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The nexus between circular economy practices, TQM, and green supply chain management in firm performance

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ABSTRACT

This qualitative study examines the sustainability dimensions of organizational practices, focusing on total quality management (TQM), green supply chain management (GSCM), and their impact on firm performance (FP), interpreted through the lens of absorptive capacity theory (ACAP). The study includes ten participants from both local and foreign companies in Thailand, representing organizations with and without ISO 14001 certification. Data were analyzed using NVivo 12 through thematic coding and theme development to provide insights into organizational factors influencing sustainability outcomes. The findings show that sustainability-oriented practices strongly influence the adoption of circular economy practices (CEP), TQM, and GSCM, all of which contribute to improved firm performance. Market demands and customer expectations were identified as key drivers encouraging both local and foreign firms to adopt sustainability initiatives. However, limited financial resources and high costs remain major barriers, especially for implementing circular economy practices. ISO 14001 certification emerged as an important differentiating factor. Certified firms demonstrated more structured and formalized practices, particularly in sourcing green materials, conducting supplier audits, and monitoring carbon emissions. These practices reflect a stronger environmental focus and alignment with regulatory and stakeholder requirements. Both Thai and foreign firms indicated that their sustainability strategies are influenced by internal goals as well as external pressures, such as government regulations and community expectations. Overall, the study suggests that while sustainability practices are widely adopted, their effectiveness and consistency depend on ISO 14001 certification, financial capacity, and the broader regulatory environment.

1. Introduction

In the contemporary business environment, sustainability has become one of the most critical priorities for both multinational corporations and local firms. The increasing awareness of environmental degradation, climate change, and global competition has driven companies to adopt sustainability policies not only as ethical responsibilities but also as strategic imperatives (Sharma and Modgil, 2020). These policies, while designed to enhance corporate environmental performance, can also function as non-tariff barriers. In practice, countries often use sustainability standards and regulations as indirect mechanisms to restrict imports and exports (Jacob-John et al., 2021). By setting high requirements for goods and services entering their markets, governments can protect domestic industries while simultaneously promoting environmental awareness. Thus, sustainability is no longer just a voluntary initiative; it has transformed into a tool that shapes global trade relations and influences business competitiveness.

In Thailand, the government has actively embraced this trend by introducing sustainability frameworks consistent with the United Nations Sustainable Development Goals (SDGs). These policies are aimed at guiding firms toward responsible environmental management, efficient resource utilization, and the reduction of ecological footprints (Chanhthamixay et al., 2017). The Thai government has also set clear goals and created a

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roadmap for organizations to align their operations with environmental control measures. Nevertheless, despite these efforts, only a limited number of Thai companies have achieved ISO 14001 certification, which is internationally recognized as the benchmark for effective environmental management systems. This certification reflects an organization's ability to systematically manage its environmental responsibilities and continually improve its sustainability performance (Delmas and Toffel, 2008). The relatively low adoption rate highlights the challenges faced by Thai firms, including cost constraints, lack of expertise, and limited awareness among management and stakeholders.

Given this context, the present study seeks to provide deeper insights into how Thai companies perceive and respond to sustainability requirements. Through in-depth interviews with both local and national firms, the research explores managerial visions, organizational practices, and challenges related to ISO 14001 implementation. By comparing the perspectives of these two groups, the study reveals important contrasts and similarities in how sustainability is understood and operationalized across different types of companies. The findings not only shed light on the barriers to wider ISO 14001 adoption but also highlight the opportunities for strengthening sustainability practices in Thailand (Khajuria et al., 2022).

To interpret these findings, the study employs absorptive capacity theory, which emphasizes how organizations acquire, assimilate, transform, and exploit external knowledge. Applying this theoretical lens allows for an understanding of how ISO 14001 functions as both a knowledge governance mechanism and a catalyst for organizational learning (Delmas, 2001). By examining sustainability practices through absorptive capacity, the research provides a robust framework for explaining why some firms successfully integrate environmental standards while others struggle. Ultimately, the study contributes to both theory and practice by demonstrating how sustainability policies, when effectively internalized, can enhance firm performance and ensure long-term competitiveness (Agyabeng-Mensah et al., 2021).

