone does not guarantee resilience in the absence of supporting mechanisms.

5.3 Combined Discussions using PLS-SEM and fsQCA Results

The findings from both PLS-SEM and fsQCA reveal converging and contrasting insights on the determinants of OR in the context of resource-intensive Bangladeshi manufacturing firms. Both methods consistently highlight the importance of CEC as a critical factor for resilience building. While PLS-SEM finds significant positive effects of CEC on organizational resilience, fsQCA further identifies CEC as a core condition in several high-resilience configurations. The consistency of the finding reinforces GDCV's logic that firms' ability to sense, seize, and transform sustainable and circular opportunities is fundamental to resilience-building, especially in a resource-intensive and highly volatile manufacturing environment. Similarly, GHRM appears to be a significant predictor of

organizational resilience in both PLS-SEM findings and in multiple high-resilience configurations. This finding further illustrates that GHRM remains vital in the process regardless of the analytical approach.

However, the combined applications of the two methods share contrasting findings, illustrating the roles of SEV. In the PLS-SEM findings, SEV is negatively related to OR, suggesting a potential trade-off between sustainable performance and operational adaptability in the resource-intensive manufacturing environment. While fsQCA offers a nuanced understanding by finding that some configurations, such as MH1 and MH3, lead to high organizational resilience without SEV, SEV is present in high OR configurations like MH4. This contrast suggests that SEV may not exert a uniform influence on resilience. While PLS-SEM identifies net effects in the process, fsQCA uncovers configurational complexity and resilience-building. Collectively, the findings provide stronger support for ROT by demonstrating that OR emerges not only from sustainable resources and circular-oriented dynamic capabilities, but also from their effective combination within organizational operations.

6. Implications

6.1 Theoretical Implications

This study has contributed in several ways to the sustainability and resilience literature on emerging-economy manufacturing firms. First, the research has extended RBV, GDCV, and ROT by explaining how resource-intensive manufacturing firms in Bangladesh contribute to organizational resilience. While prior literature examines resources and capabilities in isolation and their connection to organizational outcomes, this research integrates GHRM, CEC, SEV, and GTA within a unified framework. The findings have also confirmed that resilience in manufacturing firms is not shaped by integrating single and individual resources and dynamic capabilities. Still, it is shaped by conditional practices, deployed and combined to facilitate high resilience output.

Second, this study finds evidence from resource-intensive manufacturing firms from Bangladesh that circular economy capabilities, conceptualized within the core foundational principle of dynamic capabilities, including sensing, seizing, and transforming, are important drivers of organizational resilience. The evidential outcome supports that firms can strengthen organizational resilience, especially when they develop dynamic capabilities through environmental scanning, mobilizing responses, and reconfiguring operations, processes, and systems.

Third, the finding on SEV has challenged the conventional assumption that enhanced environmental outcomes will automatically lead to enhanced OR. In particular, the finding that SEV has a negative relationship with OR may suggest that environmental performance can be a sustainability trade-off in operational flexibility and may not universally contribute to resilience building in resource-intensive manufacturing firms of Bangladesh. This finding will extend the theoretical debates in the literature on environmental sustainability and resilience in manufacturing firms. Finally, the combined use of both methods contributes methodologically with vital findings in both net effects and combinations. While PLS-SEM estimates average relationships among circular-driven dynamic capabilities and firms' resources, fs-QCA finds multiple conditional pathways to the expected outcome. Specifically, the use of fsQCA supports equifinality and causal asymmetry to build organizational resilience.

6.2. Managerial Implications

For managers in resource-intensive manufacturing firms of Bangladesh, this research provides several valuable practical solutions. First, managers may prioritize developing and operationalizing

circular capabilities, as these capabilities have consistently emerged in this research as contributors to resilience building, supported by findings from both methods, including PLS-SEM and fsQCA. In action, managers can operationalize the capabilities by establishing a cross-functional team within the process of circular and resilience building. This team should work on identifying circular opportunities, evaluating the existing resources, and assigning responsibilities for firm-level implementation. Besides, managerial decisions should prioritize creating a positive feedback loop and coordinating the team's actions by integrating them into firm-level decision-making. Moreover, they should regularly review actions to ensure that identified circular opportunities are effectively translated into tangible environmental improvements and flexibility enhancement.

Second, managers should also recognize GHRM as a significant contributor to organizational resilience. They should tailor GHRM practices, including environmental training, performance and rewards, and green behavioral training, into organizational adaptability objectives to facilitate the development of environmental value-driven HR resources. Firm managers should incorporate environmental problem-solving and disruption-response behavior into employee training plans, performance appraisals, and rewards management. Besides, they should regularly assess the effectiveness of training by measuring observable outcomes. Managers should not consider these as compliance-based practices; instead, they should emphasize these as vital resources to support resilience performance. Besides, managers should assess employees' sustainability awareness and the adaptability of employee behavior in the training module. However, before implementing major environmental initiatives, managers should assess the short-term effects of operational rigidity and make contingency plans accordingly, taking precautionary steps in resource mobilization.

