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Customers driving a firm's responsible innovation response for grand challenges: A co-active issue-selling perspective

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Abstract

Grand challenges vary across industries and call for firms to craft a responsible innovation response to effectively address them. However, key questions concerning why firms embrace responsible innovation and the process by which they respond to grand challenges have yet to be fully answered. We integrate an issue-selling theoretical lens and the customer role from an innovation perspective to theorize about the different influencing motives that customers exert on their corresponding supplying firm to craft a more responsible innovation response to grand challenges. Based on qualitative data collected in almost a 10-year period from multiple respondents across eight customer firms and two supplying firms, we identify three core motives—regulatory, business opportunity, and socio-environmental motives—that propel customers to influence supplying firms to craft different forms of responsible innovation responses. Our research also reveals three vital socio-human capital pathways—human capital, socio-behavioral, and relationship—which, in turn, foster a co-active engagement in addressing grand challenges innovatively and responsibly. In so doing, this research advances novel theorizing on co-active engagement in responsible innovation where the customer acts as the primary champion and the supplier as the implementer. We discuss the important implications for customers and other stakeholders.

KEYWORDS

co-active engagement, grand challenges, issue selling, responsible innovation, sustainability

1 | INTRODUCTION

Health and poverty, along with privacy and security, are a few examples of grand challenges. These challenges cross geographic, organizational, and political boundaries and, by nature, require complex and ambitious solutions. Firms are called to help address them (Borja et al., 2020; Wettstein et al., 2019), and it is not surprising that Amazon, Maersk, Microsoft, and Siemens, among many others, take a stance on various grand challenges. Such firms are instrumental in finding "solutions in the form of new technologies and products... to complex and ambitious problems" (Agarwal et al., 2021, p. 385). A growing interest in research and practice on grand challenges (e.g., Christofi et al., 2023; Ferraro et al., 2015; Howard-Grenville, 2021; Zahoor et al., 2023) suggests that engaging firms in grand challenges may be desirable. Thus, a key theoretical issue concerns why firms differ in

responding to challenges that transcend corporate and national borders, with far-reaching societal consequences (Buckley et al., 2017; George et al., 2016; Liu et al., 2023; von Schomberg, 2013). Specifically, our knowledge is still limited with regard to why the levels and modes of engagement vary across firms, even within a particular industry. In particular, grand challenges are so complex that they are likely to be solved through "taking care of the future through collective stewardship of science and innovation in the present" (Stilgoe et al., 2013, p. 1570) and a "willingness to explore varieties of extant and new approaches" (Kuhlmann & Rip, 2018, p. 448).

A review of the literature, however, suggests that we need to further explore the collective efforts that parties exert by engaging in value chain activities to address grand challenges innovatively and responsibly (George et al., 2016; Omezzine et al., 2022). Responsible innovation shifts the focus from a traditional, economically driven perspective to a more socially driven approach that can help address and solve fundamental issues of concern to multiple interest groups (Carmeli et al., 2020). Yet, our knowledge about responsible innovation to address grand challenges (Voegtlin et al., 2022)—the motives, processes, outcomes, and implications (European Commission, 2011; Owen et al., 2021; von Schomberg, 2013)—is still in early stages of development. The extant literature has tended to focus on collective endeavors aimed at developing responsible innovation in response to grand challenges by illuminating the institutional theoretical lens (e.g., regulatory demands, innovation policies) (Gümüsay et al., 2020; Kuhlmann & Rip, 2018; Nilsson, 2017). While this body of research is vital, it has left the micro-processes of grand challenges relatively understudied (Voegtlin et al., 2022). Hence, we suggest that a micro-foundational lens can help to further explore the motives, processes, and behaviors of individual parties and, thereby, disentangle the collective attention directed to addressing grand challenges. Exploring the motives and behaviors of each actor (here, agents of customers and supplying firms) can shed light on why and how they play, individually and collectively, in responding to grand challenges.

We draw on issue-selling theory (Dutton & Ashford, 1993; Lauche & Erez, 2022) to advance this line of research by exploring why and how customer firms may propel their supplying firms to co-actively engage in responsible innovation for grand challenges. This research endeavor is important for at least two reasons. First, the literature on innovation management has documented the importance of customers' involvement in the innovation process (Cui & Fang, 2017; Mahr et al., 2014; von Hippel, 2006), a line of research that advances the notion of building collaborative endeavors between firms and customers to drive innovative solutions and co-create value (Degbey, 2015; Degbey & Pelto, 2021; Edvardsson et al., 2011; Melander, 2018). It allows us to disentangle collaborative efforts aimed at innovatively and responsibly responding to grand challenges. Second, advancing this micro-foundation of a customer-focused perspective requires an examination of what motivates customers to engage in value co-creation processes and how they sell these issues, often seen as costly demands, to the supplying firms to engage them in developing responsible innovation solutions to grand challenges (e.g., Christofi et al., 2023; Liu et al., 2023).

Our work addresses the question of how customers and supplying firms develop a co-active engagement approach to innovatively and responsibly address grand challenges. To this end, we utilized qualitative data collected in almost a 10-year period from multiple respondents across eight customer firms and two supplying firms in the global maritime industry, which is notorious for polluting and harming the environment and having questionable labor conditions. This effort helps us to reveal the motives of customer firms and the strategies that they craft and enact to direct the attention of supplying firms and their managers toward responsible and innovative ways to respond to grand challenges. In particular, this research develops theorizing about the co-active engagement of customer and supplying firms in grand challenges.

Practitioner points

- Customers and supplying firms develop co-active engagement in grand challenges such that the former develop different motives and act as champions by fostering the latter in directing attention and channeling effort toward solving grand challenges responsibly and innovatively.
- A co-active issue-selling process allows both parties—customers and suppliers—to endeavor toward the development of responsible innovation responses to grand challenges.
- A co-active engagement in grand challenges helps in shifting the attention of parties in the value chain activities toward actions that enhance positive societal utilities.