2. Literature review

The absorptive capacity theory (ACAP) approach, through managerial style, serves as a conceptual tool for organizational reform, capacitating firms to integrate the anticipant behavior of consumers that can influence market trends before a product launch (Sharma and Modgil, 2020). This theoretical perspective is reflected across total quality management factors, supply chain management dimensions, and firm performance measures. ACAP has been reconceptualized by incorporating elements of transformation, activation triggers, and social integration processes, and is divided into two key dimensions: potential and realized absorptive capacity (Cohen and Levinthal, 1990).

From different managerial perspectives, organizations tend to emphasize process-based approaches in distinct ways. Multinational companies typically implement global strategies that respond to international trade and consumer requirements, enhancing their operational processes to align with export–import activities and global sustainability concerns. In contrast, local companies primarily adhere to government policies related to domestic environmental regulations (Khajuria et al., 2022). For instance, ISO 14001 certification provides formal assurance that a firm manages operations with environmental responsibility, an essential aspect of sustainability adoption discourse. As analytics from the ACAP perspective further illustrate, sustainability represents a key strategic benefit within firms' managerial orientations. The prominence of products at the center of the visualization underscores firms' focus on sustainable product innovation and life-cycle management, reinforcing the CE principle of designing for circularity (Thorley et al., 2022). The frequent occurrence of environmental and management signifies that sustainability is operationalized through managerial systems consistent with standards such as ISO 14001 (Delmas, 2001). Similarly, the co-occurrence of waste and green materials supply reveals how resource optimization and waste minimization have become organizational priorities, which link CE's emphasis on resource efficiency with GSCM's focus on eco-material sourcing.

The TQM system emphasizes both internal and external processes, supported by stakeholder-oriented dimensions such as customer orientation, market focus, and supplier–vendor quality. These factors highlight the external pressures that drive sustainability initiatives (Lepistö et al., 2022). The findings align with institutional and reputational perspectives, indicating that firms adopt CE and GSCM practices not only to enhance internal efficiency but also to strengthen legitimacy, branding, and competitive positioning (Psomas et al., 2011). Furthermore, terms related to standards, implementation systems, and organizational reputation suggest the critical role of certification and eco-labeling in signaling environmental commitment to external stakeholders. Internal enablers, reflected in concepts such as quality, KPIs, employee engagement, and employee empowerment, emphasize the contribution of human capital and organizational alignment to embedding sustainability within TQM systems (Zhang et al., 2021).

Policy- and regulation-related terms such as carbon, emissions, and regulatory standards demonstrate the growing influence of decarbonization agendas, which act as external forces affecting organizational transformation. However, the relatively smaller emphasis on government and regulation implies that market forces are perceived as stronger motivators than formal policy mandates (Agyabeng-Mensah et al.,

2021). This observation suggests that firms are becoming increasingly selective in engaging vendors who can supply raw materials and services aligned with low-carbon and environmentally responsible supply chains, often verified through supplier audits and quality assessments. Sector-specific requirements such as reducing energy consumption and fossil fuel use in import–export logistics further reveal industry-level nuances (Delmas and Toffel, 2008). Many firms, particularly in infrastructure and manufacturing sectors, emphasize renewable energy adoption, resource reuse strategies, and supply chain decarbonization, such as the installation of solar farms to minimize carbon emissions. From the perspective of performance measurement, firms often distinguish between two key dimensions: financial and non-financial indicators. This contrast reflects the logic of the balanced scorecard framework, which incorporates both internal and external performance measures to guide continuous improvement and ensure that operations effectively meet customer requirements. In summary, visualization consolidates key insights from thematic analysis by illustrating how sustainability discourse is shaped both internally and externally (Jacob-John et al., 2021).

It portrays a performance- and market-oriented orientation in which firms integrate CE, TQM, and GSCM principles into managerial routines while responding to customer expectations, supplier standards, and market reputation. Thus, the visualization serves as strong evidence that sustainability adoption in practice is driven by the interplay of internal managerial systems, external legitimacy pressures, and sectoral innovation pathways (Khajuria et al., 2022).