Third, managers should also be cautious not to assume that enhancing sustainable environmental performance will automatically improve operational adaptability, as the findings from this research suggest that such enhancement may not automatically guarantee organizational resilience at manufacturing firms. However, managers should consider integrating this construct strategically with adaptability-building objectives. Firms should balance operational flexibility and environmental optimization so that sustainable environmental performance enhancement does not trade off operational flexibility. Fourth, the significant moderating influence of GTA may indicate that firms' investment in sustainable technology adoption can facilitate resilience outputs, particularly those from circular-driven dynamic capabilities. However, this aligns with firms deciding to allocate more resources to implementing sustainable technologies. However, they should also emphasize integrating advanced technology into firms' operations, particularly addressing specific issues such as sustainability-related challenges and operational adaptability. Therefore, technology investments should especially align with operational flexibility requirements, including real-time resource monitoring, waste tracking, recycling, and adjustment. Each technology project should be designated based on measurable resilience and environmental outcomes.

6.3 Policy Implications

The research findings have also generated several valuable policy implications for policymakers and regulatory bodies who seek to ensure sustainable industrialization in Bangladeshi manufacturing firms. First, policymakers should not treat sustainable and circular economy practices as compliance-oriented or regulatory assessments; they should encourage firms to develop capability development within manufacturing. Accordingly, they should provide support programs aimed at guiding manufacturers through circular-oriented dynamic capability-building processes. The emphasis should be on actual resilience-building outcomes rather than focusing solely on environmental compliance. Second, because green technology adoption has been found to be a significant

moderator of the resilience-building process, policymakers should emphasize assessing it at the firm level. For this, governmental and industrial bodies should support firms with funding, tax incentives, and technical assistance, with a focus on deploying sustainable technologies to address environmental challenges. These initiatives should support firms in building resilience by strengthening the effectiveness of their resources and capabilities, ultimately improving organizational resilience at firms. Third, policymakers can also encourage firms to integrate sustainability into workforce development programs. In particular, some programs, including sustainability training, certification, and industrial knowledge-sharing campaigns, can help enable GHRM in firms. Particular attention should be paid to export-oriented firms or industries that consistently contribute to the country's greater national and export earnings.

6.4 Limitations and Future Research Directions

The study has several limitations that could guide research directions for future policymakers. First, the study is designed as cross-sectional research, which can limit the ability to explore causal relationships among GHRM, CEC, SEV, GTA, and OR. The findings from this study reflect associations at a specific point in time. It may not capture the dynamic evaluation of policies. Future studies may perform longitudinal or panel data methods to explore the dynamic evolution of sustainability and resilience-building practices over time.

Second, this study is only based on the Bangladeshi manufacturing context, which is a single emerging country. The findings may not be fully generalizable to firms operating in different institutional, cultural, or regulatory environments. It also may not be generalizable to other neighboring South Asian emerging countries. Future researchers can employ cross-country panel analysis methods and compare emerging and developed economies.

Third, this research has also focused only on the manufacturing industry. It may not be generalizable to service-based industries. Future researchers can examine the proposed framework by sampling service-based firms to analyze how these constructs contribute to resilience-building within the service-based industry.

Fourth, although this research finds significant negative relationships between SEV and OR, it cannot fully explain the underlying mechanisms. This research was unable to directly identify the underlying mechanisms responsible for this negative relationship. However, it is very important to identify the causes behind this relationship. Accordingly, future researchers can conduct qualitative, mixed-methods, or case study-based investigations to explore the underlying causes. It will help generate valuable insights to address underlying causes.

Fifth, this research relies on respondents' perceptual responses. However, these could be affected by response biases, social desirability bias, and others. Future researchers can consider longitudinal research, various-source data collection, and multi-participant techniques within enterprises to validate and strengthen the findings.

Sixth, the study has considered only GTA as the primary boundary condition within the sustainability-resilience relationship. This is a limited boundary condition that can reduce insights from the influences of other conditions, such as environmental uncertainty, institutional pressure, and organizational culture, which can also play a moderating role in the process. Future researchers can also investigate the moderating influences of these constructs.

Lastly, CEC was conceptualized through sensing, seizing, and transforming the logic of GDCV. Although this operationalization captures the dynamic capability perspective, it may not reflect the broader multidimensional nature of circular economy practices. Future researchers can

conceptualize these capabilities along additional dimensions, including circular model innovation, resource recovery systems, recycling, and others.

