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Overcoming reactance to climate change: The business-ecology nexus☆

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ABSTRACT

This study explores how concerns around misinformation, data integrity, and information asymmetry fuel psychological reactance among small business owners, impeding their adaptability to climate change initiatives. Through interviews with 25 small business owners across four countries, we uncover this reactance stemming from information risks. We propose the 'Business Ecology Nexus' framework to address these challenges. Grounded in co-creation and customer engagement principles, this framework manages psychological reactance by balancing ecological and business values, providing a strategic pathway for small businesses to mitigate information risks and drive climate change adaptation. Our work offers actionable recommendations for businesses, climate authorities, technical experts, and policymakers to implement environmental strategies that protect businesses, consumers, and ecosystems.

1. Introduction

Addressing climate change in the rapidly evolving global business landscape is paramount. The complexity of climate change presents a multifaceted challenge, requiring collective responses from diverse stakeholders to effectively mitigate its impacts (Bowen, Bansal, & Slawinski, 2018; George et al., 2019; Marty, Christopher, & Ageron, 2024). Despite growing global awareness, commercial interests often fuel resistance to change within economic systems, perpetuating inertia toward climate action (Nyberg et al., 2020). The reluctance of businesses worldwide to invest significantly in climate action, citing concerns over competitiveness and returns on investment, is evident (Finke, Gilchrist, & Mouzas, 2016; Warren-Myers, Hurlimann, & Bush, 2020).

Climate change inaction is significantly high, with small business owners facing regulatory uncertainty and difficulty anticipating climate policy impacts on investment decisions (Barbosa, Castañeda-Ayarza, & Ferreira, 2020; Smith, Discetti, Bellucci, & Acuti, 2022). This uncertainty, coupled with the short-term costs and uncertain long-term returns of climate responses, creates tension between profitability and sustainability (Alam, Du, Rahman, Yazdifar, & Abbasi, 2022; Jervis, 2024). The complexity of climate data and the plethora of scientific reports can overwhelm them, hindering their ability to discern the specific risks posed to their businesses (Hodson, Traynor, Wilkes, Dale, & Petersen, 2018; Sharma, Borah, Haque, & Adhikary, 2024). Managing the psychological reactance of small business owners to embrace climate change initiatives is pivotal in addressing information risks like disinformation (Bilfinger, Brummernhenrich, & Jucks, 2023; Ratcliff, 2021).

Small business owners typically need more knowledge, expertise, and financial resources to adapt their business processes to comply with climate change policies (Qamar, Ahmad, Oryani, & Zhang, 2022; Westman, Luederitz, Kundurpi, Mercado, & Burch, 2023). Prior research has extensively explored the influence of organizational and institutional pressures on corporate responses to climate change (Cadez, Czerny, & Letmathe, 2019; Damert & Baumgartner, 2018; Lee & Klassen, 2016; Lopes, Remoaldo, Ribeiro, & Martin-Vide, 2022). However, there remains a dearth of understanding regarding the perspectives of small businesses (Daddi, Todaro, De Giacomo, & Frey, 2018; Smith et al., 2020; Westman et al., 2023), and the intersection of these concepts within small business contexts remains inadequately studied (Khan, Gupta, Kumar, & Kumar, 2023; Smith et al., 2020).

The research on small business owners' climate change inaction is still nascent, particularly on their lack of engagement with policy

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(Barclay & Barker, 2020; Jervis, 2024; Westman et al., 2023). Convincing small business owners to embrace climate change initiatives requires a multifaceted approach that addresses information gaps, regulatory challenges, and psychological barriers (Alam et al., 2022; Barbosa et al., 2020; Marty et al., 2024; Smith et al., 2022).

This qualitative exploratory study addresses the scholarly call by examining climate change inaction among small business owners and the reasons for their resistance. Through 25 in-depth interviews, the study offers exploratory insights into their readiness to adapt to climate change initiatives. We argue that with better engagement by small business owners in designing and implementing climate change initiatives, stakeholders can ensure policies are tailored to their needs and capabilities. This approach fosters a sense of ownership, reduces resistance, and enhances willingness to adopt climate-friendly practices.

A collaborative strategy with enhanced customer engagement is pivotal to overcoming resistance (Hollebeek, Sarstedt, Menidjel, Sprott, & Urbonavicius, 2023; Sharma et al., 2024). We introduce the "Business Ecology Nexus" framework based on co-creation and customer engagement. This innovative approach balances business and ecological values for small business owners, overcoming psychological reactance and fostering co-creation among stakeholders (Hollebeek, Srivastava, & Chen, 2019). This framework facilitates a win–win scenario for all parties by promoting heightened business engagement with climate change initiatives. Organizational resilience in navigating climate change, particularly concerning natural resources, is critical for the sustainability of the ecosystem (de Ruyter et al., 2022). The study offers actionable recommendations for businesses, regulators, climate change advocates, and policymakers to address adversities and enhance engagement in climate initiatives. These include fostering industry-wide partnerships, developing tailored support programs for small businesses, and establishing transparent communication channels.

Moving forward, small businesses face climate change challenges and a broader array of environmental and social issues, including waste management, water conservation, and broader social responsibility initiatives like community well-being and employee welfare. Research has demonstrated that small businesses increasingly adopt strategies aligning environmental sustainability with operational benefits (de Oliveira, Ghobakhloo, & Figueira, 2023; Tyler et al., 2024). For instance, small businesses involved in waste reduction and circular economy practices can achieve ecological and economic benefits by minimizing waste and reusing resources (Chenavaz & Dimitrov, 2024). Similarly, in sectors such as agriculture and hospitality, efforts in water conservation have led to significant cost savings while contributing to environmental sustainability (Prakash, Sharma, Singh, & Vijayvargy, 2023). Additionally, the growing focus on social equity and employee welfare highlights the interconnectedness between business sustainability and broader social responsibilities (Ahmad, Ullah, Ryu, Ariza-Montes, & Han, 2023).

While not directly related to climate change, these challenges share common themes with climate adaptation, highlighting the need for a comprehensive sustainability strategy that integrates ecological, social, and operational imperatives. The Business Ecology Nexus framework introduced in this study gives small businesses a holistic approach to managing environmental risks and opportunities across multiple domains. Its broader applicability underscores its potential to foster small business engagement in sustainability, address waste management and social equity issues, and ultimately strengthen organizational resilience.

By incorporating insights from other environmental and social domains, small businesses can ensure a more comprehensive design and implementation of climate change initiatives. Expanding the focus to include diverse sustainability challenges allows businesses to leverage synergies across areas, creating integrated solutions that promote long-term viability.

2. Literature review

2.1. Customer engagement

Customer engagement remains a concept subject to varied interpretations, lacking a unified definition despite considerable attention in the marketing literature (Calder et al., 2019; Lim, Rasul, Kumar, & Ala, 2022). Brodie, Hollebeek, Jurić, and Ilić (2011) and Hollebeek (2011) offer a comprehensive perspective, defining it as a psychological state cultivated through interactive experiences with a brand or firm. This encompasses cognitive, affective, and behavioral dimensions beyond mere transactions. Despite differing nuances, its significance in contemporary marketing is evident, aiming to foster long-term customer relationships and desired behaviors (Bozkurt, Gligor, & Gligor, 2022; Calder, Malthouse, & Schaedel, 2009; Hollebeek, Kumar, & Srivastava, 2022; Lim et al., 2022).