3. Methodology

This study employed a qualitative research approach based on in-depth interviews with top- and middle-management personnel across the chemical, food and packaging, paint and construction, and automotive industries. These managerial levels were selected due to their direct involvement in strategic decision-making, operational oversight, and sustainability-related initiatives. The qualitative inquiry enabled an in-depth exploration of how CEP, TQM, and GSCM are understood, implemented, and experienced within organizational contexts, as well as how these practices influence firm performance, as presented in Table 1.

Table 1: Qualitative research questions

Question	Items
Q1	How does your organization understand the concept of the circular economy, and how it has been implemented in practice?
Q2	Does your organization have any standardized processes or systems in place for environmental management or the implementation of CE?
Q3	What challenges or obstacles have you encountered in applying CE principles in practice?
Q4	How do financial costs and incentives influence the decision to undertake CE initiatives?
Q5	In your opinion, does the implementation of CE affect your organization's competitiveness or corporate image?
Q6	How do the leaders in your organization support quality improvement or sustainability initiatives?
Q7	Does your organization listen to customer feedback and use it to improve products or services?
Q8	What internal quality control processes or systems are in place in your organization?
Q9	Do employees participate in quality management or propose improvement suggestions?
Q10	Does your organization consider environmental criteria when selecting suppliers?
Q11	What strategies does your logistics process use to reduce waste or carbon emissions?
Q12	How does your organization collaborate with suppliers or partners to achieve sustainability goals?
Q13	How does your organization measure success in implementing CE, TQM, or GSCM initiatives?
Q14	In your view, how do these practices (CE, TQM, GSCM) impact profitability, efficiency, or corporate image?
Q15	How has ISO 14001 helped your organization establish a concrete environmental management system?
Q16	Even without ISO 14001, does your organization follow any alternative approaches to environmental management?
Q17	Does your company have global environmental policies or specific directives from your headquarters?
Q18	Are your organization's environmental policies influenced by government regulations or market changes?

The interview data were analyzed using thematic analysis to support systematic interpretation and theory-informed pattern identification. NVivo 12 Pro software was utilized to facilitate data management, coding, and theme development, following the six-step thematic analysis procedure outlined by Braun and Clarke (2016), which is familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. These steps were rigorously applied to identify recurring themes, interpret latent patterns, and synthesize relationships across cases. To enhance content validity and analytical rigor, the interview protocol was reviewed by subject-matter experts prior to data collection (Sanderson and Fisher, 1994). The interview questions were designed to ensure comprehensive thematic coverage while eliciting contextualized managerial insights and organizational practices relevant to CEP, TQM, and GSCM. Furthermore, the interview structure enabled comparative interpretation across firm types and levels of environmental management adoption.

In-depth semi-structured interviews were conducted with ten top- and middle-level managers from firms operating in chemical, food packaging, construction materials, and automotive-related industries. The sample comprised both local and national firms, including organizations with and without ISO 14001 certification, thereby enabling comparative insights across diverse organizational contexts. The sample size was determined based on the principle of thematic saturation, defined as the point at which no new conceptual insights emerge from additional data collection. Prior qualitative research indicates that saturation in relatively homogeneous managerial samples can typically be achieved with 8–12 interviews when research

questions are focused and theoretically informed (Braun and Clarke, 2016). In the present study, thematic saturation was reached after the ninth interview, with the tenth interview serving to confirm existing themes rather than generate new analytical categories.

The participant group included managers from both top and middle management levels and allowed for analytical differentiation based on company type and environmental management adoption. Specifically, seven participants represented local firms and three represented national firms. With respect to environmental management systems, eight firms had adopted ISO 14001 principles, while two firms had not implemented ISO 14001. A detailed profile of the participating firms and their characteristics is provided in Table 2.