7. Conclusion

This research highlights how organizational resilience in Bangladeshi manufacturing firms depends on the interaction of GHRM, CEC, SEV, and GTA in organizational operations. For managers, the key message is that they need to develop CEC through continuously identifying circular opportunities, mobilizing resources, and reconfiguring operations, while embedding environmental competencies in HRM practices. GTA should be directed towards specific circular and resilience needs rather than treated as an isolated technology mechanism. The findings of this research also caution that firm managers should not assume that improved SEV will automatically strengthen organizational resilience. This is because environmental initiatives may be resource-constrained and increase firms' operational rigidity, especially when they are not integrated within operational routines. Rather, managers should operationalize circular-economy capabilities and environmental initiatives aligned with operational flexibility goals. Policymakers in this context should support firm resilience-building through targeted technological incentives, circular economy capability development programs, workforce training, and implementation support, from compliance-driven sustainability practices to actual flexibility enhancement. However, resilience building may require managerial coordination among firms to implement resilience-building practices as combined actions rather than isolated ones.

Appendix A: Boolean Expression of High OR Configuration

```
--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 1
consistency cutoff: 0.809778
raw unique
coverage coverage consistency
---------- ---------- ----------
CEP*~SEV 0.491912 0.0168115 0.873009
~SEV*GTA 0.365543 0.0259942 0.845865
CEP*GHRM*~GTA 0.424383 0.0245815 0.874654
~CEP*SEV*~GTA 0.295966 0.0633609 0.809505
solution coverage: 0.65035
solution consistency: 0.816513
```

```
--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1
consistency cutoff: 0.809778
Assumptions:
raw unique
coverage coverage consistency
---------- ---------- ----------
CEP*~SEV 0.491912 0.0492336 0.873009
CEP*GHRM*~GTA 0.424383 0.0245814 0.874654
~SEV*GHRM*GTA 0.308963 0.0240164 0.872009
~CEP*SEV*~GHRM*~GTA 0.278449 0.0613123 0.809778
solution coverage: 0.645052
solution consistency: 0.827999
```

Appendix B: Boolean Expression of Low OR Configuration

```
--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 1
consistency cutoff: 0.828564
raw unique
coverage coverage consistency
---------- ---------- ----------
~GHRM 0.671653 0.023733 0.738497
SEV 0.687812 0.0491069 0.718989
~CEP*GTA 0.388373 0.0133183 0.854583
solution coverage: 0.741905
solution consistency: 0.671006
```

```
--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1
consistency cutoff: 0.828564
Assumptions:
raw unique
coverage coverage consistency
---------- ---------- ----------
CEP*~GHRM 0.581645 0.0114247 0.829807
SEV*~GHRM 0.630878 0.0630566 0.779642
CEP*SEV 0.597677 0.0294769 0.823535
~CEP*~SEV*GHRM*GTA 0.190052 0.0213344 0.828564
solution coverage: 0.704475
solution consistency: 0.714487
```

Acknowledgement

This research was not funded by any grant.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Sinkovics, N., Hoque, S. F., & Sinkovics, R. R. (2016). Rana Plaza collapse aftermath: Are CSR compliance and auditing pressures effective? *Accounting, Auditing & Accountability Journal, 29*(4), 617–649. https://doi.org/10.1108/AAAJ-07-2015-2141

[2] Mohsin, A., Gerschberger, M., Rashed, M., Ahmed, S. F., Islam, M. F., & Tushar, H. (2025). The greenwashing paradox: Can corporate sustainability narratives truly build stakeholder trust? *Academy of Management Proceedings, 2025*(1). https://doi.org/10.5465/amproc.2025.16565

[3] Rashed, M., Uddin, M. K., Islam, M. F., Mohsin, A. K. M., Rahman, S., Kumar, S., & Rana, J. (2025). Building organizational resilience in emerging economies: Strategic insights from Bangladesh. *Sustainable Futures, 10*, 101327. https://doi.org/10.1016/j.sftr.2025.101327

[4] Shumon, R., Halim, Z., Rahman, S., & Ahsan, K. (2019). How do suppliers address stringent environmental requirements from buyers? An exploratory study in the Bangladesh ready-made garment industry. *International Journal of Physical Distribution & Logistics Management, 49*(9), 921–944. https://doi.org/10.1108/IJPDLM-08-2018-0305

[5] Chowdhury, M. A. A., Dey, M., Rahman, M. M., & Ali, M. (2023). Demystifying the role of stakeholder pressure and competitive advantage on environmental performance of readymade garments industries in Bangladesh. Journal of Environmental Accounting and Management, 11(2), 115–138. https://doi.org/10.5890/JEAM.2023.06.001