2 | THEORETICAL BACKGROUND

2.1 | Grand challenges and responsible innovation

Grand challenges are complex problems involving both social and technological elements and that influence the

environment, society, health and welfare, and economies. These challenges are often derived from macro-level (e.g., institutional) pressures and compel more coordinated, comprehensive, and systemic efforts (Doh et al., 2019; Ferraro et al., 2015; Zahoor et al., 2023). A firm's endeavors toward addressing such challenges requires the development of an awareness of the issues at hand, followed by the careful design of a strategy to tackle them (Grimes & Vogus, 2021).

Research on grand challenges in management has been slow to accumulate, although there is the potential for theory development and the production of practical knowledge on this subject (Seelos et al., 2023). In other disciplines and cross-disciplinary fields, including medical informatics (Haux, 1997), chemistry (Lippard, 2000), computer science (Simons et al., 1991), artificial intelligence (Reddy, 1995), and business and information systems engineering (Mertens & Barbian, 2015), the discourse on grand challenges has been relatively more extensive. This opens up opportunities to outline grand challenges' major attributes and approaches in management research as it regards the development of conceptual clarity and practical knowledge (e.g., Kunisch et al., 2023; Seelos et al., 2023; Suddaby, 2010). In studies of grand challenges in management, scholars have viewed grand challenges as a macro-level phenomenon (e.g., Vakili & McGahan, 2016) in that it pertains to problems that affect many people (Ferraro et al., 2015). A macro-level perspective is of merit as it allows us to delve into system-level motives, choices, and influences, but it does not capture the micro-forces underlying them. Further, the study of a phenomenon of grand challenges at the macro level may not fully allow researchers to "contextualize findings appropriately," as can be obtained when advancing a micro-foundational lens (Seelos et al., 2023, p. 260).

Grand challenges require firms to go beyond the transaction-cost considerations underlying an agency theoretical lens, because to take a stance on them, managers need an environmental, social, governance (ESG) cause that matters greatly to a variety of constituents (Aguilera et al., 2007). In such ways, the firms and their leadership own a responsibility over a grand challenge. Further, grand challenges are non-trivial problems and, therefore, require participatory endeavors and innovative solutions (Ferraro et al., 2015; Verweij et al., 2006). As such, firms engaging in grand challenges need to develop a responsible innovation approach (Stilgoe et al., 2013; Voegtlin et al., 2022), which captures a firm's engagement in the development of innovative solutions to ensure a more sustainable future.

Although scholarly literature exploring responsible innovation solutions to grand challenges still plays catch-up to practice and could help support practice by offering theoretical frameworks, it largely employs a top-down, institutional, or macro-level framework. In particular, such endeavors emerge mainly from policymakers, intergovernmental actors, and other practitioner-oriented spheres (e.g., EU, 2021; UN., 2015). Other governmental policy-level examples include the UK's institutionalization of responsible innovation through universities (Owen et al., 2021), the US-instituted regulatory body supporting responsible innovation in the financial technology sector (OCC, 2021), and the Chinese government's instituted notion of a "harmonious society" to foster development in which "economic growth is balanced against the urgent need to tackle pressing societal and environmental problems existing in China" (See, 2009, p. 1). Further, and more importantly, these endeavors mostly do not integrate business as a central source of innovation (Voegtlin et al., 2022). Recognizing and engaging business firms in these initiatives is crucial, as they are "important and necessary social change agents" (Aguilera et al., 2007, p. 857). Although responsible innovation often derives from societal (macro-level) pressures, it could well follow from business firms' awareness of and engagement in addressing grand challenges in a quest for positioning of the firm or for doing good.

For example, given the high level of social and environmental crises in the maritime industry, a firm's adoption of a responsible innovation approach may enable it to assert its ethical foundations, such as accountability and sustainable development-oriented governance approaches (Genus & Stirling, 2018; Scherer & Voegtlin, 2020), to not only differentiate itself from other firms in the same industry but also to establish a moral standing of doing good for society. Additionally, from an ethical viewpoint, a firm's adoption of such a responsible innovation approach may serve to answer calls from the United Nations, such as the sustainable development goals (SDGs), that aim to resolve social and environmental grand challenges to safeguard the achievement of peace and prosperity for all (UN., 2015). However, scholars suggest that the predominant focus on ethical dimensions in extant research on responsible innovation might be limiting and thus argue for the examination of broader performance implications of responsible innovation for profit-oriented firms involved in responsible innovation as a unique path to tackling grand challenges (e.g., Arslan & Tarakci, 2022; Liu et al., 2023). In this regard, Liu et al. (2023) demonstrated that the performance implications of hybrid (i.e., profit and socially driven) organizations engaged in responsible innovation in responding to grand challenges can be rewarding in terms of innovation performance, given that they consider industry boundary conditions that help them resolve innovation barriers.

Compared to grand challenges, responsible innovations tackle the firm's footprint. A firm adopting and crafting a responsible approach may be propelled by its stakeholders (e.g., customers, employees, suppliers, and investors), who foster the organizational leadership in developing a more holistic and prosocial perspective that transcends the immediate organization-specific utilities. For example, some scholars find the enabling role of diverse senior management teams in creating innovative approaches for grand challenges in the context of emerging market small- and medium-sized enterprises (Zahoor et al., 2023), while others show the role of national government R&D investments in enabling a more efficient path for responsible innovation firms to address grand challenges in the context of more developed nations (Liu et al., 2023). Despite the importance of advancing a responsible innovation approach by firms in efforts to help address grand challenges (Voegtlin et al., 2022), it remains unclear not only what motivates customer firms, but also how customer and supplying firms co-actively engage in adopting and crafting a responsible innovation approach to grand challenges. In what follows, we suggest that an issue-selling theory can help answer this question by delineating the motives and the pathways whereby customer and supplying firms co-actively develop and enact a responsible innovation approach to grand challenges.