Table 2: Profile of Interview Participants

Firm	Company type	ISO adoption	Managing level
A	Local	Yes	Top level
B	Local	Yes	Middle level
C	Local	No	Top level
D	Local	Yes	Middle level
E	Local	Yes	Middle level
F	Local	Yes	Top level
G	Nationality	Yes	Top level
H	Nationality	Yes	Middle level
I	Nationality	Yes	Top level
J	Local	No	Top level

4. Results and discussions

The thematic summary in Table 3 synthesizes the key themes emerging from the in-depth interviews and illustrates how Circular Economy Practices (CEP), Total Quality Management (TQM), and Green Supply Chain Management (GSCM) are embedded within organizational systems and linked to firm performance (FP). Rather than depicting isolated managerial activities, the thematic synthesis reveals recurring patterns that reflect the interaction between environmental orientation, internal managerial systems, supply chain coordination, and performance outcomes. Viewed through the lens of absorptive capacity, these patterns indicate that sustainability implementation depends on firms' ability to systematically acquire, assimilate, transform, and exploit sustainability-related knowledge across organizational functions. The results, therefore, reveal a multifaceted understanding of how sustainability is institutionalized through the convergence of CEP, TQM, GSCM, and FP, functioning collectively as organizational learning routines.

Word-cloud analysis, illustrated in Fig. 1, was used as an analytical complement to thematic coding, providing insight into lexical emphasis across the ten interviews. The prominence of terms such as environment, quality, supplier, and market highlights the dual orientation of sustainability practices toward internal managerial systems and external stakeholder engagement, consistent with prior sustainability management research (Delmas, 2001). From an ACAP perspective, this lexical emphasis reflects firms' recognition of external environmental and market signals (knowledge acquisition) and their translation into structured managerial and operational responses (knowledge assimilation).

Participants demonstrated a shared understanding of circular economy principles through tangible operational initiatives, including waste-to-energy systems, solvent recovery, and green packaging. These initiatives were consistently associated with formal circular economy policies and internal energy reuse strategies, indicating that codified frameworks play a critical role in enabling the transformation of environmental knowledge into operational routines. Environmental management standards, particularly ISO 14001 certification and PDCA-based routines, emerged as central mechanisms for structuring environmental control and monitoring processes. Firms adopting these standards reported more systematic approaches to carbon footprint measurement and regulatory compliance, reinforcing the role of environmental management systems in institutionalizing sustainability practices (Khajuria et al., 2022). Within an ACAP framework, ISO 14001 functions as a governance infrastructure that strengthens knowledge assimilation and transformation by formalizing learning cycles, documentation, and feedback mechanisms.

At the same time, several constraints were identified that moderated the adoption of circular economy initiatives. Cost-related challenges, including the high price of green materials and limited access to certified suppliers, were reported more frequently among small and medium-sized enterprises. Financial considerations, such as return on investment assessment and procurement-driven budgeting, further shaped managerial decision-making, often delaying or scaling down sustainability investments. These constraints can be interpreted as limitations in firms' potential absorptive capacity, where insufficient financial and resource slack restricts the ability to convert acquired sustainability knowledge into implemented practices. These findings align with prior evidence indicating that financial constraints represent a critical barrier to the adoption of sustainability among resource-constrained firms (Xu et al., 2018). Despite these constraints, respondents emphasized that sustainability initiatives contributed positively to corporate image and international competitiveness, particularly by facilitating export activities and alignment with ESG expectations, suggesting that firms selectively exploit sustainability knowledge when performance and legitimacy benefits are perceived to be high.

Managerial and organizational enablers also emerged as critical factors in sustainability implementation. Leadership commitment, expressed through top-down KPI setting and incentive alignment, was frequently identified as a decisive factor in sustaining circular economy initiatives. From an absorptive capacity perspective, leadership

plays a central role in activating realized absorptive capacity by legitimizing sustainability priorities and allocating resources for implementation. In parallel, customer feedback mechanisms such as complaints management and service-level agreements supported continuous improvement and green product adaptation, reflecting the influence of TQM principles. Internal quality assurance systems, including QA and QC procedures and ISO 9001 compliance, further embed sustainability within routine operational control, particularly among ISO-compliant firms. These findings are consistent with previous studies emphasizing the role of standardized quality systems in supporting sustainability integration through organizational learning and process discipline.