As concerns about climate change and environmental sustainability grow, businesses recognize the necessity of integrating climate considerations into customer engagement strategies (Chuah, El-Manstrly, Tseng, & Ramayah, 2020; Pucci, Casprini, Galati, & Zanni, 2020; Sharma et al., 2024). Customers are key stakeholders, making active engagement essential for addressing climate issues (Hur, Moon, & Kim, 2020). Strategic collaborations with customers have emerged as a powerful tool for businesses in this endeavor (Dwivedi, Balakrishnan, Das, & Dutot, 2023; Rashidi-Sabet, Madhavaram, & Parvatiyar, 2022), allowing them to leverage positive engagement in climate initiatives to drive sustainability, enhance customer satisfaction, and promote pro-environmental actions. However, according to research on environmental commitment, there is often a gap between attitudes and behaviors, intentions are not always followed by actions (Sukumara and Majhi, 2024). White, Habib, and Hardisty (2019) offer different approaches to close this gap and foster concrete engagement about environment. Social influence thus appears to be an important driver of commitment through "descriptive norms" which refer to information about what others do or be used to doing (Reno, Cialdini, & Kallgren, 1993). Tangibility is another motivator, so providing clear substantiated information on the current effects of climate change helps to increase engagement. Thus, Slawinski, Pinkse, Busch, and Banerjee (2017) advocate that managers' limited understanding of climate issues hampers climate action.

While customer engagement is well-studied, its relevance to business is often overlooked (Khan et al., 2023). Understanding business perspectives is crucial for informing sustainability strategies and influencing a broader appeal (Shankar & Gupta, 2024). However, research on small business engagement in climate issues remains scarce (Khan et al., 2023; Marty et al., 2024; Smith et al., 2020), highlighting a significant knowledge gap. Further, small businesses lacking resources and expertise face barriers to climate initiatives (Alam et al., 2022). Targeted support, including financial aid and training, can empower them to adopt sustainable practices (Smith et al., 2020). To help overcome these issues, we explore the engagement of small businesses and their role in fostering sustainability.

2.2. Psychological reactance theory

Psychological reactance theory explains how individuals respond to perceived threats to their autonomy and freedom (Brehm, 1966). When individuals feel their freedom of choice is challenged, they experience reactance—a state marked by defiance and a strong urge to reclaim autonomy (Badewi, Shehzad, & Naeem, 2023). As a result, individuals adopt behaviors contrary to recommendations to restore their freedom (Dillard & Shen, 2005; Rosenberg & Siegel, 2018). The intensity of reactance depends on the perceived threat's importance, legitimacy, and individual characteristics (Rosenberg & Siegel, 2018). We argue that climate change initiatives and regulations can trigger significant reactance, particularly among small business owners who highly regard

autonomy and independence (McGee & Terry, 2024). Climate measures may clash with their entrepreneurial ethos, rooted in individual initiative and self-determination, leading to skepticism or rejection (Ratcliff, 2021). Concerns about added costs, operational changes, and workflow disruptions fuel apprehension and resistance (Bilfinger et al., 2023).

Additionally, stringent regulations impose financial burdens on businesses with limited resources and profit margins, potentially undermining their ability for climate action (Barbosa et al., 2020; Jervis, 2024). Further, a lack of specialized knowledge hampers regulatory compliance for small businesses, unlike larger corporations with dedicated resources (Friedman & Ormiston, 2022; McGee & Terry, 2024; Westman et al., 2023). Also, skepticism and misinformation trigger resistance, influencing business owners' reactions (Bilfinger et al., 2023; Ratcliff, 2021). This study actively investigates how climate change initiatives influence small business owners and their propensity to resist, leading to inaction.

While psychological reactance significantly contributes to small business owners' resistance to climate change initiatives, it is not the only barrier they face. Regulatory uncertainty often leaves them unsure about compliance requirements, causing hesitation to commit to sustainable practices due to fears of penalties (Alam et al., 2022). The lack of financial resources further hinders their ability to invest in necessary technologies or practices. Operating on tight margins, many small businesses view climate initiatives as financially burdensome rather than beneficial (Westman et al., 2023).

Additionally, the complexity of climate-related information overwhelms many owners, leading to disengagement as they struggle to interpret scientific data and identify actionable steps. Misinformation exacerbates these challenges, distorting perceived risks and benefits and fostering skepticism about climate action (Sharma et al., 2024). Business owners often prioritize short-term profitability, overshadowing long-term sustainability. Thus, they encounter difficulty accessing the right resources for adaptation, whether through limited support networks or inadequate information on available technologies (Jervis, 2024). Climate policies must address these diverse barriers to promote more inclusive and sustainable engagement. They must also empower small business owners to embrace climate initiatives and contribute positively to sustainability efforts.

3. Methodology

3.1. Research approach

We conducted in-depth, semi-structured interviews with twenty-five small business owners, each with a minimum of ten years of experience, from four countries: Denmark, Australia, Malaysia, and Sri Lanka (see Table 1 for the participant profile).

The country selection deliberately captured diverse perspectives on sustainability practices. Denmark, a leader in climate initiatives, offered insights into sustainable practices. Australia's varied geography and natural resource reliance provided valuable environmental management lessons. Sri Lanka and Malaysia, deeply affected by the 2004 Tsunami, presented compelling cases for examining climate vulnerabilities. Sri Lanka's context was rich for exploring resilience-building amid climate impacts, while Malaysia's focus was on sustainable development amidst rapid urbanization and industrialization.

Our sampling methodology was meticulous and purposeful (Campbell et al., 2020). Participants were identified through the Chamber of Commerce, business, and trade associations, supported by personal references. This method yielded 14 participants. Additionally, we utilized snowball sampling (Emerson, 2015) to recruit an additional 11 participants through recommendations from existing participants. To ensure convenience and accessibility, interviews were conducted via Zoom videoconferencing, guaranteeing interviewee anonymity to promote candid responses and open discussions.

The study experienced data saturation after the 19th interview (Hennink & Kaiser, 2022). Additionally, six further participants were interviewed to ensure member validation (Bell, Bryman, & Harley, 2022) and facilitate synthesized member checking (Birt, Scott, Cavers, Campbell, & Walter, 2016). Interviews were conducted online from September 2023 to March 2024, with durations ranging from 52 to 86 min each. The key research questions were: i) How do you perceive climate change impacting your business? ii) What challenges do you face in implementing climate change initiatives? iii) To what extent do you consider climate change information credible? iv) How would you rate your knowledge of climate change initiatives? v) How do regulatory measures affect your business, and do they hinder or support your operations? vi) What role should small businesses play in shaping climate change policies? vii) Are there policies that have negatively impacted your business?

Table 1
Participant profile.