[6] Julie, S., Potter, A., & Geng, R. (2024). Examining the effects of stakeholder forces on sustainable practices in the Bangladeshi garment industry. *Cleaner Logistics and Supply Chain, 12*, 100162. https://doi.org/10.1016/j.clscn.2024.100162
[7] HHHLinnenluecke, M. K. (2017). Resilience in business and management research: A review of influencing factors and future research directions. *International Journal of Management Reviews, 19*(1), 4-30. https://doi.org/10.1111/ijmr.12076
[8] Hillmann, J., & Guenther, E. (2021). Organizational resilience: A valuable construct for management research? *International Journal of Management Reviews, 23*(1), 7-44. https://doi.org/10.1111/ijmr.12239
[9] Karman, A., Prokop, V., & Lopes de Sousa Jabbour, A. B. (2024). Circular economy practices as a shield for the long-term organisational and network resilience during crisis: Insights from an industrial symbiosis. *Journal of Cleaner Production, 466*, 142822. https://doi.org/10.1016/j.jclepro.2024.142822
[10] Ivanov, D. (2023). The Industry 5.0 framework: Viability-based integration of the resilience, sustainability, and human-centricity perspectives. *International Journal of Production Research, 61*(5), 1683-1695. https://doi.org/10.1080/00207543.2022.2118892
[11] Kassier, L. (2024). Interconnected or disconnected? A review of sustainability, resilience, and sustainable business model constructs in the academic business literature. *Journal of the Knowledge Economy, 15*(4), 15931–15958. https://doi.org/10.1007/s13132-023-01712-z
[12] Camarinha-Matos, L. M., Rocha, A. D., & Graça, P. (2024). Collaborative approaches in sustainable and resilient manufacturing. *Journal of Intelligent Manufacturing, 35*(2), 499–519. https://doi.org/10.1007/s10845-022-02060-6
[13] Aftab, J., Abid, N., Cucari, N., & Savastano, M. (2023). Green human resource management and environmental performance: The role of green innovation and environmental strategy in a developing country. *Business Strategy and the Environment, 32*(4), 1782–1798. https://doi.org/10.1002/bse.3219
[14] He, R., & Wang, X. (2023). Enhancing industrial environmental performance: Interplay among environmental sustainability, green HRM, and green competitive advantage. *Environmental Science and Pollution Research, 30*(46), 103073–103086. https://doi.org/10.1007/s11356-023-29513-6
[15] Aust, I., Matthews, B., & Muller-Camen, M. (2020). Common good HRM: A paradigm shift in sustainable HRM? *Human Resource Management Review, 30*(3), 100705. https://doi.org/10.1016/j.hrmr.2019.100705
[16] Zafar, H., & Suseno, Y. (2024). Examining the effects of green human resource management practices, green psychological climate, and organizational pride on employees' voluntary pro-environmental behavior. *Organization & Environment, 37*(4), 581-609. https://doi.org/10.1177/10860266241241532
[17] Monson, F. K. S. (2024). Unveiling the strategic resource dimension: A bibliometric and systematic review of the Resource-Based View and its application to corporate governance. *Journal of High Technology Management Research, 35*(2), 100516. https://doi.org/10.1016/j.hitech.2024.100516
[18] Geissdoerfer, M., Santa-Maria, T., Kirchherr, J., & Pelzeter, C. (2023). Drivers and barriers for circular business model innovation. *Business Strategy and the Environment, 32*(6), 3814–3832. https://doi.org/10.1002/bse.3339 BSE
[19] Khan, O., Daddi, T., & Iraldo, F. (2021).The role of dynamic capabilities in circular economy implementation and performance of companies. *Corporate Social Responsibility and Environmental Management, 28*(5), 1391-1407. https://doi.org/10.1002/csr.2020
[20] Acquah, I. S. K., Quaicoe, J., & Gatsi, J. G. (2024). Modelling circular economy capabilities and sustainable manufacturing practices for environmental performance: Assessing linear (PLS-SEM) and non-linear (fsQCA) effects. *Technological Forecasting and Social Change, 205*, 123501. https://doi.org/10.1016/j.techfore.2024.123501
[21] Hopkinson, P., De Angelis, R., & Zils, M. (2020). Systemic building blocks for creating and capturing value from circular economy. *Resources, Conservation and Recycling, 155*, 104672. https://doi.org/10.1016/j.resconrec.2019.104672
[22] Zhu, Q., Sarkis, J., & Lai, K. (2012). Green supply chain management innovation diffusion and its relationship to organizational improvement: An ecological modernization perspective. *Journal of Engineering and Technology Management, 29*(1), 168–185. https://doi.org/10.1016/j.jengtecman.2011.09.012
[23] Zhu, Y., Zhang, H., Siddik, A. B., Zheng, Y., & Sobhani, F. A. (2023). Understanding corporate green competitive advantage through green technology adoption and green dynamic capabilities: Does green product innovation matter? *Systems, 11*(9), 461. https://doi.org/10.3390/systems11090461
[24] Bag, S., Pretorius, J. H. C., Gupta, S., & Dwivedi, Y. K. (2021). Role of institutional pressures and resources in the adoption of big data analytics powered artificial intelligence, sustainable manufacturing practices and circular economy capabilities. *Technological Forecasting and Social Change, 163*, 120420. https://doi.org/10.1016/j.techfore.2020.120420
[25] Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120. https://doi.org/10.1177/014920639101700108