In addition, supply chain integration and performance measurement emerged as central themes. Employee engagement was identified as a key internal driver, with respondents highlighting the role of suggestion systems, reward mechanisms, and KPI awareness in improving both environmental and process outcomes. These mechanisms facilitate internal knowledge sharing and recombination, strengthening firms' ability to transform sustainability-related insights into operational improvements. From a supply chain perspective, firms increasingly applied green criteria in supplier selection, tiered supplier management, and audit processes, demonstrating the operationalization of GSCM practices. These practices extend absorptive capacity beyond organizational boundaries by enabling inter-organizational knowledge exchange and joint learning with supply chain partners (Zhang et al., 2021).

Logistics and emission reduction initiatives, including the adoption of electric vehicles, solar energy utilization, and emission monitoring systems, reflected proactive efforts toward decarbonization. However, technological and financial limitations constrained broader implementation, indicating uneven development of realized absorptive capacity across firms. Collaboration with external partners was largely customer-driven, particularly in product development activities shaped by regulatory and market requirements. This pattern suggests that sustainability collaboration is often reactive to external pressure rather than internally initiated, underscoring the dominant role of customers and export markets in triggering sustainability-related knowledge acquisition and exploitation.

Performance-related themes indicate that firms increasingly rely on tangible indicators such as KPIs, waste reduction metrics, and green certifications to assess sustainability outcomes. Respondents linked circular economic initiatives to long-term profitability, efficiency gains, and enhanced corporate image, particularly in sectors where environmental credibility influences project selection and market access. Mid-frequency references to profit, KPI, and circular economy further suggest a maturing sustainability orientation in which environmental initiatives are increasingly connected to measurable performance outcomes and financial returns (Thorley et al., 2022). These findings reflect the final stage of absorptive capacity, where sustainability knowledge is fully exploited to generate economic and strategic value.

Overall, the thematic synthesis demonstrates that sustainability implementation is not driven by a single managerial practice but emerges from the interaction of environmental standards, managerial systems, supply chain coordination, and performance measurement. Viewed explicitly through the lens of absorptive capacity theory, CEP, TQM, and GSCM operate as complementary learning routines that collectively enable firms to sense external sustainability demands, internalize them through structured systems, and translate them into performance-enhancing outcomes (Cohen and Levinthal, 1990).

ISO 14001 certification emerged not as an end in itself but as a governance mechanism that strengthens firms' ability to convert external sustainability knowledge into internal capabilities. Collectively, the findings confirm that CEP, TQM, GSCM, and FP form an interconnected framework through which firms align environmental responsibility with competitiveness, legitimacy, and long-term performance.