2.2 | Issue selling

The theory of issue selling views individuals who *do not* hold top executive positions as potential initiators of change (Dutton et al., 2001). While scholarly work has, to date, tended to focus on individuals in an organization (employees and middle-level managers;Dutton et al., 2001; Dutton & Ashford, 1993), we propose that issue selling can also emerge through the inter-organizational relationships exchange. Specifically, we theorize about the ways customers influence the approach adopted by a product/service firm (i.e., supplier). In doing so, we depart from the literature on buyer–supplier relationships in that both parties shift their attention from solving problems solely for their own benefits to endeavors aimed at serving society as a whole. Thus, a main perspective we advance here expands on the notion that issue selling is not (necessarily) about the solutions but, rather, about the attention that individuals may attract and direct to a particular subject of inquiry (Dutton & Ashford, 1993; Dutton et al., 2001).

The process of issue selling has been described as consisting of four behavioral elements: naming the issue, collecting relevant information, discussing the issue, and creating a task force to address the issue (Dutton & Ashford, 1993). In its focus on employees and managers, issue selling can be viewed as a relational process between individuals and groups where credibility, dialogue, and legitimacy come to the forefront (Lauche & Erez, 2022; Satterstrom et al., 2021). When we connect issue selling with collaborative engagements between customers and supplying firms, the customer becomes the actor potentially adopting credibility, dialogue, and legitimacy in the approach of convincing the supplying firm to deal with issues beyond the firm's borders or related to responsible innovation and beyond the firm's footprint. Selling issues thereby becomes the link between grand challenges and responsible innovations in how the customer tries to influence the supplying firm to consider grand challenges and from them—jointly or separately from the customer—into seeking responsible innovations. This is a novel approach compared to prior descriptions of grand challenges as influencing firms through institutional pressure, and this approach provides a motivational viewpoint of responsible innovation while extending issue selling beyond the firm's boundaries. Selling issues thereby becomes a means for organizations to respond to challenges that transcend corporate and national borders, as well as how they sell these issues across corporate borders to the firms from which they purchase and use products or services. The customer-driven issue-selling perspective proposed here resonates with Voegtlin et al.'s (2022) responsible innovation (governance) framework; the latter relies on reflexivity and deliberative capacities to allow for managing tensions among individual parties while tackling grand challenges. Moreover, it leverages insights from the discursive and phenomenon-driven approaches (Seelos et al., 2023) to inform customer-driven issue-selling motives, processes, and behaviors.

3 | METHODS

3.1 | Empirical research context

To gain insight into how customers drive firms to engage in responsible innovation when dealing with grand challenges, we studied collaborative engagements involving customers and suppliers of products and services in the global maritime industry. These collaborative engagements consisted of a Chinese multinational company and its Finnish subsidiary in the maritime industry (both described herein as suppliers) and their key customer companies around the world (described herein as customers).

Our selected research setting is suitable for many reasons. The global maritime industry represents one of the

major sectors that has significant impacts on environmental, human health, economic, geopolitical, and digital issues (Global Maritime Issues Monitor, 2020). It therefore provides a uniquely rich setting for research that aims to address diverse challenges of grand proportions (i.e., transcending country or corporate boundaries). Not only does the global maritime industry constitute the backbone of international trade and the global economy, contributing over 80% of the volume of global trade via seas (United Nations Conference on Trade and Development [UNCTAD], 2021), but it also has tremendous harmful effects on health and the environment with, for instance, poor working conditions, air pollutant emissions, oil and chemical cargo discharges, litter, sewage, and invasive species in ballast water (Parviainen et al., 2018; Solakivi et al., 2019).

The current and recent global crises relate to the maritime industry in multiple ways. Discussion around *climate change* has directed attention to the environmental impacts of shipping. Most often, the discussion has dwelled on CO_2 emissions and alternative fuels, but more recently, it expanded to also cover other emissions, such as sulfur, as the International Maritime Organization (IMO) has introduced global regulations to reduce the environmental impacts of maritime transportation (see Solakivi et al., 2019).

In addition to environmental concerns, social (and health) issues related to the industry have also received increasing attention. During the *COVID-19 pandemic*, hundreds of thousands of seafarers faced serious problems related to quarantine requirements, restrictions on border crossings, and difficulties with crew changeover and repatriation (Doumbia-Henry, 2020; UNCTAD, 2021). In addition to infections, maritime industry workers are exposed to many other types of risks. For instance, research has shown that seafarers are up to 27.8 times more likely to face work-related fatal injuries than shore-based workers and are at increased risk for poor well-being and mental health problems (see Andrei et al., 2020).

Further, Russia's *war in Ukraine* has had significant consequences for the global maritime industry due to, for example, an increase in energy costs and restrictions and shifts in trade patterns (see, e.g., UNCTAD, 2022). The war in Ukraine also included large-scale cyber operations, so the need to improve cybersecurity across industries has been emphasized (Lewis, 2022). In the global maritime industry, cybersecurity has already been on top of the agenda of port and maritime leaders, as several cyberattacks have been reported in the past few years (de la Peña Zarzuelo, Ignacio., 2021). The magnitude of these grand challenges faced by the maritime industry requires attention and actions of global institutional actors and policymakers worldwide. However, companies in the industry also need to work together to solve these issues. Such initiatives may be more effective in that they are likely to reach beyond the pre-defined goals of individual firms and thereby engender more proactive positive solutions to grand challenges rather than reactive responses, which may not necessarily yield positive outcomes.

The subfield of the maritime industry in which the *supplying firms*[1] operate includes floating construction services, offshore engineering services, ship design, contract management, and consultancy services. These services require collaborative engagements in order to meet the high levels of knowledge-intensive services and requirements of customers (cf. Aarikka-Stenroos & Jaakkola, 2012). For example, *supplying firm 2's* (see Table 1) business environment being characterized by engagements with various firms implies that the connections between the firms may not always be simple supplier–buyer relationships. *Supplying firm 2* may have a contract with a shipyard, yet needs to collaborate closely with the shipyard's customer—the ship owner—who is the end user of the tangible ready product. In such situations, *supplying firm 2's* designs must first be approved by the ship owner, although there is no contract between those two firms. Furthermore, in some projects, *supplying firm 2* may be subcontracted by another engineering company that either does not have the required expertise for a specific task or simply does not have enough resources available at the time to carry out the task by themselves. Hence, firms that work together on some projects may on other occasions be competitors.