[26] Grant, R. (2009). The resource-based theory of competitive advantage: Implications for strategy formulation. In *Knowledge Strategy* (pp. 3–24). https://doi.org/10.1016/B978-0-7506-7088-3.50004-8
[27] Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350. https://doi.org/10.1002/smj.640
[28] Khan, O., Daddi, T., & Iraldo, F. (2021). Sensing, seizing, and reconfiguring: Key capabilities and organizational routines for circular economy implementation. *Journal of Cleaner Production, 287*, 125565. https://doi.org/10.1016/j.jclepro.2020.125565
[29] Schroeder, P., Anggraeni, K., & Weber, U. (2019). The relevance of circular economy practices to the Sustainable Development Goals. *Journal of Industrial Ecology, 23*(1), 77-95. https://doi.org/10.1111/jiec.12732
[30] Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management, 22*(3), 265–289. https://doi.org/10.1016/j.jom.2004.01.005
[31] Chow, W. S. (2012). Corporate sustainable development: Testing a new scale based on the mainland Chinese context. *Strategic Direction, 28*(7), 427–430. https://doi.org/10.1108/sd.2012.05628gaa.010
[32] Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review, 32*(1), 273–292. https://doi.org/10.5465/amr.2007.23466005
[33] Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource orchestration to create competitive advantage. *Journal of Management, 37*(5), 1390–1412. https://doi.org/10.1177/0149206310385695
[34] Hu, Q., Yuan, C., & Li, X. (2024). The impact of environmental strategy on environmental performance: Mediating role of green human resource management and moderating role of green consciousness of top managers. *International Journal of Human Resource Management, 35*(17), 2891–2915. https://doi.org/10.1080/09585192.2024.2382480
[35] Peng, M. Y., Zhang, L., Lee, M., Hsu, F., Xu, Y., & He, Y. (2024). The relationship between strategic human resource management, green innovation and environmental performance: A moderated-mediation model. *Humanities and Social Sciences Communications, 11*(1), 239. https://doi.org/10.1057/s41599-024-02754-7
[36] Rana, J., Ahmad, M. Z., Islam, M. F., Jihad, M. N. I., Rashed, M., & Kamruzzaman, M. (2025). Optimizing supply chain performance through sustainable manufacturing practices and capabilities in emerging markets: An integrated linear (PLS-SEM) and non-linear (fsQCA) approach. *Cleaner Logistics and Supply Chain, 16*, 100257. https://doi.org/10.1016/j.clscn.2025.100257
[37] Uddin, M. (2022). Leveraging green human resource management practices towards environmental performance: An empirical evidence from the manufacturing context in emerging economy. *International Journal of Business and Society*, 23(1), 585-603.https://doi.org/10.33736/ijbs.4631.2022
[38] Singh, S. K., Del Giudice, M., Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change, 150*, 119762. https://doi.org/10.1016/j.techfore.2019.119762
[39] Naeem, M., Ali, S., Memon, S., Khan, K., & Hyder, S. A. O. (2025). From green HRM to lean operations: The mediating role of digital green transformation: A dynamic capabilities perspective. *Journal of Ethics, Entrepreneurship and Technology*, 1–17. https://doi.org/10.1108/jeet-05-2025-0026
[40] Huq, F. A., Chowdhury, I. N., & Klassen, R. D. (2016). Social management capabilities of multinational buying firms and their emerging market suppliers: An exploratory study of the clothing industry. *Journal of Operations Management, 46*, 19-37. https://doi.org/10.1016/j.jom.2016.07.005
[41] Shao, D., Zhou, R., Mao, J., & Y, Ji. (2026). Nurturing Employee Green Resilience with Green Human Resource Management: A Resource-Based Perspective, *Human Resource Development Quarterly*. https://doi.org/10.1002/hrdq.70023
[42] Dumont, J., Shen, J., & Deng, X. (2017). Effects of green HRM practices on employee workplace green behavior: The role of psychological green climate and employee green values. *Human Resource Management, 56*(4), 613–627. https://doi.org/10.1002/hrm.21792
[43] Bin Saeed, B., Afsar, B., Hafeez, S., Khan, I., Tahir, M., & Afridi, M. A. (2019). Promoting employees' proenvironmental behavior through green human resource management practices. *Corporate Social Responsibility and Environmental Management, 26*(2), 424–438. https://doi.org/10.1002/csr.1694
[44] Ren, S., Cooke, F. L., Stahl, G. K., Fan, D., & Timming, A. R. (2023). Advancing the sustainability agenda through strategic human resource management: Insights and suggestions for future research. *Human Resource Management, 62*(3), 251–265. https://doi.org/10.1002/hrm.22169
[45] Van Lancker, E., Knockaert, M., Audenaert, M., & Cardon, M. (2022). HRM in entrepreneurial firms: A systematic review and research agenda. *Human Resource Management Review, 32*(3), 100850. https://doi.org/10.1016/j.hrmr.2021.100850