Fig. 1: Word cloud by NVivo 12 program

Table 3: Summary of themes and theoretical mapping

Theme	Sub-themes	Observed correlations	Quoted evidence	Theoretical lens
Circular economy understanding	Waste-to-energy, solvent recovery, green packaging	CE adoption is linked to clear CE policies and energy reuse	"We operate our power plant fueled by waste-to-energy methods..." (E)	CEP
Environmental management standards	ISO 14001, PDCA, EcoVadis	Firms with ISO 14001 show structured controls	"We follow ISO 14001... calculate carbon footprint..." (B)	CEP/GSCM
Key challenges	Green material cost, certification gaps	Cost barriers more prevalent in SMEs	"Green materials are double the price... limited vendors" (G)	CEP/GSCM
Financial considerations	ROI, investment planning, procurement-driven budgeting	High-cost limits CE transition	"High competitiveness... we must assess ROI before implementation" (E)	FP/CEP
Corporate image and competitiveness	Eco-labels, ESG reporting, international standards	Image aligns with ESG, helps in exports	"After certification, exports became easier" – (E)	FP
Leadership and organizational support	Top-down KPI setting, BOI incentives	Leadership commitment improves CE performance	"Carbon targets set by executive committee..." (F)	TQM/CEP
Customer feedback integration	Complaints, SLAs, and product improvement	Feedback loops guide green innovation	"Customers influence packaging, coatings, content types..." (D)	TQM
QA and internal systems	QA/QC, ISO 9001, internal audits	QA systems are embedded in ISO-compliant firms	"QA team operates from raw materials to final QC..." (G)	TQM
Employee engagement	Suggestions, reward systems, and KPI awareness	Engagement improves environmental and process outcomes	"Frontline employees see issues better than execs..." (G)	TQM
Supplier and procurement strategies	Green criteria, tiered suppliers, and audits	Firms screen suppliers based on sustainability	"We tier and audit all suppliers based on ISO 14001 and waste data..." (B)	GSCM
Logistics and emission reduction	Electric trucks, solar, optimized delivery	Emission reductions are often tech-limited	"We monitor carbon emissions from logistics... implement solar energy..." (A)	GSCM
Collaboration with partners	Customer-driven development, joint design	Partnerships are more customer-driven than firm-initiated	"We co-develop green products based on customer regulations" (H)	GSCM
Success measurement	KPIs, waste volume, green certifications	Success tied to tangible KPIs	"We use metrics like waste reduction, solvent reuse..." (A)	TQM/FP
Profitability and efficiency	Long-term ROI, tax incentives, BOI, image improvement	CE improves firm image, cuts costs over time	"Green image helps us win infrastructure projects..." (E)	FP/CEP
Market and regulation influence	Demand-driven change, export requirements	Market drives behavior more than regulation	"We adjust more to customer needs than government rules" (B)	FP/CEP

5. Conclusion

Based on the ten interviews and word-cloud analysis, local and national companies exhibited distinct capability and managerial profiles that influence how CEP, TQM, and GSCM are implemented, and how their benefits are realized and measured in terms of FP. These variations are shaped not only by company type but also by managerial style and the degree of ISO 14001 adoption. From a managerial perspective, national firms tended to apply a strategic and system-oriented management style, emphasizing formal procedures, cross-departmental coordination, and measurable performance outcomes (Psomas et al., 2011). Local firms, in contrast, reflected a reactive and adaptive management style, focusing on short-term problem solving, cost control, and incremental learning. This divergence in managerial orientation directly affected the scope and consistency of sustainability practices (Zhang et al., 2021).

In circular economy implementation, local firms emphasized cost barriers and market access constraints when adopting green materials or redesigning products, noting that "green materials are twice the price… limited vendors." Consequently, circularity initiatives were incremental, project-based, and closely tied to ROI considerations. This managerial tendency toward short-term financial prudence constrained broader CE transformation. National firms, guided by more formalized management styles, embedded CE within export-oriented programs emphasizing eco-label certification, carbon accounting, and material traceability. ISO-certified firms institutionalized CE through documented procedures, such as material substitution criteria, waste KPIs, and PDCA cycles, which facilitated repeatability and scalability in practices such as green packaging, solvent recovery, and energy reuse. Conversely, non-ISO firms (two local companies) described CE adoption as ad hoc and cost-dependent, typically initiated by customer demands or when payback periods were favorable (Thorley et al., 2022). These differences illustrate how both managerial style and ISO certification act as enablers of systemic CE adoption, converting sustainability intent into measurable practice.

Within the TQM dimension, managerial style again played a significant role. National firms, whose managers emphasized structured quality systems and continuous improvement, reported stronger alignment with ISO 9001 and KPI governance. Typical responses included: "the QA team operates from raw materials to final QC" and "carbon targets are set by the executive committee." Local firms also engaged in TQM practices, but their managerial focus was narrower and resource-driven, often constrained by limited training and audit capacity. Improvements occurred incrementally and were primarily responsive to customer feedback: "customers influence packaging, coatings, and content types" (Lepistö et al., 2022). In ISO environments, leadership established measurable KPIs, integrated employee feedback, and used systematic audits to reinforce accountability. Non-ISO firms still maintained basic quality control mechanisms but lacked the governance discipline and cross-functional integration found in ISO-

adopting firms. This evidence supports the view that managerial professionalism and formal quality systems together strengthen absorptive capacity and learning routines within organizations (Khajuria et al., 2022).