Further, the type of business the *supplying firms* operate has unique features, such as knowledge-intensive work requiring high-level expertise, heavily regulated business operations at home and abroad, a small customer base but where each customer generates high levels of revenue, large financial investments in each project, and heavy fluctuations in industry business activities. It is important to add that customers of these highly specialized *supplying firms* are central to their innovation and growth in that they hold knowledge that is

[1]"To provide further background beyond the information in Table 1, *supplying firm 2* was founded in the early 1980s, and it has wholly owned subsidiary offices around the world. The company is known for its technical expertise and has a track record of developing multiple new prototype vessels with environmentally friendly solutions. *Supplying firm 1*, the parent company of *supplying firm 2*, belongs to a large Chinese multinational group that owns several shipyards and offers, among other things, ship brokering services, contract management, and consultancy services. The Chinese multinational group is a Global 500 firm. The studied customer firms numbers 1 to 8 include ship owners, ship operators, and offshore (engineering) contractors."

high-priced, difficult to acquire, and also difficult to transfer in these contexts (von Hippel, 2006). Choosing this particular research setting is suitable because a focus on a single industry supports a more valid comparison of firms and employees.

3.2 | Qualitative case study approach

From a methodological viewpoint, we employed a qualitative case study methodology to investigate the various strategies and actions customers use to propel their suppliers toward responsible innovation that addresses grand challenges. We chose the case study approach for two particular reasons: First, the case study strategy allowed us to tackle the "how" and "why" questions that emerged from the identified research gap (Yin, 2017). Indeed, case studies are ideal for topics that have not amassed much scholarly research and, thus, require an approach that can uncover connections among studied items and their embeddedness in a specific setting for theory building (Edmondson & McManus, 2007; Eisenhardt et al., 2016). Second, the case study approach is especially useful in contextualizing theory (Ghauri, 2004; Welch et al., 2011). As the empirical context of the global maritime industry plays an important role in our theory building, our case study approach can be labeled *contextualized explanation* (see Welch et al., 2011, 2022) and perceived as following *critical realist ontology* (e.g., Easton, 2010; Sayer, 2000).

In contextualized explanations, the aim is not to produce generalizable findings but, rather, situated explanations of particular outcomes. In this respect, contextualized explanation is in line with critical realism (Welch et al., 2022). Critical realism assumes a reality independent of observers yet accepts that the world is also socially constructed (Easton, 2010; Welch et al., 2011). Although aiming to explain, critical realism acknowledges an interpretive element in social science and recognizes the role of context in its explanations (Sayer, 2000; Welch et al., 2011). In theory development, critical realism challenges the possibility of both pure induction and deduction (e.g., Bhaskar, 1998). Instead, the critical realist view of the research process is inherently abductive (Easton, 2010; Welch et al., 2011), thus combining both induction and deduction by theoretical thinking (e.g., Blaikie, 1993). In this study, we built a conceptual model of co-active issue selling of responsible innovation by integrating issue-selling theory and insights on the role of customers in responsible innovation development with empirical data about our case firm and its customers in the maritime industry.

In addition to abductive reasoning, our research design has other features typical of case studies following a contextualized explanation approach: First, we focused on a single case (a focal organization in a collaborative engagement setting) that was selected for its uniqueness rather than representativeness (Welch et al., 2022). The single-case design offered more depth and contextual insight to study the phenomenon under scrutiny (cf. Siggelkow, 2007). Second, our case study included "deep engagement with the field to achieve both spatial and temporal reach in data collection" (Welch et al., 2022, p. 19). The longitudinal case design permitted us to examine the phenomenon over time in its naturalistic context (Hassett & Paavilainen-Mäntymäki, 2013; Olson, 2010), as we strove to get as close to the studied phenomenon as possible so as to generate a thick description of it (Polkinghorne, 1997).

3.3 | Participants and data collection

In line with the logic of purposeful sampling, as a "critical" case for our study (Fletcher & Plakoyiannaki, 2011), we selected a collaborative engagement consisting of a Chinese multinational company and its Finnish subsidiary in the maritime industry and their key customer companies around the world. This case selection was based on the richness of information and the transparency that provided insights into the phenomenon of theoretical interest (Yin, 2017). The access was first negotiated with the Finnish subsidiary, which opened up access to data collection from its Chinese parent company and several customer companies.

To facilitate contextual insight, thick descriptions, and depth of analysis, the first author spent an extensive period on fieldwork and collected data using different sources and perspectives (see, e.g., Welch et al., 2022). Data collection spanned almost a decade, following the initial announcement of the engagement between the two supplying firms in 2012. This provided an adequate amount of longitudinal evidence to understand our phenomenon of interest—issue selling—as a unique view of how customers drive organizations in the global maritime industry to engage in responsible innovation to address grand challenges. We used three types of data sets to facilitate our case study: 36 interviews with key informants, private and publicly available documents about the collaborative engagement, and detailed field notes about direct observations and informal conversations. These three data sets were collected during overlapping time periods and served different purposes in our study.

The first data set consisted of documentary data, with which we aimed to understand and frame our analysis by familiarizing ourselves with the various research sites, integrating documentary data, and collecting contextually driven information about the collaborative

engagements from the customer and supplying firms. The collection of documentary data spanned the period September 2012 until March 2022 and covered the time both before and after the qualitative interviews, observations, and informal conversations. We collected over 141 public and private archival documents, which included over 60 documents from *supplying firm 2* (business intelligence documents, company PowerPoint slides, company brochures, internal company files, maritime industry research reports, news releases and bulletins, and internet sites), 20 documents from *supplying firm 1* (internal company files, press releases, and company internet sites), and 61 documents from *customer firms 1–8* (documentation of completed projects, magazines and newsletters, company presentation slides, internet sites, and company brochures). Overall, the role of the documentary data was threefold: First, it helped us to prepare for the research interviews by allowing us to become familiar with the participating companies beforehand. Second, it enabled the development of contextual understanding of the maritime industry; and third, it complemented the interview data by allowing its verification and providing more detailed information on, for example, technical solutions, product development projects, and timelines of events.