[46] Duchek, S. (2020). Organizational resilience: A capability-based conceptualization. *Business Research, 13*(1), 215–246. https://doi.org/10.1007/s40685-019-0085-7
[47] Chen, Y.-S., & Chang, C.-H. (2013). The determinants of green product development performance: Green dynamic capabilities, green transformational leadership, and green creativity. *Journal of Business Ethics, 116*(1), 107-119. https://doi.org/10.1007/s10551-012-1452-x
[48] Santa-Maria, T., Vermeulen, W. J. V., & Baumgartner, R. J. (2022). How do incumbent firms innovate their business models for the circular economy? Identifying micro-foundations of dynamic capabilities. *Business Strategy and the Environment, 31*(4), 1308–1333. https://doi.org/10.1002/bse.2956
[49] Pan, X., Wong, C. W. Y., Wong, C. Y., Boon-itt, S., & Li, C. (2024). The influences of circular economy practices on manufacturing firm's performance: A meta-analytic structural equation modeling study. *International Journal of Production Economics, 273*, 109267. https://doi.org/10.1016/j.ijpe.2024.109267
[50] Bag, S., Gupta, S., & Kumar, S. (2021). Industry 4.0 adoption and 10R advance manufacturing capabilities for sustainable development. *International Journal of Production Economics, 231*, 107844. https://doi.org/10.1016/j.ijpe.2020.107844
[51] Bag, S., & Rahman, M. S. (2023). The role of capabilities in shaping sustainable supply chain flexibility and enhancing circular economy-target performance: An empirical study. *Supply Chain Management, 28*(1), 162–178. https://doi.org/10.1108/SCM-05-2021-0246
[52] Helfat, C. E., & Peteraf, M. A. (2009). Understanding dynamic capabilities: Progress along a developmental path. *Strategic Organization, 7*(1), 91–102. https://doi.org/10.1177/1476127008100133
[53] Jabbour, A. B. L. S., Latan, H., Jabbour, C. J. C., & Seles, B. M. R. P. (2023). Does applying a circular business model lead to organizational resilience? Mediating effects of Industry 4.0 and customer integration. *Technological Forecasting and Social Change, 194*, 122672. https://doi.org/10.1016/j.techfore.2023.122672
[54] Ameer, F., Khan, M. R., Khan, I., Khan, N. R., & Keoy, K. H. (2024). Organizational resilience and green innovation for environmental performance: Evidence from manufacturing organizations. *Vision: The Journal of Business Perspective*. https://doi.org/10.1177/09722629241254955
[55] Duchek, S. (2020). Organizational resilience: A capability-based conceptualization. *Business Research, 13*(1), 215-246. https://doi.org/10.1007/s40685-019-0085-7
[56] Ortiz-de-Mandojana, N., & Bansal, P. (2016). The long-term benefits of organizational resilience through sustainable business practices. *Strategic Management Journal, 37*(8), 1615–1631. https://doi.org/10.1002/smj.2410
[57] Pagell, M., & Wu, Z. (2009). Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars. *Journal of Supply Chain Management, 45*(2), 37–56. https://doi.org/10.1111/j.1745-493X.2009.03162.x
[58] Luthra, S., Garg, D., & Haleem, A. (2015). An analysis of interactions among critical success factors to implement green supply chain management towards sustainability: An Indian perspective. *Resources Policy, 46*, 37–50. https://doi.org/10.1016/j.resourpol.2014.12.006
[59] Rigdon, E. E. (2024). Understanding composite-based structural equation modeling methods from the perspective of regression component analysis. *Multivariate Behavioral Research, 59*(4), 677–692. https://doi.org/10.1080/00273171.2024.2330148
[60] Protogerou, A., Caloghirou, Y., & Lioukas, S. (2012). Dynamic capabilities and their indirect impact on firm performance. *Industrial and Corporate Change, 21*(3), 615–647. https://doi.org/10.1093/icc/dtr049
[61] Al-Khatib, A. W. (2023). The impact of dynamic capabilities on circular economy: The mediating effect of the industrial Internet of Things. *Journal of Manufacturing Technology Management, 34*(6), 873–895. https://doi.org/10.1108/JMTM-01-2023-0003
[62] Liang, Y., Kim, T. H., & Lee, M. J. (2026). Digital dynamic capabilities and environmental sustainability: The role of circular supply chain practices. *Corporate Social Responsibility and Environmental Management, 33*(4), 5434-5452.https://doi.org/10.1002/csr.70458
[63] Baquero, A. (2025). Leveraging green dynamic capabilities and institutional support for green technological innovation and performance: Evidence from Spanish manufacturing firms. *Corporate Social Responsibility and Environmental Management*. https://doi.org/10.1002/csr.70149
[64] Perotti, F. A., Dhir, A., Ferraris, A., & Kliestik, T. (2024). Investigating digital technologies' implementation in circular businesses: Evidence from the going circular path. *Journal of Management & Organization, 30*(3), 421–451. https://doi.org/10.1017/jmo.2023.60
[65] De, T. M., Verma, P., Gangaraju, P. K., Bhaskar, A. N. S., Mahlawat, S., Kumar, V., & Singh, S. (2024). Exploring the synergistic effects of circular economy, Industry 4.0 technology, and green human resource management practices on sustainable performance: Empirical evidence from Indian companies. *Business Strategy and Development, 7*(3), e70002. https://doi.org/10.1002/bsd2.70002