For GSCM, local firms described their practices as reactive and customer-led: "we co-develop green products based on customer regulations." Supplier screening and collaboration existed but were inconsistent, reflecting a flexible managerial approach shaped by market pressure rather than strategy. National firms, however, practiced proactive supplier management with tiered auditing, traceability, and environmental criteria in procurement "we rate and audit all suppliers based on ISO 14001 and waste data reports." These findings suggest that ISO certification reinforces structured managerial control and promotes long-term supplier partnerships, while non-ISO firms rely more heavily on relational trust and short-term adjustments (Schöggl et al., 2020).

In terms of firm performance, both groups reported reputational and market-related benefits, but their managerial motives differed. National firms viewed sustainability as a competitiveness strategy linked to export facilitation and brand positioning: "after certification, exports became easier." Local firms associate performance gains with operational efficiency and cost savings realized through waste reduction and energy reuse, with profitability dependent on ROI thresholds and incentive schemes. ISO-certified organizations demonstrated clearer performance linkages between environmental initiatives and strategic outcomes such as export access, project bids, and stakeholder confidence "the green image helps us win infrastructure projects." In contrast, non-ISO firms prioritized internal risk control and cost reduction with fewer explicit brand or market-access gains.

An examination of the word cloud patterns reveals clear differences in managerial orientation between national and local firms. National firms exhibit a more formalized managerial approach that emphasizes external legitimacy, regulatory compliance, and alignment with international standards. In contrast, local firms place greater emphasis on terms such as cost, waste, materials, and implementation, reflecting a pragmatic and cost-sensitive managerial style focused on operational feasibility rather than systemic integration (Sharma and Modgil, 2020). When these lexical patterns are integrated with the fifteen coded qualitative themes, including environmental management standards, supplier and procurement strategies, profitability and efficiency, the findings indicate that managerial style and ISO 14001 adoption jointly shape the maturity, structure, and performance outcomes of Circular Economy Practices, Total Quality Management, and Green Supply Chain Management. Firms that adopted ISO 14001 consistently reported the use of codified managerial routines, such as PDCA cycles, internal and external audits, carbon footprint measurement, supplier screening, and formal documentation processes. These routines contributed to greater transparency, accountability, and organizational learning, thereby strengthening the systematic integration of sustainability practices (Xu et al., 2018; Psomas et al., 2011). The prominence of keywords including standards, labels, image, carbon, and KPIs among ISO adopting firms further underscores the institutionalization of sustainability within their managerial systems. In contrast, non-ISO firms tended to emphasize cost control, vendor selection, and bidding processes, indicating a more reactive and budget-driven approach to sustainability implementation. This pattern suggests that sustainability initiatives in non-ISO firms are often pursued as isolated improvements rather than as part of an integrated management system.

Overall, the findings confirm that ISO 14001 certification amplifies the positive effects of structured managerial practices on sustainability integration. While ISO adopting firms demonstrate more comprehensive and learning-oriented sustainability systems, non-ISO firms continue to prioritize short-term cost considerations, resulting in narrower and less systemic sustainability outcomes. As illustrated in Fig. 2, these dynamics can be understood through the absorptive capacity framework, which captures the interaction between external pressures, internal managerial processes, and firm performance outcomes. External forces, including market requirements, customer expectations, and regulatory standards, function as knowledge triggers that initiate organizational learning. Internal managerial systems, particularly Total Quality Management and Green Supply Chain Management routines, facilitate the assimilation and transformation of this knowledge into operational practices. These learning processes ultimately generate performance outcomes such as efficiency gains, reputational benefits, and enhanced competitiveness. ISO 14001 certification strengthens these pathways by institutionalizing learning routines and formalizing sustainability governance, thereby reinforcing the translation of sustainability knowledge into sustained organizational performance (Cohen and Levinthal, 1990).