The second data set consisted of direct observations and informal conversations. The collection of this data took place from 2012 to 2014 and started before conducting the qualitative semi-structured interviews (i.e., September 2012). This data set, collected from customer and supplying firms, includes field notes documenting observations of interactions between different members of these firms and participation in seminar presentations, along with 75 emails between participants (key informants) and the first author. The main purpose of these data was to combine the information with the interviews to trace evolving elements/factors and mechanisms about issue selling as an important viewpoint from which customers drive organizations to engage in responsible innovation. The data from observations and informal conversations were used in complementing the interview data and confirming the findings of the analysis.

The third and most important data set consisted of interview data. We conducted a total of 36 interviews with middle and top managers from 10 customer and supplying firms. The average tenure of these participants in the global maritime industry was 7 years for middle managers and 16 years for top executives. The first author conducted the interviews using a semi-structured interview protocol over a period spanning 2013–2021. The interviews lasted from 33 to 150 min, during which the participants guided the interview by narrating their lived experiences of the subject matter, "with the interviewer prompting for more information after particularly important or incomplete responses" (Schabram & Maitlis, 2017, p. 589).

The face-to-face qualitative interviews (32) were conducted at the informant's company premises, either in a conference room or in the informant's office, between November 2013 and June 2014. To further investigate the topic of interest, four non-face-to-face qualitative interviews were conducted in June 2021 using Zoom and Microsoft Teams video communication applications as a safety measure due to the COVID-19 pandemic. All 36 interviews were conducted in English, which both the interviewer and informants generally use in daily work-related activities. By using a common language, we eliminated the possibility of any translation or interpretation-related errors. All the interviews were tape-recorded and fully transcribed verbatim afterward. While all informants gave their informed consent with respect to recording and using the interviews for research purposes, it was agreed that all informants and participating companies in the research were anonymized to protect the participants' identities and adhere to the companies' confidentiality restrictions (Kvale, 1996). Table 1 presents an overview of informants and the characteristics of the firms involved in this study.

The interviews were aimed at providing interpretive sensemaking based on informants' data, tightly interwoven with theory (Welch et al., 2011). Additionally, the interviews were combined with observations and informal conversations to trace evolving factors and mechanisms regarding the phenomenon under scrutiny.

3.4 | Data analysis

For the analysis of our qualitative interview data, we used Gioia's methodology in order to give voice to the interviewees' experiences when conceptualizing new concepts and constructs, while adhering to Gioia et al.'s (2013) four suggested coding phases in the data analysis. The data analysis proceeded mostly inductively, providing avenues for fresh and new insights to emerge from the data. However, the process also included deductive elements when the ideas and themes emerging from the data were continually compared with the literature, thus making the analysis procedure iterative and abductive by nature (cf. Bansal & Corley, 2012; Gioia et al., 2013; Welch et al., 2011). In contrast to purely inductive theory building, which perceives theory as emerging from data, our contextualized explanation approach regards theory as being "actively and imaginatively constructed by the researcher" (Welch et al., 2022, p. 18).

TABLE 1 Overview of participant and firm characteristics.

Participant code	Participant title	Company's relationship in the collaborative engagement	Location of company's headquarters	Firm size (number of employees)	Duration of interview (minutes)	Ownership
CS1a	Senior advisor	Supplying Firm 1	China	230,000	60	Public
CS1b	Sales director	Supplying Firm 1	China		43	
CS1c	General manager (cruise research institute) and vice-president (the Chinese Group)	Supplying Firm 1	China		69	
CS1d	Commercial manager	Supplying Firm 1	China		42	
CS1e	Technical manager	Supplying Firm 1	China		74	
FS2a	Sales director	Supplying Firm 2	Finland	400	115	Private
FS2b	Director, offshore oil and gas	Supplying Firm 2	Finland		150	
FS2c	Managing director	Supplying Firm 2	Finland		75	
FS2d	Project manager (ship design and offshore engineering)	Supplying Firm 2	Finland		97	
FS2e	Project manager (ship design and offshore engineering)	Supplying Firm 2	Finland		70	
FS2f	Marketing staff/officer	Supplying Firm 2	Finland		50	
FS2g	Marketing manager	Supplying Firm 2	Finland		50	
FS2h	Director, corporate research collaboration	Supplying Firm 2	Finland		45	
SC1a	Vice-president, marine services	Customer Firm 1	Sweden	800	65	Private (family owned)
SC1b	Director, new building	Customer Firm 1	Sweden		89	
SC1c	Project manager, technical	Customer Firm 1	Sweden		60	
SC1d	Project manager and leader of ship design	Customer Firm 1	Sweden		62	
SC1e	Project manager, new building	Customer Firm 1	Sweden		99	
NC2	Vice-president, deep water and Arctic solutions	Customer Firm 2	Norway	1500	128	
NC3a	Senior vice-president, marine and technical	Customer Firm 3	Norway	2400	97	Private
NC3b	Project director, cruise and ferry services	Customer Firm 3	Norway		37	
NC3c	Project manager, fleet services, new building department	Customer Firm 3	Norway		36	
NC3d	Document controller, new building and maintenance	Customer Firm 3	Norway		33	

TABLE 1 (Continued)

Participant code	Participant title	Company's relationship in the collaborative engagement	Location of company's headquarters	Firm size (number of employees)	Duration of interview (minutes)	Ownership
NC3e	Superintendent, electric navigation and automation	Customer Firm 3	Norway		40	
NC3f	Superintendent, electric navigation and automation	Customer Firm 3	Norway		40	
NC4a	Senior project manager, fleet management	Customer Firm 4	Norway	375	63	Public
NC4b	Superintendent, new building	Customer Firm 4	Norway		112	
NC4c	Manager, engineering	Customer Firm 4	Norway		112	
TNC5a	General manager	Customer Firm 5	The Netherlands	600	61	Private (family owned)
TNC5b	Marketing and sales manager	Customer Firm 5	The Netherlands		65	
TNC6a	Manager, engineering (offshore contractor)	Customer Firm 6	The Netherlands	10,000	45	Public
TNC6b	Department head, technology management	Customer Firm 6	The Netherlands		55	
TNC7a	Section head, contracts manager	Customer Firm 7	The Netherlands	2000	74	Private
TNC7b	Marine systems engineer	Customer Firm 7	The Netherlands		84	
TNC7c	Senior manager, engineering (marine and offshore)	Customer Firm 7	The Netherlands		50	
CC8	Vice-president of global technical operations	Customer Firm 8	Canada (participant's office is in the United States)	2000+	70	Private

Note: Average tenure (years) of middle manager participants was 7 years, and that of an executive or top manager was 16 years. We removed the names of individual interviewees and companies to preserve data confidentiality.