Code	Country	Industry	Experience
D1	Denmark	Agriculture	12
D2	Denmark	Trading	10
D3	Denmark	Hospitality	15
D4	Denmark	Agriculture	12
D5	Denmark	Confectionary	13
D6	Denmark	bicycle	16
A1	Australia	Dairy	12
A2	Australia	Wine	11
A3	Australia	Wine	30
A4	Australia	Trading	21
A5	Australia	Agriculture	14
A6	Australia	Tourism	12
A7	Australia	Meat	14
M1	Malaysia	Fashion	16
M2	Malaysia	Food and beverage	10
M3	Malaysia	Retail	10
M4	Malaysia	Retail	12
M5	Malaysia	Beauty and wellness	17
M6	Malaysia	Confectionary	13
SL1	Sri Lanka	Garment	24
SL2	Sri Lanka	Tea	21
SL3	Sri Lanka	Hospitality	15
SL4	Sri Lanka	Tea	25
SL5	Sri Lanka	Agriculture	20
SL6	Sri Lanka	Agriculture	17

3.2. Data analysis

Following Magnani and Gioia (2023), data analysis involves three stages: i) creating analytic codes and categories, assembling them into a data structure containing 1st order (informant-centered) codes and 2nd order (theory-centered) themes and aggregate dimensions; ii) a grounded theoretical model by constantly comparing data across informants; iii) present findings thorough, data-driven narrative, with 2nd order themes and aggregated dimensions, with an iterative use of 1st order quotations (see Table 2 data structure).

We used multiple strategies to ensure validity and generalisability. Three coders manually validated the coding, employing a percentage agreement method to assess levels of agreement. Intercoder agreement revealed an 88 % overlap, with the remaining 12 % of data deliberated among coders until a consensus was reached. Synthesized member checking with 10 participants was conducted after one month of interviews to authenticate the conceptual model and validate thematic accuracy (Birt et al., 2016). Finally, the conceptual model and the findings were discussed with three different entrepreneurs not included in the study to ensure external validity (Rose & Johnson, 2020).

In constructing first-order concepts, polarized responses revealed both resistance to accepting climate change initiatives and a desire for increased engagement to adapt to them. This led to the development of second-order categories of information risk and engagement. The themes of disinformation, data integrity, and information asymmetry

Table 2
Data structure.

1st Order Concepts	2nd Order Themes	Theoretical Grounding	Aggregate Dimensions	Iterative process for conceptual development	Substantive Concept
Data overload hampers clarity and decision-making. There is doubt about decisions due to misinformation. Restrictions on autonomy intensify frustration with policies. Disbelief in scientific facts breeds reluctance to adapt. Media misinterpretations fuel resistance and pushback.	Disinformation	Psychological Reactance	Business value	Pragmatic view. Must yield measurable future value. Business certainty, long-term view, and sustainable return amidst market potential Retune on investment for the risk and ensure business continuity. Transparency and measurable results for climate action.	Business Ecology Nexus
Businesses doubt climate data integrity and reliability. Data inconsistency deviates from past experiences. Frustration with the lack of transparency in the policy. Impossible to relate the data to the business model. Resistance to accept data due to lack of central authority	Data Integrity	Co-creation & Customer Engagement		Win-win: Climate action efforts generate benefits for both businesses and the planet.	
Balanced information promotes fair, inclusive decisions. Information imbalance hampers small business involvement. Lack of symmetry obstructs climate policy adaptation. Disparity undermines genuine small business efforts. One-way decisions perpetuate frustration and resistance.	Information Asymmetry				
Better insights on initiatives crucial for business progression. Access to knowledge enhances control over decisions. Learning connects environmental goals with business. Clear, relevant data facilitates easier adaptation and action. Continuous learning is vital for overcoming resistance.	Learning		Ecological value	Dedicated to preserving natural habitats while ensuring business protection. Ecological value is non-negotiable; committed to impactful initiatives. Focused on eco-friendly strategies for meaningful environmental change. Success rests in tangible results and biodiversity preservation.	
Sharing insights with policymakers for better understanding. Collaboration between policymakers and businesses Ground-level business ideas are essential for real solutions. Equal sharing of knowledge in a transparent manner. Common platform for collective decision-making	Knowledge Sharing			Prioritize the plant in decision-making for a sustainable future.	
Collaboration optimizes resources for climate change plans. Aligning the industry with regulators and policy is critical. Integrated resources enhance adaptation to climate initiatives. Partnerships foster innovative solutions and synergy. Combining skills is vital to facing challenges effectively.	Resource Integration				

emerged with information risk, while engagement themes included learning, knowledge sharing, and resource integration (see Table 3 for selective quotes).

These themes are grounded in psychological reactance, co-creation, and customer engagement theories (Gioia, 2021). Consequently, aggregate dimensions of business and ecological value were derived, reflecting dynamic data analysis facilitated by grounded theory (Corbin & Strauss, 2014; Gioia, Corley, & Hamilton, 2013). A substantive conceptual outcome was synthesized into a novel concept termed the 'Business Ecology Nexus.' This concept, aligning with Gioia's emphasis on qualitative studies contributing to new conceptual or theoretical developments, represents an innovative outcome (Magnani & Gioia, 2023),

The conceptual model (see Fig. 1 at the end of the findings section) is

Table 3
Selective quotes, themes, and theoretical foundations.

Themes	*Selective quotes from respondents*			*Information Risk & Psychological Reactance*
Disinformation	*"With all this talk about climate change, we are drowning in information. Finding accurate data is impossible. There is too much noise that can throw us off track. Our hands are tied, and it is hard not to push back when there is no freedom of choice"*	*"The flood of propaganda confuses me. As a small business owner, I only consider credible, evidence-based information. However, this misinformation often sparks doubt about climate change initiatives. I am hesitant. Without clear, trustworthy guidance, we cannot call the shots"*	*"It is hard to agree to climate change initiatives with so much out there and misinterpretations, especially by the media. It is like we are being boxed in, making us want to push back even harder."*	*This study identifies three key aspects of information risk: disinformation, data integrity challenges, and information asymmetry. There is a gap in the awareness of climate change data, leading to misconceptions (*Hodson et al., 2018; Sharma et al., 2024; Su et al., 2024*).*
Data Integrity	*"There's so much data out there. It is like drinking from a firehose. I don't trust these claims. I must have the freedom to select what is relevant to my business. We are not big oil companies; I produce canned food, that is it".*	*"I am committed to upholding rigorous standards and providing a solid foundation for sustainability initiatives. However, the lack of reliable data clouds my vision, and I resist all this big talk. It is frustrating when they undermine independent business decisions"*	*"As a businessman, I always try to understand climate change data and see some light. With so much hype, I do not believe everything is true. My gut feeling is that I resist these things; what if I stop my business? Will this improve? I don't think so."*	*The bureaucratic policies foster skepticism toward climate change mitigation efforts (*Citrin & Stoker, 2018; Treen et al., 2020; Vasist & Krishnan, 2023*).*
Information Asymmetry	*"We don't have the same access to information. Unlike big corporations, we face major challenges. There is no level playing field. It is annoying when decisions are made without input. We feel excluded and resistant. It is easy to talk, but we are on the road with real life."*	*"Information disparities block small businesses' genuine effort to adapt climate change policies. Not all businesses create these environmental issues. My factories are good, and we have quality procedures. There is an imbalance in the information flow"*	*"They should understand our perspective on crucial decisions. It is frustrating, as all these decisions are one-way traffic. We cannot accept these. I have been in business for 30 years, and this madness started a few years back. Honesty, I hate this hypocrisy."*	*The complexity and lack of clarity in formation impact the climate change adaptation of small businesses (*Bilfinger et al., 2023; Taddicken & Wolff, 2023*). The multifaceted challenges of information risk influence small business owners experiencing psychological reactance (*Friedman & Ormiston, 2022; McGee & Terry, 2024*).*