6. Implications

The results show that integrating sustainability into organizational systems has several managerial and policy implications. To achieve verifiable performance outcomes, CE should be integrated into TQM and GSCM frameworks rather than operating as a unique or compliance-driven program. In addition to institutionalizing ISO 14001 as a learning platform rather than just a certification, leadership must match CE indicators with key performance KPIs. Audits, compliance reports, and corrective action plans can be turned into tools for supplier engagement, eco-design, and carbon-linked performance enhancement. Product labeling, EcoVadis scores, and ISO 14001 external

communications can also translate sustainable credibility into competitive advantages.

Non-ISO 14001 firms should begin with fundamental quality controls, supplier self-assessments, and internal environmental audits to capture learning at low cost before pursuing full certification. Local firms can strengthen absorptive capacity through supplier tiering, green sourcing, and incremental eco-innovation pilots such as solvent recovery or packaging redesign. National firms, with more mature systems, should emphasize collaborative supplier development to diffuse sustainability gains across the value chain. Policy support is essential, especially for SMEs that face obstacles related to cost and skill. Participation can be accelerated by incentives like tax breaks, carbon credits, and BOI subsidies.

Using KPIs, carbon per unit, waste per unit, supplier compliance, and digital tools that incorporate material flows and emissions data, organizations and legislators should institutionalize sustainability. To improve competitiveness and long-term sustainability, this study offers both theoretical and practical recommendations for integrating CE into supply chains, business strategy, and governance.

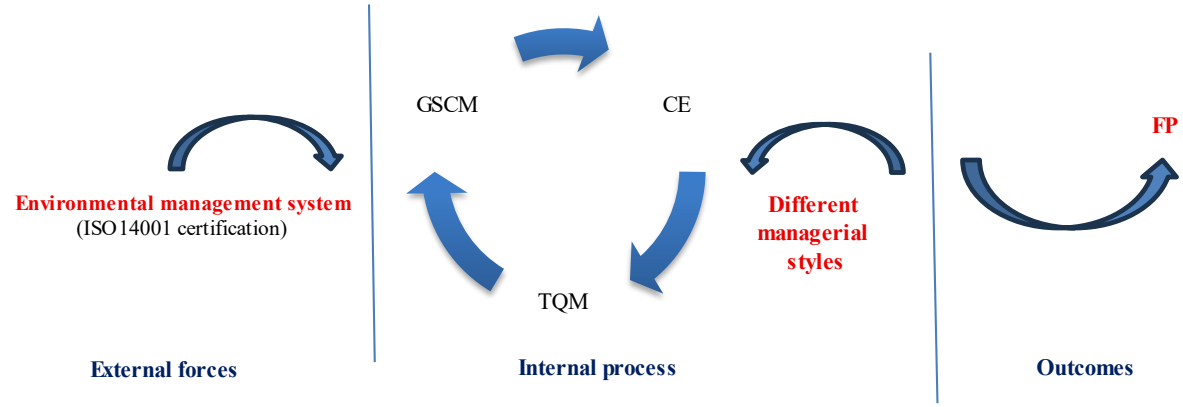

Fig. 2: Development of phenomenon dynamics in this case study based on ACPA theory (Cohen and Levinthal, 1990)

List of abbreviations

ACAP	Absorptive capacity theory
BOI	Board of investment
CE	Circular economy
CEP	Circular economy practices
ESG	Environmental, social, and governance
FP	Firm performance
GSCM	Green supply chain management
ISO	International organization for standardization
KPI	Key performance indicator
NVivo	Qualitative data analysis software (NVivo 12)
PDCA	Plan–do–check–act cycle
QA	Quality assurance
QC	Quality control
ROI	Return on investment
SDGs	Sustainable development goals
SLA	Service-level agreement
SMEs	Small and medium-sized enterprises
TQM	Total quality management

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Compliance with ethical standards

Ethical considerations

All participants provided informed consent, participation was voluntary, anonymity and confidentiality were ensured, and the study was conducted in accordance with institutional ethical guidelines.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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