The trustworthiness of the qualitative data analysis in the study was enhanced by researcher triangulation (Lincoln & Guba, 1985; Miles & Huberman, 1994), with two of the authors first analyzing the data separately and then discussing their analyses and interpretations as they worked on a joint analysis. We used a qualitative analysis program, QSR NVivo, during the analysis to aid in flexibly coding and organizing the data (Eriksson & Kovalainen, 2008). The use of such computer-assisted analysis tools guaranteed that our analysis was systematic and enhanced the trustworthiness of the research (Sinkovics & Alfoldi, 2012). The analysis focused on identifying (1) customers' diverse motives in the issue selling of grand challenges, (2) different ways that customers influence responsible innovation development, and (3) various types of responsible innovations targeted at managing grand challenges. The analysis proceeded through the four steps of Gioia et al.'s (2013) methodology.

In the first step of the analysis, the interview transcripts were coded with words, phrases, and terms emerging from the data. This phase resulted in a rather large number of codes (see Table 2). *In the second step* of the analysis, these data-driven codes were organized into

TABLE 2 Structure of data analysis.

Data-driven codes	First-order concepts	Second-order constructs	Aggregate dimensions
Current regulations; legislation; IMO guidelines; future regulations; beyond regulations; Fuel consumption; efficiency; operating costs; profit; savings; tax incentives; competitive advantage; ahead of competition; forerunners; Environmental concern; emissions; pollution; pandemic; crew health; ergonomics; safety	Regulatory compliance related motives Regulatory anticipation related motives Cost-related incentives Competitive advantage related motives Environmental concern related motives Passenger and crew health-related motives	Regulatory motivation Business opportunity motivation Socio-environmental motivation	Customer motivation for issue selling to promote responsible innovation
Knowledge sharing; expertise; information; experience; platform development; learning; technical skills; project management skills Requirements; demanding; tough; extra costs; investments; reputation; respect; confidence; trust; positive experience; risk-sharing; Long-term relationships; past experience; commitment; open discussions; active communication; team work; personal relationships; friendships	Knowledge resources Capability development Demanding behavior Supportive behavior Buyer–supplier relationships Interpersonal relationships	Human capital pathway Socio-behavioral pathway Relationship pathway	Socio-human capital pathways of customer influence on responsible innovation development
Compact design; weight control; decreased fuel consumption; LNG; dual fuel propulsion system; batteries; hybrid solution; zero-emission; heat recovery; eco-ship; solar energy; wind energy; Intelligent cabin control system; infection-free solutions; optimal human–machine space; automated ship handling; ergonomics; Cyberattack; cyber-defense, cybersecure, cyber-badge	Efficient design Emission control Green energy Infection control Crew safety & ergonomics Cyber-related concerns	Emission reduction Health and safety issues Cybersecurity	Responsible innovation responding to grand challenges in the maritime industry

Abbreviation: IMO, International maritime organization.

higher-level nodes, namely first-order concepts. These first-order concepts were still informant-centric by nature. *In the third step of the analysis*, the first-order concepts were organized into more research-centric or theoretically oriented second-order constructs. *In the fourth step of the analysis*, aggregate theoretical dimensions were formed from the second-order constructs. Finally, the data structure (see Table 2) was used to create a theoretical model of customer issue selling of grand challenges in the maritime industry (Figure 1).

As suggested by Eisenhardt (1989), we use tables to summarize and present the data. Table 2 presents the codes at each level of analysis, while Tables 3–5 demonstrate the links between the data and their interpretations by presenting the structure of the data analysis together with selected empirical evidence. Following Pratt's (2009) suggestion, we used the interview extracts in Tables 3–5 to serve as the so-called proof quotes, while the body of text in Section 4 includes the so-called power quotes, which are citations that best illustrate the points made in the text.

4 | FINDINGS

This section details how customer issue selling promotes responsible innovations that address grand challenges in the maritime industry. It is structured around the three aggregate dimensions in the structure of data analysis: (1) customers' motives for issue selling responsible innovation in the maritime sector, (2) socio-human capital pathways driving responsible innovation development,

and (3) types of responsible innovations responding to grand challenges in the maritime industry.

4.1 | Customers' motives for issue selling responsible innovation

In our case study, we found many occasions in which the supplier's responsible innovation response toward grand challenges was directly initiated by its customer firms. Customers' motives for selling the grand challenge issues varied and can be grouped into three main constructs of motivations: regulatory driven, business opportunity driven, and socio-environmentally driven, as presented in Table 3.

The first construct, *regulatory driven motivation*, consists of motives related to *regulatory compliance* and *regulatory anticipation*. For many customer companies, fulfilling the tightening environmental regulations was a major motive for approaching the supplying firm to acquire new solutions that are increasingly environmentally friendly. However, this meant a constant struggle with the rising costs that adopting new greener technologies inevitably brings.

> I think our main concern will be to adjust to the new rules and regulations [...] and to be able to follow up and keep on being able to run the business profitably enough. (NC3d)

However, some customers not only complied with current environmental regulations but behaved more proactively by anticipating future regulations. Their aim was to be well prepared for the coming legislative and regulative changes as they were looking for solutions going beyond the current regulations.

> For several years, I think we can say that we are upfront on this. Somehow, we are very

TABLE 3 Customers' motivations for responsible innovations.