Themes	*Selective quotes from respondents*			*Co-creation & Customer Engagement*
Learning	*"As a business owner, I'm eager to learn from best practices and expand my knowledge. By staying informed, we can better align our business strategies with the environment and address hurdles that hold back our connectivity. Also, freedom to make informed decisions"*	*"You know, I've mostly learned about climate change by getting my hands dirty rather than reading books, but I see the value in staying up to date. When information is clear and relevant, getting on board and making moves is easier"*	*"I know I gotta keep investing in learning to stay on top of things as they change. Being an exporter, I'm seeing some countries getting pretty strict about these rules, and if I don't catch up and start following them, I could be in trouble real quick"*	Hollebeek et al. (2019) *identify three core processes of customer engagement within the service-dominant (S-D) logic: customer learning., customer knowledge sharing, and customer resource integration (*Lim et al., 2022*; Ng et al., 2020;* Vargo, Wieland, & O'Brien, 2023*). In this study, we adopt Hollebeek et al.'s theoretical framework (2019) to build co-creation and customer engagement with small business owners.*
knowledge Sharing	*"If we start speaking up and sharing what we've been through, we could really help shape better decisions. Opening up channels for communication will improve collaboration. And when we feel more in control, we're way more likely to get involved and stop dragging our feet"*	*"Mate, unlike those policy folks, we business owners have a knack for seeing things as they are. We see how the world is changing. Sharing our stories will be a goldmine. Our guys are happy to get on the board. Always better to work together on these things"*	*"Bridging the gap between government and businesses is essential for effective climate change action. To accept these ideas and initiatives, we need first to be sure of transparent policies. They should be equal to every business and can't favor one sector and jeopardize another"*	*Small businesses can become crucial agents in combating climate change through enhanced learning and competency (*Smith et al., 2020*). Further, can facilitate knowledge sharing, essential for value co-creation, with collaborative efforts to share sustainability strategies with stakeholders (*Khan et al., 2023*).*
Resource Integration	*"Combining resources and effort smartly is the key to implementing climate change plans in my business. By teaming up with others and making the most of what we've got, I'm not just aiming for sustainability but also to see some solid returns on investment"*	*"Optimizing resources is paramount for successfully adapting to climate change initiatives. I can navigate complexities more effectively by integrating resources strategically, get things like and collaborating with partners. This should be a collaborative effort with mutual interest like tax relief".*	*"I'm fine with combining different skills and resources to devise practical solutions. And let's face it: Partnership is key for business growth—whether it's with the competition or working things out with the regulators, a bit of give and take goes a long way"*	*Businesses foster positive climate change engagement by actively participating in resource integration for collective decision-making, as they play a crucial role in connecting customers, industry, and regulations (*Dwivedi et al., 2023*; Ruyter et al., 2022;* Sharma et al., 2024*).*

(*continued on next page*)

Table 3 (*continued*)

Themes	*Selective quotes from respondents*			*Information Risk & Psychological Reactance*
Themes	***Selective quotes from respondents***			***Business Ecology Nexus***
Business Value	*"I'm pragmatic about climate change initiatives. Any investment I make needs measurable results, whether it's switching to eco-friendly packaging or implementing energy-efficient practices. It should appear on the balance sheet."*	*"For me, climate change initiatives aren't just about being environmentally conscious; they're about driving concrete business value. The efforts should be financially viable, like increased sales, new customers and cost savings. It's about making investments that are transparent and backed by evidence"*	*"As an entrepreneur, I understand the importance of transparent and measurable results regarding climate change initiatives. It's about making data-driven decisions that benefit both my business and the planet." This should be a win–win situation"*	*The study introduces the Business Ecology Nexus, which integrates business and ecological values to manage climate change initiatives with five core features.*
Ecological Value	*"Preserving the ecosystem is a must and non-negotiable for me. I'm all in for initiatives that make a difference, like cutting carbon emissions, cleaning the air and water, etc. It's about being straight up and taking responsibility for my part in protecting this beautiful planet"*	*"I'm dedicated to initiatives that produce tangible environmental benefits, such as preserving natural habitats. It's about being transparent about my ecological impact and continuously striving for improvement. However, businesses also need to be protected"*	*"For me, the success of climate change initiatives lies in their ability to deliver tangible results. We must not destroy nature solely for consumption. However, the world cannot operate without business. Of course, there should be proper balance. We need a car no matter what it takes"*	***Symbiotic Relationship**: Aligns business operations with ecological preservation, leveraging long-term sustainable practices through co-creation and engagement.* ***Balanced Approach**: Business goals are integrated with ecological concerns, creating a win–win situation.* ***Synergistic Benefits:** The Nexus drives long-lasting advantages for stakeholders by promoting sustainability and resilience[, heralding a new era in business-environment interaction.* ***Paradigm Shift:** The nexus directs a departure from profit-centric models to holistic approaches, acknowledging the intertwined nature of economic prosperity and environmental health.* ***Leadership in Sustainability:** Embracing the Nexus empowers businesses to lead in sustainability, attract eco-conscious consumers, and build a competitive advantage.*

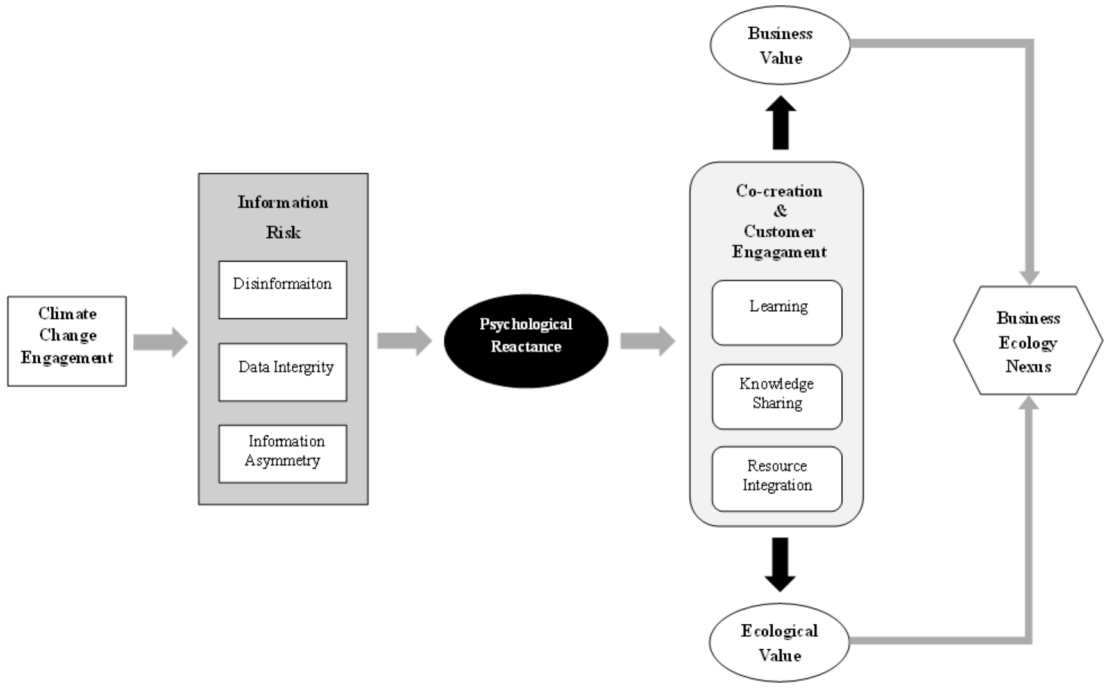

Fig. 1. Business ecology nexus.

developed and grounded in the data structure. It offers the potential for future research and serves as a platform for building propositions and converting them into testable hypotheses (Gioia, 2021).