[66] Mallik, S. K., Ali, R., Nahiduzzaman, D. M., Shoumik, S. C., Islam, T., & Rahman, M. A. (2025). Sustainable textile industry: Balancing growth and environmental concerns in Bangladesh. *International Journal of Scientific Research Archive, 14*(1), 664–678. https://doi.org/10.30574/ijsra.2025.14.1.0076

[67] Hosain, M. S., Mitu, F., & Mustafi, M. A. A. (2026). Green HRM practices and firm environmental performance: Mediating role of employee green behavior. *Journal of Advanced Management Research*,*23*(2), 215-244 https://doi.org/10.1108/JAMR-04-2023-0099

[68] Razzak, M. R. (2023). Mediating effect of productivity between sustainable supply chain management practices and competitive advantage: Evidence from apparel manufacturing in Bangladesh. *Management of Environmental Quality: An International Journal, 34*(2), 428–445. https://doi.org/10.1108/MEQ-01-2022-0022

[69] Faul, F., Erdfelder, E., Buchner, A., & Lang, A. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

[70] Johari, J., Shamsudin, F. M., Zainun, N. F. H., Yean, T. F., & Yahya, K. K. (2022). Institutional leadership competencies and job performance: The moderating role of proactive personality. *International Journal of Educational Management, 36*(6), 1027–1045. https://doi.org/10.1108/IJEM-07-2021-0280

[71] Ambulkar, S., Blackhurst, J., & Grawe, S. (2015). Firm's resilience to supply chain disruptions: Scale development and empirical examination. *Journal of Operations Management, 33–34*, 111–122. https://doi.org/10.1016/j.jom.2014.11.002

[72] Khan, O., Daddi, T., & Iraldo, F. (2020). The role of dynamic capabilities in circular economy implementation and performance of companies. *Corporate Social Responsibility and Environmental Management, 27*(6), 3018–3033. https://doi.org/10.1002/csr.2020

[73] Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling, 127*, 221-232. https://doi.org/10.1016/j.resconrec.2017.09.005

[74] Ahmad N., Scholz M., AlDhaen E., Ullah Z. and Scholz P. (2021). Improving Firm's Economic and Environmental Performance Through the Sustainable and Innovative Environment: Evidence from an Emerging Economy. *Frontiers in Psychology, 12*, 651394. https://doi.org/10.3389/fpsyg.2021.651394

[75] Singh, S. K., & El-Kassar, A. (2019). Role of big data analytics in developing sustainable capabilities. *Journal of Cleaner Production, 213*, 1264–1273. https://doi.org/10.1016/j.jclepro.2018.12.199

[76] Huang, J., & Li, Y. (2017). Green innovation and performance: The view of organizational capability and social reciprocity. *Journal of Business Ethics, 145*(2), 309–324. https://doi.org/10.1007/s10551-015-2903-y

[77] Rönkkö, M., & Evermann, J. (2013). A critical examination of common beliefs about partial least squares path modeling. *Organizational Research Methods, 16*(3), 425-448. https://doi.org/10.1177/1094428112474693

[78] Cheah, J., Sarstedt, M., Ringle, C. M., Ramayah, T., & Ting, H. (2018). Convergent validity assessment of formatively measured constructs in PLS-SEM: On using single-item versus multi-item measures in redundancy analyses. *International Journal of Contemporary Hospitality Management, 30*(11), 3192–3210. https://doi.org/10.1108/IJCHM-10-2017-0649

[79] Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, 20(2), 195–204.

[80] Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing, 53*(11), 2322–2347. https://doi.org/10.1108/EJM-02-2019-0189

[81] Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. Springer. https://doi.org/10.1007/978-3-030-80519-7

[82] Ragin, C. C. (2000). *Fuzzy-set social science*. University of Chicago Press.