Second-order constructs	First-order concepts	Representative quotes
Regulatory motivation	Regulatory compliance related motives	"Basically these rules are, they are pushing for changes and to follow up. To meet those requirements, we need skilled people to provide this service" (NC4c). "There are many annual check-ups from the authorities and from the classification societies so we mostly do those that we have to do by law" (NC3a).
	Regulatory anticipation related motives	"We see in the UK that the legislation toward the environment is becoming more stringent, so we have to design our systems to be even more environmentally friendly" (TNC7c). "In some other cases, it might also help because once the compliancy level is lifted next time, we are already there" (SC1e).
Business opportunity motivation	Cost-related motives	"We try to save fuel, because fuel is also a very high operational expense" (TNC5a). "They tried to explain to us that they have their government encouraging them to implement these batteries or the environmentally friendly technologies. It sounds like they have these tax advantages" (CS1e).
	Competitive advantage related motives	"Our company always strives to be ahead. The environmental issues are very important for us [...] Our belief is that in the long term, it is paying off to be environmentally friendly" (SC1d).
Socio-environmental motivation	Environmental concern related motives	"I'm always pro-environment, because my children have to live there, their children have to live there, so whatever I can do" (TNC7a). "The family, our owners, are very, very environmentally concerned, so we are trying everything we can to improve the environmental footprint of our vessels" (SC1b).
	Crew and passenger health-related motives	"We're putting a great deal of focus on improving the safety performance of our fleets. And I think starting from the design and cost-efficiency, we should be thinking proactively of incorporating those ergonomics and safety elements" (CC8). "We are very, very safety conscious, and that also goes in our working environment, so the requirements for the facilities are quite strict" (NC2). "Now we know the COVID-19 is becoming a very sensitive, very crucial topic for the future of the cruise business" (CS1c).

> well prepared for what we see these days, and that's also how we are building the vessels, prepared for future environmental requirements. (NC4b)

Several of the customer informants saw the tightening environmental regulations in a positive light, as something that is bringing new business opportunities for their firms. This brings us to the second construct, *business opportunity driven motivation*. This construct consists of issues related to *cost reduction* and *competitive advantage*. Despite the higher costs of new, greener technology, more environmentally friendly solutions were often seen as a way to cut costs in the long run, as indicated by the following interview excerpt:

> Of course, our absolute first concern is the design to be as fuel-efficient as possible. And that means state-of-the-art high-technology vessels which are as fuel-efficient as possible because the fuel bill is more than half of our total investment operating costs. (SC1b)

Hence, the motive for seeking environmentally responsible innovations was related to the reduction of fuel consumption and, consequently, fuel costs, for the benefit of the customer as the user of the vessel. In addition to savings on operating costs, greener solutions were sometimes encouraged by government incentives (e.g., in the form of tax reductions for more environmentally friendly ships). Aside from direct financial incentives, the greener solutions were considered to bring competitive advantages through operating beyond the regulations. Indeed, some customer firms felt that being ahead of the competition in environmental sustainability issues would be profitable in the long run, and stricter environmental regulations were considered to be beneficial for the business, as suggested by the following comment:

> I think [the environmental regulations] are primarily generating new business. I think it's actually one of the driving forces. It's not necessarily so that it's motivated by very noble thoughts of saving the environment, but for some of the companies in Europe and US, it provides a new business opportunity when someone else has taken the business from them. (SC1e)

Indeed, many European and North American companies felt that they could not compete on prices with their Asian competitors. Hence, for them, being a forerunner in environmentally friendly technology formed an important competitive advantage.

The third main motive construct, *socio-environmental motivation*, includes both *environmental concerns* and *health and safety related issues*. For some customer firms, environmental concerns seemed to be the most important motive, overruling financial questions. For instance, at one of the interviewed customer firms, the aspirations for environmentally friendly solutions were based on the firm owners' personal values and deep environmental concerns. Consequently, the firm was willing to invest in greener technologies even more than the operating management seemed to think was financially sensible.

> For me, as an engineer, it is quite clear-cut [between environmental sustainability and cost issues], but I have an owner and he is, or they, the family, they decide certain things, and then you just have to do it. And they don't bother about the technical details. If I say that it is a bad decision economically and engineering wise, no, this is something we want to do. And then commercially, we carry this around as a penalty in our business because we have added cost somewhere which is eating up the profit, but that is how they want to do, so that is how we do. I could remove a lot of features here, cut down the cost, but it has not really been up for discussion. (SC1e)

In addition to the environmental concerns, crew and passenger health and safety issues played an important role in some of the customer firms' requests for new innovative solutions. At one of the interviewed customer firms, in particular, worker's safety and ergonomics seemed to be the number one priority:

> Ergonomics and machinery spaces, we're looking at a change in proactive maintenance schemes, so what could we be doing differently to allow for us safe operation on ships with the least amount of people onboard, with reliability in the automation systems. Not just comply with the marathon regulations which tend to be extremely reactive and I would say 20 years behind latest research. But there is a lot going on in the ergonomics world that I don't think we're spending enough time looking into. At least not in the bulker world. (CC8)

More recently, the COVID-19 pandemic has brought up additional needs for new solutions related to both crew and passenger health and safety issues. Especially for the cruise business, infection control has become a

major concern, requiring responsible innovations in ship designs.

4.2 | Socio-human capital pathways for issue selling

Just as customers had different motives for selling the issue of grand challenges to their supplier, they also employed various pathways to influence the supplying firms' responsible innovation development. We grouped these different pathways into three main constructs: human capital pathway, socio-behavioral pathway, and relationship pathway, as shown in Table 4.

The first construct, *human capital pathway*, includes the various ways a customer firm may support the supplier's responsible innovation development by increasing its *knowledge* and *capabilities*. Indeed, in the knowledge-intensive services sector where the supplier's Finnish subsidiary operates, suppliers and customers are typically dependent on each other's knowledge and resources. In the innovation development process, customers are an important source of knowledge, as indicated by the following interview comments:

TABLE 4 Socio-human capital pathways of customer influence on responsible innovation development.