3.3. Findings

Table 2 and Table 3 present the data structure and the themes, respectively.

3.3.1. Information risk

3.3.1.1. Disinformation. In the context of climate change, disinformation campaigns often aim to cast doubt on the scientific consensus regarding the reality and severity of climate change. These campaigns may be propagated through various channels, including digital and traditional media (Abbass et al., 2022; Hodson et al., 2018). The growth of disinformation poses a significant challenge as businesses need help to discern accurate information amidst the noise (Filieri, Acikgoz, & Du, 2023).

The echo chambers exacerbate the problem, as individuals gravitate towards information that aligns with their beliefs, reinforcing preconceived notions and hindering open dialogue (Williams, 2015). Greenwashing is a tactic that creates misleading or false claims about environmental practices and disinformation in the context of climate change initiatives (Vasist & Krishnan, 2023). Confirmation bias, the tendency to seek out information that confirms preexisting beliefs while ignoring contradictory evidence, further compounds the problem. Small business owners susceptible to confirmation bias may interpret climate change information selectively, resulting in skewed perceptions and decision-making (Taddicken & Wolff, 2023).

The following quotes illustrate disinformation.

" With all this talk about climate change, we are drowning in information. Finding accurate data is impossible. There is too much noise that can throw us off track. Our hands are tied, and it is hard not to push back when there is no freedom of choice" (A2)

"The flood of propaganda confuses me. As a small business owner, I only consider credible, evidence-based information. However, this misinformation often sparks doubt about climate change initiatives. I am hesitant. Without clear, trustworthy guidance, we cannot call the shots" (D6).

" "It is hard to agree to climate change initiatives with so much out there and misinterpretations, especially by the media. It is like we are being boxed in, making us want to push back even harder." (M4).

3.3.1.2. Data integrity. Despite acknowledging the existence of climate change, individuals often lack specific knowledge regarding its impacts and the efficacy of mitigation measures (Vasist & Krishnan, 2023). Research indicates a gap between businesses awareness of climate change and understanding of its intricacies (Huang & Wang, 2024). Access to comprehensive and accurate data is necessary for businesses to formulate effective adaptation strategies, allocate resources efficiently, and mitigate risks associated with climate change (Westman et al., 2023). Small businesses relying on flawed or incomplete data risk regulatory non-compliance, which can result in legal penalties, fines, and reputational damage. Further, misunderstanding climate change's timing and scale often leads to viewing it as a distant threat rather than an immediate crisis (Su et al., 2024). A damaged reputation can diminish customer trust and loyalty, resulting in financial setbacks and a competitive disadvantage.

The following quotes illustrate data integrity.

"There's so much data out there. It is like drinking from a firehose. I don't trust these claims. I must have the freedom to select what is relevant to my business. We are not big oil companies; I produce canned food, that is it". (M6)

"I am committed to upholding rigorous standards and providing a solid foundation for sustainability initiatives. However, the lack of reliable data clouds my vision, and I resist all this big talk. It is frustrating when they undermine independent business decisions." (D2).

"As a businessman, I always try to understand climate change data and see some light. With so much hype, I do not believe everything is true. My gut feeling is that I resist these things; what if I stop my business? Will this improve? I don't think so." (SL4).

3.3.1.3. Information asymmetry. Significant information about climate change is derived from official regulatory systems. Lack of trust in regulatory sources exacerbates information asymmetry, fostering resistance to change among small businesses (Citrin & Stoker, 2018). To mitigate information asymmetry, marketers must adopt strategies that align messaging with broader societal values and promote trust-building initiatives (Sun & Higham, 2021).

Unlike corporations, small businesses face a major hurdle in the fight against climate change as they lack access to crucial information (Alam et al., 2022; Qamar et al., 2022). To address this disparity, efforts are needed to democratize access to information through educational programs and collaborative platforms. Addressing the multifaceted challenges of information risk requires a holistic approach encompassing promoting data literacy and bridging information asymmetries (Liyanaarachchi, Mifsud, & Viglia, 2024).

The following quotes illustrate Information Asymmetry.

"We don't have the same access to information. Unlike big corporations, we face major challenges. There is no level playing field. It is annoying when decisions are made without input. We feel excluded and resistant. It is easy to talk, but we are on the road with real life." (M5)

"Information disparities block small businesses' genuine effort to adapt climate change policies. Not all businesses create these environmental issues. My factories are good, and we have quality procedures. There is an imbalance in the information flow." (D1)

"They should understand our perspective on crucial decisions. It is frustrating, as all these decisions are one-way traffic. We cannot accept these. I have been in business for 30 years, and this madness started a few years back. Honesty, I hate this hypocrisy. (A3).

3.3.2. Co-creation & customer engagement

3.3.2.1. Customer learning. Constrained by limited resources and capacities, small businesses often prioritize short-term urgencies over long-term necessities (Smith et al., 2022). Small business owners face significant challenges due to climate change impacts, compounded by a lack of formal knowledge (Niemistö et al., 2019; Nyberg, Ferns, Vachhani, & Wright, 2022). Access to information on compliance procedures often leads to confusion, hindering their ability to act effectively due to resource constraints (Qamar et al., 2022; Williams & Schaefer, 2013). Limited technical expertise and financial resources exacerbate this issue, necessitating professional support to navigate climate change initiatives (Alam et al., 2022). Small businesses prioritize expert guidance and training to integrate climate change actions into their operations, enhancing their confidence and capability to participate in such initiatives. Proper guidance also facilitates access to financial incentives like tax benefits and carbon credits, reinforcing their engagement in climate change mitigation efforts (Abbass et al., 2022; Treen, Williams, & O'Neill, 2020).

The following quotes illustrate the vital role of customer learning.

"As a business owner, I'm eager to learn from best practices and expand my knowledge. By staying informed, we can better align our business strategies with the environment and address hurdles that hold back our connectivity. Also, freedom to make informed decisions." (M2).

"You know, I've mostly learned about climate change by getting my hands dirty rather than reading books, but I see the value in staying up to date. When information is clear and relevant, getting on board and making moves is easier." (D3).

"I know I gotta keep investing in learning to stay on top of things as they

change. Being an exporter, I'm seeing some countries getting pretty strict about these rules, and if I don't catch up and start following them, I could be in trouble real quick" (A4).

3.3.2.2. Customer knowledge sharing. Small businesses can proactively engage with climate change catastrophes (Qamar et al., 2022), demonstrating a positive approach to addressing environmental challenges. This necessitates collaborative efforts among value chain partners (Khan et al., 2023). A transparent and real-time information-sharing platform facilitates such collaboration and fosters positive engagement (Dwivedi et al., 2023; Rashidi-Sabet et al., 2022). Further, policymakers and industry partners should establish a platform for small businesses to share their sustainability initiatives and receive support in achieving their green goals. As a result of collaboration, small businesses can engage with B2B partners in the value chain, sharing best practices, offering support, and gaining valuable insights to create mutual value (Hur et al., 2020; Khan et al., 2023). Additionally, the collective voice of connected small businesses influences regulators and policymakers to implement practical and viable climate change policies and regulations tailored to their needs (Alam et al., 2022; Sharma et al., 2024).

The following quotes illustrate the importance of customer knowledge sharing.