[83] Pappas, I. O., & Woodside, A. G. (2021). Fuzzy-set qualitative comparative analysis (fsQCA): Guidelines for research practice in information systems and marketing. *International Journal of Information Management, 58*, 102310. https://doi.org/10.1016/j.ijinfomgt.2021.102310

[84] Sun, X., Rong, N., Sun, M., & Zhu, F. (2023). Combining structural and sequential ambidexterity: A configurational approach using fsQCA. *Management and Organization Review, 19*(4), 803–837. https://doi.org/10.1017/mor.2022.41

[85] Tóth, Z., Thiesbrummel, C., Henneberg, S. C., & Naudé, P. (2015). Understanding configurations of relational attractiveness of the customer firm using fuzzy set QCA. *Journal of Business Research, 68*(3), 723–734. https://doi.org/10.1016/j.jbusres.2014.07.010

[86] Pappas, I. O., & Woodside, A. G. (2021). Fuzzy-set qualitative comparative analysis (fsQCA): Guidelines for research practice in information systems and marketing. *International Journal of Information Management, 58*, 102310. https://doi.org/10.1016/j.ijinfomgt.2021.102310

[87] Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal, 54*(2), 393–420. https://doi.org/10.5465/amj.2011.60263120
[88] Misangyi, V. F., Greckhamer, T., Furnari, S., Fiss, P. C., Crilly, D., & Aguilera, R. (2017). Embracing causal complexity: The emergence of a neo-configurational perspective. *Journal of Management, 43*(1), 255–282. https://doi.org/10.1177/0149206316679252
[89] Pappas, I. O., & Woodside, A. G. (2021). Fuzzy-set qualitative comparative analysis (fsQCA): Guidelines for research practice in information systems and marketing. *International Journal of Information Management, 58*, 102310. https://doi.org/10.1016/j.ijinfomgt.2021.102310
[90] Mikalef, P., & Pateli, A. (2017). Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA. *Journal of Business Research, 70*, 1–16. https://doi.org/10.1016/j.jbusres.2016.09.004
[91] Crespo, N. F., Rodrigues, R., Samagaio, A., & Silva, G. M. (2019). The adoption of management control systems by start-ups: Internal factors and context as determinants. *Journal of Business Research, 101*, 875–884. https://doi.org/10.1016/j.jbusres.2018.11.020
[92] Pappas, I. O., & Woodside, A. G. (2021). Fuzzy-set qualitative comparative analysis (fsQCA): Guidelines for research practice in information systems and marketing. *International Journal of Information Management, 58*, 102310. https://doi.org/10.1016/j.ijinfomgt.2021.102310
[93] Shojaee, A., Rashed, M., Islam, M. F., & Vasa, L. (2026). Sustainable practices and resource reconfiguration drive firm performance: Insights from PLS-SEM and fsQCA. *Discover* Psychology*, 6*, 267. https://doi.org/10.1007/s44202-026-00778-5
[94] Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems, 116*(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382
[95] Benitez, J., Henseler, J., Castillo, A., & Schuberth, F. (2020). How to perform and report an impactful analysis using partial least squares: Guidelines for confirmatory and explanatory IS research. *Information & Management, 57*(2), 103168.https://doi.org/10.1016/j.im.2019.05.003
[96] Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2024). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pacific Journal of Management, 41*(2), 745-783. https://doi.org/10.1007/s10490-023-09871-y
[97] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104
[98] Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.
[99] Voorhees, C. M., Brady, M. K., Calantone, R., & Ramirez, E. (2016). Discriminant validity testing in marketing: An analysis, causes for concern, and proposed remedies. *Journal of the Academy of Marketing Science, 44*(1), 119–134. https://doi.org/10.1007/s11747-015-0455-4
[100] Gray, J. V., Esenduran, G., Rungtusanatham, M. J., & Skowronski, K. (2017). Why in the world did they reshore? Examining small to medium-sized manufacturer decisions. *Journal of Operations Management, 49–51*, 37–51. https://doi.org/10.1016/j.jom.2017.01.001
[101] Dul, J. (2016). Necessary condition analysis (NCA): Logic and methodology of "necessary but not sufficient" causality. *Organizational Research Methods, 19*(1), 10–52. https://doi.org/10.1177/1094428115584005
[102] Ragin, C. C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond*. University of Chicago Press.
[103] Schneider, C. Q., & Wagemann, C. (2012). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. Cambridge University Press.
[104] Ragin, C. C. (2006). Set relations in social research: Evaluating their consistency and coverage. *Political Analysis, 14*(3), 291–310. https://doi.org/10.1093/pan/mpj019
[105] Nath, S. D., Eweje, G., & Sajjad, A. (2020). The hidden side of sub-supplier firms' sustainability – An empirical analysis. *International Journal of Operations & Production Management, 40*(12), 1771–1799. https://doi.org/10.1108/IJOPM-05-2019-0403
[106] Geng, Y., & Doberstein, B. (2008). Developing the circular economy in China: Challenges and opportunities for achieving "leapfrog development". *International Journal of Sustainable Development & World Ecology, 15*(3), 231–239. https://doi.org/10.3843/SusDev.15.3:6
[107] Ahmed Mustafi, M. A., Dong, Y., & Hosain, M. S. (2025). The mediating role of perceived competitive advantage on the relationships between green supply chain management practices and operational performance: Evidence from Bangladeshi manufacturing firms. *Benchmarking: An International Journal, 32*(4), 1284–1307. https://doi.org/10.1108/BIJ-06-2023-0377