"If we start speaking up and sharing what we've been through, we could really help shape better decisions. Opening up channels for communication will improve collaboration. And when we feel more in control, we're way more likely to get involved and stop dragging our feet."(D4).

A2"Mate, unlike those policy folks, we business owners have a knack for seeing things as they are. We see how the world is changing. Sharing our stories will be a goldmine. Our guys are happy to get on the board. Always better to work together on these things" (A4).

"Bridging the gap between government and businesses is essential for effective climate change action. To accept these ideas and initiatives, we must first be sure of transparent policies. They should be equal to every business and can't favor one sector and jeopardize another" (M3).

3.3.2.3. Customer resource integration. Despite aspiring to advance climate change initiatives, many small businesses encounter challenges due to resource constraints (Barbosa et al., 2020; Smith et al., 2022). Limited resources and capacities hinder their engagement in decarbonization efforts, including a lack of knowledge and finance for climate-proofing (Herrmann & Guenther, 2017). Allocating funding and promoting digital finance concepts are vital to facilitate their involvement, given the upfront costs of sustainability efforts (Alam et al., 2022; Qamar et al., 2022). Providing technical experts and facilitators helps design and implement viable climate change initiatives.

Moreover, small businesses can address climate change issues by fostering mutual resource integration through collaborative networks and partnerships (Hodson et al., 2018; Shankar & Gupta, 2024; Smith et al., 2022). Sharing hands-on business experiences and knowledge empowers policymakers to grasp the groundwork for effective climate change initiatives. This collaboration enables small businesses to surmount barriers and contribute meaningfully to combating climate change.

The following quotes exemplify the vitality of customer resource integration.

"Combining resources and effort smartly is the key to implementing climate change plans in my business. By teaming up with others and making the most of what we've got, I'm not just aiming for sustainability but also to see some solid returns on investment." (D5)

"Optimizing resources is paramount for successfully adapting to climate change initiatives. I can navigate complexities more effectively by integrating resources strategically, getting things done, and collaborating with partners. This should be a collaborative effort with mutual interest, like tax relief" (M1).

I'm fine with combining different skills and resources to devise practical solutions. And let's face it: Partnership is key for business growth—whether it's with the competition or working things out with the regulators, a bit of give and take goes a long way"(D6).

3.3.3. Business & ecological value

3.3.3.1. Business value. Small business owners prioritize initiatives that offer tangible business value while aligning with broader environmental objectives. This emphasis on business value underscores the necessity for initiatives to demonstrate clear returns on investment, as evidenced by increased sales, cost savings, or enhanced customer loyalty (Barbosa et al., 2020). Small business owners advocate for initiatives backed by reliable evidence and data-driven decision-making, highlighting their pragmatic approach (Smith et al., 2022).

Implementing sustainable practices helps small businesses save costs through resource optimization and operational efficiencies and meets consumer preferences (Damert & Baumgartner, 2018). Moreover, consumers increasingly favor environmentally conscious companies, driving the demand for sustainable products and services (Su et al., 2023). By aligning with climate change initiatives, small businesses can stand out, attract environmentally conscious consumers, and enhance their brand reputation, leading to increased market share. Proactively embracing climate change initiatives ensures compliance with regulations and mitigates the risk of penalties and reputational damage. By staying ahead of regulatory trends, small businesses position themselves strategically for future opportunities (Hodson et al., 2018; Westman et al., 2023).

The following quotes illustrate the business value.

"I'm pragmatic about climate change initiatives. Any investment I make needs measurable results, whether switching to eco-friendly packaging or implementing energy-efficient practices. It should appear on the balance sheet." (M2).

"For me, climate change initiatives aren't just about being environmentally conscious; they're about driving concrete business value. The efforts should be financially viable, such as increased sales, new customers, and cost savings. It's about making investments that are transparent and backed by evidence." (D3).

"As an entrepreneur, I understand the importance of transparent and measurable results regarding climate change initiatives. It's about making data-driven decisions that benefit both my business and the planet." This should be a win–win situation" (SL6).

3.3.3.2. Ecological value. Concurrently, the ecological value represents the environmental benefits of climate change initiatives, which small business owners perceive as integral to sustainable business practices. Small business owners should ensure transparency in environmental reporting, aiming to adopt initiatives that align with sustainability metrics (Bowen et al., 2018).

Therefore, by prioritizing sustainability, small businesses play a crucial role in safeguarding ecosystems, conserving natural resources, and mitigating adverse impacts (Abbass et al., 2022; Hur et al., 2020). Small businesses can preserve habitats and minimize pollution, contributing to the preservation of ecosystems and endangered species. Small businesses' engagement in ecological preservation enhances ecosystem resilience and helps communities adapt to climate-related challenges such as extreme weather events and habitat loss. Thus, ecological value extends beyond environmental considerations to social and economic benefits (Khan et al., 2023; Treen et al., 2020).

The following quotes illustrate the ecological value.

Preserving the ecosystem is a must and non-negotiable for me. I'm all in for initiatives that make a difference, like cutting carbon emissions, cleaning the air and water, etc. It's about being straight up and taking responsibility for my part in protecting this beautiful planet" (D5).

I'm dedicated to initiatives that produce tangible environmental benefits, such as preserving natural habitats. It's about being transparent about my

ecological impact and continuously striving for improvement. However, businesses also need to be protected" (SL4).

"For me, the success of climate change initiatives lies in their ability to deliver tangible results. We must not destroy nature solely for consumption. However, the world cannot operate without business. Of course, there should be a proper balance. We need a car no matter what it takes" (M5).

3.3.3.3. Business ecology nexus. The study introduces the Business Ecology Nexus, which integrates business and ecological values to manage climate change initiatives with five core features.

Symbiotic Relationship: The Business Ecology Nexus aligns business operations with ecological preservation, leveraging long-term sustainable practices through co-creation and engagement. For example, a manufacturing company may collaborate with environmental organizations to develop eco-friendly production processes that minimize waste and pollution.

Balanced Approach: Business goals are integrated with ecological concerns, creating a win–win situation. Building strategic partnerships with suppliers for echo-friendly sourcing materials ensures high-quality products for customers and builds loyalty while contributing to conservation efforts.

Synergistic Benefits: The Nexus drives long-lasting advantages for stakeholders by promoting sustainability and resilience, ushering in a transformative era of interconnected prosperity and environmental stewardship. This results in improved bottom lines and enhanced value for stakeholders, encompassing financial gains and broader societal benefits.

Paradigm Shift: The Nexus moves away from profit-centric models, embracing holistic approaches that recognize the interdependence of economic prosperity and environmental health. Implementing energy-efficient practices and offering eco-friendly products set a new industry standard for success.

Leadership in Sustainability: Embracing the Nexus empowers businesses to lead in sustainability, attract eco-conscious consumers, and build a competitive advantage. By positioning itself as a leader in sustainability, the company can capture a larger market share, enter new markets, and establish itself as a trusted brand in the eyes of consumers.

Managing information risks, fostering collaboration, and promoting the Business Ecology Nexus is crucial to implementing the Nexus effectively. We recommend the following:

Mitigating information risks: Beyond establishing a management information system, we propose implementing digital climate dashboards tailored to small businesses. These dashboards can provide actionable climate data, updated regulations, and best practices in sustainability. Partnering with local governments and environmental agencies can ensure the credibility and timeliness of this information.

Fostering Collaboration: We emphasize creating eco-business consortiums where companies in similar sectors collaborate on sustainability goals. These consortiums can co-fund research into low-carbon technologies and participate in industry-wide sustainability certifications, sharing best practices and cost-saving innovations.

Promoting the Business Ecology Nexus: Besides its theoretical benefits, practical methods to promote the Nexus include integrated supply chain audits for ecological and financial health and cross-sector partnerships that align business success with environmental conservation.

Although numerous studies have examined customer engagement strategies to promote pro-environmental behavior and address climate change, a systematic investigation focused on customer engagement for fostering climate action within business firms remains notably absent (Sukumara & Majhi, 2024). In particular, research regarding small business engagement with climate issues is still underexplored (Khan et al., 2023; Marty et al., 2024; Smith et al., 2020), revealing a significant knowledge gap. This gap is critical to address, considering that small businesses often lack the resources and expertise available to larger firms, complicating their ability to implement climate initiatives effectively (Alam et al., 2022).

This study introduces the novel "Business Ecology Nexus" framework by merging customer engagement and sustainability literature streams. This framework elucidates how small businesses can contribute to sustainability through effective engagement with climate change initiatives. Given the interactive nature of customer engagement behavior (Hollebeek, 2011; Viglia, Pera, & Bigné, 2018) and the sensitivity surrounding climate change, fostering sustainability through active engagement in climate initiatives is significantly shaped by social factors. Specifically, social influence refers to how customers modify their behavior to conform to the expectations of their social environment. However, the psychological effects of social influence on fostering customer engagement behavior remain poorly understood, warranting further exploration.

Consequently, we frame this study theoretically using psychological reactance theory to investigate the psychological impact of social influence in promoting sustainability through effective engagement with climate change initiatives. By recognizing the interplay of customer engagement, social influence, and psychological reactance, we aim to enrich the theoretical foundations of the Business Ecology Nexus framework and provide a more comprehensive understanding of how small businesses can effectively navigate the complexities of the climate change initiative.

Fig. 1 visually presents the Business Ecology Nexus model.

4. Discussion

4.1. Theoretical implications

First, the "Business Ecology Nexus" concept is introduced as a unique approach to managing climate change from a business perspective, emphasizing the need for a collaborative framework that balances business interests with ecological sustainability. This innovative concept proposes a solution to climate change inaction by advocating for effective customer engagement (Hollebeek et al., 2019; Sharma et al., 2024). The study responds to scholars' calls for a more holistic examination of customer engagement within the B2B context for enhancing climate resilience (Alam et al., 2022; Hollebeek et al., 2022; Jervis, 2024; Khan et al., 2023; Lim et al., 2022; Marty et al., 2024). The model contributes to the literature by investigating how customer engagement operates in small businesses and manifests sustainable practices within B2B relationships.

The study underscores the application of Hollebeek et al. (2019) S-D logic as a *meta*-theoretical framework for framing studies on promoting customer engagement to address climate change and co-create value in a business context. We suggest addressing information risk through a co-creation and customer engagement approach, which can mitigate psychological reactance among small business owners towards climate change initiatives. Integrating the Business Ecology Nexus framework, which emphasizes ecological and business values, encourages stakeholders to collaborate in developing climate change strategies.

Second, the study acknowledges the significant influence of psychological reactance theory on small business owners' climate change inaction. While previous research predominantly examines reactance from a consumer standpoint (Badewi et al., 2023; Ogbanufe & Gerhart, 2022; Rosenberg & Siegel, 2018), this study introduces a novel perspective by focusing on small businesses. We argue that the heightened reactance stemming from concerns about information risk compromises their decision-making autonomy. This novel viewpoint extends reactance theory from the consumer to the business sphere, emphasizing businesses' need to reclaim autonomy in facilitating climate change action. Encouraging collaboration through co-creation and customer engagement fosters learning, knowledge sharing, and resource integration, effectively addressing psychological resistance.

4.2. Managerial implications

This paper presents four actionable implications for practice. First, small business owners should integrate climate change considerations into their strategic planning, aligning future business objectives with environmental concerns. This proactive approach mitigates environmental risks and positions businesses to gain a competitive advantage in the long run through effective leadership on sustainability.

Second, businesses should establish a management information system to mitigate information risks and ensure accurate information. A solid business ecology nexus through market intelligence will facilitate growth, generate a competitive advantage, and reach new markets.

Third, policymakers should prioritize information transparency, streamlining information dissemination channels, and fostering clarity through digital media and official platforms. This should build a verification system through official media challenges to eliminate information risk. This mitigates psychological reactance and fosters a supportive business environment for effective climate action.

Fourth, climate change advocates and regulators should prioritize stakeholder collaboration. This can be achieved by developing joint forums like business-policy partnerships and industry associations. Involving small business owners fosters ownership and alignment with climate change initiatives. Recognition awards for good practices incentivize sustainable engagement and contribute to climate action. One lingering issue in this respect – the role of business cycles – is exogenous (Hampson, Xie, Li, Kou, & Wang, 2024).

We propose the following immediate actionable steps to assist small businesses, policymakers, and climate change advocates overcome information risks, foster collaboration, and implement the Business Ecology Nexus.

Climate-action checklists: Small businesses can utilize climate-action checklists that outline steps like switching to energy-efficient methods and optimizing resource usage. Quarterly updates from local environmental agencies can help businesses stay aligned with new climate policies.

Data Integration: Businesses should integrate climate-related data into existing operational dashboards and decision-making systems to track energy use and carbon emissions.

Fast-track funding: Governments can establish grants or tax incentives for small businesses investing in emissions-reducing technologies. Partnerships with local environmental consultants can offer subsidized advisory services for swift implementation.

Information validation portals: Policymakers can create portals for small businesses to verify climate-related information, link to trusted sources, and enhance real-time verification tools to reduce misinformation risks.

Stakeholder engagement platforms: Advocates and regulators can develop digital platforms for small business collaboration, sharing of best practices, and connecting with industry leaders. Fast-tracked recognition programs can reward measurable improvements, like eco-certifications or participation in low-carbon technology trials.

To enhance the practical relevance of our findings, we recommend specific initiatives to support small businesses. Governments and relevant institutions should launch programs to help small businesses secure investments in emissions-reducing equipment and operational changes. For instance, the British Business Bank offers low-interest green loans for energy efficiency and renewable energy projects (British Business Bank, n.d.). Providing advisory services can assist these businesses in refining their emission reduction plans. The Small Business Innovation Research (SBIR) Program provides funding for research and development of innovative technologies focused on climate solutions (SBIR, n.d.).

Initiating business-industry and business-policy partnerships can facilitate more frequent forums addressing climate change issues. The Small Business Sustainability Support Program SA from the Australian government offers resources and support for adopting sustainable practices (Australian Government, n.d.). Additionally, recognition awards for best practices and innovative solutions to climate change initiatives, such as those offered by the Green Business Network, incentivize sustainable engagement and encourage small businesses to engage in climate action (Green Business Network, n.d). The Environmental Defense Fund's (EDF) Climate Corps connects students with companies to develop climate action strategies, fostering collaboration and innovation (EDF, n.d.).

4.3. Limitations and future research avenues

Future research should explore the business ecology nexus across various industries, organizational structures (including large corporations, multinationals, etc.), and diverse geographical contexts. As Magnani and Gioia (2023) specified, the conceptual model can be tested through quantitative research to generalize the idea's applications. It is also essential for scholars to delve into the underlying causes of psychological reactance, examining specific factors such as financial circumstances or resource availability, particularly in sectors like mining where natural resources and carbon emissions play a significant role. Additionally, exploring the long-term effects and sustainable business practices on branding and reputation-building strategies can provide valuable insights for enhancing their effectiveness.

The variability in perceptions of climate change among small business owners—shaped by industry, geographic location, and personal beliefs—may limit the generalizability of our findings. This variability suggests that different contexts could yield divergent outcomes regarding engagement with climate initiatives. Additionally, some small business owners may exhibit skepticism towards regulatory measures to promote sustainability, viewing them as burdensome rather than supportive, which could undermine the proposed benefits of aligning business operations with ecological goals.

A significant limitation of our study is the sample size and diversity, as including 25 participants may restrict the breadth of insights regarding the challenges and motivations faced by small businesses in varying contexts. While qualitative interviews provide rich insights into the experiences of small business owners, they may also introduce biases related to personal interpretation and recollection, limiting the complexity of climate change engagement captured in our findings. To address this, future research should consider more extensive, diverse samples and potentially employ quantitative methods to reveal broader statistical trends in small business responses to climate change initiatives. Finally, the adoption of climate change initiatives can vary significantly across different geographical contexts due to variations in regulatory frameworks, cultural norms, and socio-economic factors, which warrants further investigation.

Expanding on these limitations and exploring the impact of the sample's industry composition on the findings and their broader applicability is crucial. While the sample includes agriculture, hospitality, food and beverage, and retail businesses, the overrepresentation of agriculture-related sectors may bias the findings towards industries highly dependent on natural resources and directly affected by climate variability. For instance, the challenges agricultural businesses face in mitigating climate risks, such as resource scarcity or regulatory compliance, may not fully align with those experienced by industries like technology or financial services, which are absent from the sample. Future studies should address this imbalance by diversifying the industry representation to include sectors like robotics and automation, which encounter distinct sustainability challenges, such as energy efficiency and supply chain complexities.

Additionally, while reflective of pragmatic decision-making, emphasizing economic motivations as the primary driver for engagement with climate initiatives may overlook the broader spectrum of motivators. Sectors like fashion or retail may prioritize consumer perceptions, branding, and market differentiation, whereas industries like hospitality or entertainment might focus on co-creation with stakeholders and customer engagement. Future research should examine how

these diverse motivators interact with economic imperatives, potentially offering a more holistic understanding of small business responses to sustainability imperatives.

Moreover, the variability in small business perceptions highlights the need for sector-specific analyses to capture how regulatory frameworks and socio-economic factors shape engagement. For example, businesses in highly regulated industries like food and beverage may perceive climate-related policies as opportunities for differentiation, whereas less-regulated sectors may view them as burdensome. Investigating these sectoral differences through mixed-methods approaches—combining qualitative with quantitative —can provide a more nuanced understanding of small business engagement across contexts.

Finally, future studies should adopt longitudinal designs to explore the durability of sustainability initiatives in diverse sectors. Examining how industries such as agriculture or wine, which rely heavily on environmental stability, maintain ecological practices over time could reveal key drivers of long-term success. Similarly, tracking how sectors like retail or entertainment integrate sustainable practices into evolving consumer expectations can illuminate strategies for sustained impact. These directions will enhance the theoretical depth and practical applicability of the Business Ecology Nexus, addressing both the limitations of this study and the need for broader, more actionable insights.

In Table 4 we provide a table with the future research agenda.

Table 4
Future research agenda.

Research focus	Key topics
Business Ecology Nexus:	• Assessing the effectiveness of the Business Ecology Nexus in various industries • Analyzing the impact of climate change initiatives on business resilience using the Nexus model • Comparing the adoption of the Nexus framework between small businesses and large corporations
Psychological Reactance:	• Exploring strategies to mitigate reactance through co-creation and customer engagement with consumer markets • Analyzing the influence of information risk on decision-making autonomy and psychological reactance in diverse business settings
Policy & Regulatory Frameworks:	• Examining diverse regulatory frameworks' influence on small business engagement with climate change initiatives • Assessing small businesses' adaptation and compliance with climate change regulations • Developing standardized guidelines to support sustainable business practices globally. • Industry-specific impacts, risks, and benefits.
Co-Creation and Customer Engagement:	• Comparing climate change adaptation strategies and regulatory landscapes across countries and regions • Examining cultural and socio-economic influences on small businesses' engagement with climate change initiatives • Studying the role of digital platforms in facilitating co-creation between small businesses and customers
Business process	• Analyzing financial implications of carbon pricing mechanisms for small businesses • Exploring data privacy concerns and compliance strategies in the context of climate change initiatives on business information • Examining sustainable leadership practices' influence on small business performance and environmental sustainability

4.4. Conclusion

The study examines climate change inaction from the perspective of small business owners through the lens of psychological reactance, proposing a solution through co-creation and customer engagement in collaboration with climate change policymakers, regulators, and advocates. Our study culminates in formulating the Business Ecology Nexus conceptual model, which provides a framework for managing climate change by balancing the commercial interests of businesses with environmental concerns to create a win–win situation.

This comprehensive model offers a pioneering perspective that extends beyond consumer-focused research. By focusing on the business context, we aim to address a significant gap in existing literature and lay the groundwork for future inquiries in this emerging field. Our study makes a timely and relevant contribution to the pivotal global issue of climate change by connecting with the business perspective, manifesting a pluralist approach to the ecosystem. We facilitate further research and discussions regarding applying the conceptual model in diverse industry and international contexts to manage climate inaction sustainably.

Further, exploring specific policy reforms to address the barriers identified in our research is essential. The following actionable policy recommendations aim to support small businesses in overcoming information risks, resource constraints, and psychological barriers, thereby fostering greater engagement in climate action:

1. Addressing information risks: Policymakers should focus on developing transparent, accessible, and reliable climate data sources to mitigate information asymmetry. Providing small businesses with clear, actionable climate risk, opportunity, and regulatory information will reduce misinformation and improve decision-making. Establishing independent advisory bodies to offer personalized guidance can further alleviate small businesses' uncertainty in engaging with climate change initiatives

2. Resource constraints: Governments can ease the financial burden on small businesses by offering targeted financial incentives, such as subsidies, tax benefits, or low-interest loans. These measures would help small businesses overcome resource constraints while adopting sustainable practices. Additionally, grants to support the initial costs of transitioning to greener technologies could facilitate the adoption of climate change mitigation strategies

3. Psychological factors and behavioral support: Policy reforms should also target the psychological barriers that small business owners face, such as skepticism toward climate change initiatives or resistance to regulations. Awareness campaigns that emphasize the business benefits of climate action—such as long-term cost savings, increased competitiveness, and improved reputation—can help shift attitudes. A collaborative approach involving small business owners in co-creating solutions would reduce psychological reactance and increase their commitment to climate action.

These reforms provide a practical roadmap for policymakers to support small businesses in overcoming the identified barriers and drive greater engagement in climate action.

CRediT authorship contribution statement

Gajendra Liyanaarachchi: Writing – original draft, Visualization, Methodology, Conceptualization. **Thilini Chathurika Gamage:** Methodology, Formal analysis, Data curation. **Giampaolo Viglia:** Writing – review & editing, Validation, Supervision, Investigation. **Florence Charton-Vachet:** Writing – review & editing, Validation, Investigation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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