Second-order constructs	First-order concepts	Representative quotes
Human capital pathway	Knowledge resources	"We basically have a basic design which we have developed in-house with specifications, and then we jointly [with the supplier] develop this complex specification. And the basic design changes a bit with the supplier and us together, and then the design work proceeds" (SC1b). "The ship owner [name removed], they bring the experience, they have been able to guide us, to comment it, on how to make it more optimal, more accurate arrangement, you know. So, that's why we achieved altogether a good product" (CS1c). "When we train them in our systems, then they can use that also when they sell services to our competitors. But that's just how it is" (NC2).
	Capability development	"I think we indeed learned a lot from [a shipowner], because at that time, it was the first time for us to reach into this RoPax segment, and we understood a lot, how to design and how to build, during this project. And that has helped us a lot to develop other RoPax and ferry projects" (CS1d).
Socio-behavioral pathway	Demanding behavior	"They always put pressure on the shipyard and everything is quite optimized. If you do not follow their requirements, you actually get these penalties. The ship owner is very tough" (CS1c). "I think [the supplier] will design whatever we like them to design. So we set high requirements, and they will do that" (SC1d).
	Supportive behavior	"So this time around, maybe it's a question of dealing with an educated customer that makes things easier. And this time around, they have been very flexible, very easy to deal with, very responsive and I'm very satisfied with their participation in the project that is coming to an end right now" (CC8). "So then we finally achieved this project, I think everybody was proud, [the customer] was also very happy when the ship was delivered after everything was approved" (CS1c).
Relationship pathway	Buyer–supplier relationships	"I see primarily the yard as the potential possible long-term business relationship. If we develop this design now with [the supplier], and it is a successful design, we would stay with this yard" (SC1e). "And in the middle of this project, they start to think about this battery concept, and they start to ask us to do some studies, and because they are a big client, we are willing to do some studies for them for free" (CS1e).
	Interpersonal relationships	"And we have run some very successful projects with them, so we know the people, and we know how they work, and we like how they work. So that's why we like to work with [the supplier]" (TNC5a). "Some of the customers, they are coming pretty close, because a project can last two or three years. And sometimes, you have to share pretty much time with those customers, and they are becoming like friends" (FS2d).

> We are the provider of the competence here. We know what type of product they need to produce. The yard has been there for 30 years, building vessels for many owners—domestic, foreign—but they've never built this type of vessel. How these vessels are operated, what they do, that is the knowledge that we bring into this. (SC1e)

The customer knowledge-sharing role was essential in upgrading the supplier's competence base. Some of the customers provided technical training, for instance, on their preferred computer tools for the supplier's staff. These new learned skills can also be used in future development projects with other customers. In particular, customer companies whose motives and goals go beyond regulations are most intensively enhancing the supplier's knowledge base and developing its competences.

The second construct for how customers influence the supplier's responsible innovation development was termed the *socio-behavioral pathway*. It refers to customers' *demanding* and *supporting behaviors* through which they are able to enhance the supplier's innovation development. First, customers' demanding behaviors naturally push the supplier to work hard to fulfill the customer's strict requirements, which can lead to more innovative solutions.

> But as ship owners, they always want to get more. They try to squeeze the shipyard to do more [...] bring some new high-tech, new concepts during the process. (CS1e)

The supplier firm did not view this sort of demanding behavior as being particularly negative. In fact, "tough" customers were often highly respected, and their demands were seen rather positively as they pushed the supplier to find new innovative solutions and, consequently, increased the supplier's skills and competences. When the customer's requirements for extra work were monetarily compensated, in particular, the behavior was considered more supportive than demanding. Indeed, customers' behavior was often seen as supportive: customers were helpful by, for instance, sharing information, offering advice, and most importantly, by showing trust and respect to the supplying firm, as indicated in this interview excerpt:

> They submit some papers supporting their opinion for a lot of things [...] So, [the customer] was convinced that we are a very strong technical team and we are capable of doing such things, and they believed we can deliver the ships successfully, even though we are building a RoPax vessel for the first time. (CS1e)

This sort of supportive behavior played a significant role in building the supplier's level of confidence in their own abilities and encouraging them to pursue further innovative projects.

The third construct, *relationship pathway*, refers to the important role of both long-term *supplier–buyer relationships* and *interpersonal relationships* between the members of the supplier and customer organizations. The quality of the buyer–supplier relationship is an important factor in the innovation development process. The supplier seemed to be willing to work especially hard to fulfill the needs of major or long-term customers. Sometimes, the supplier was ready to do additional research for a large customer without getting any extra payment for it. In general, many of the supplier's business relationships with its customer firms were long-term and characterized by mutual trust and commitment between the parties. The long-term business relationships often resulted in close personal relationships between staff members of supplier and customer organizations, as described in the following quote from an interview:

> With this person from [the supplier], we are friends from long back, from a project starting in 2006. We have a long history. The personal aspect is, of course, very important, that we are able to have an open, frank dialogue. (NC4b)

The well-functioning personal relationships were considered to facilitate open discussion and, thus, enhanced issue selling. The open communication was also essential for a joint responsible innovation development.

4.3 | Responsible innovations addressing grand challenges in the maritime industry

From our data-driven analysis, we identified three major grand challenges that the customer firms are selling as issues to the supplier firms, who then address them with their responsible innovations: *emission reduction, health and safety issues onboard*, and *cybersecurity* (see Table 5).

The respondents in our study named decarbonization as *the* grand challenge of the maritime industry. Decarbonization refers to the process of removing or reducing the carbon dioxide (CO_2) output, hence decreasing the amount of CO_2 emissions. The customer firms expected the supplier to provide them with innovative

TABLE 5 Responsible innovations responding to grand challenges in the maritime industry.

Second-order constructs	First-order concepts	Representative quotes
Emission reduction	Efficient design	"Because our designs are better than any other regarding the fuel consumption, when we came to the bulk carrier market, we were 25% better than any other design in the world" (FS2a). "We are looking to design the optimal vessel, and of course, fuel consumption is a huge advantage where [the supplier] can provide their expertise and competency that allows us to increase the speed or decrease the fuel consumption for our vessels" (CC8).
	Emission control	"We're doing a lot of study on greenhouse gas reduction technologies, and we already use LNG as a fuel, of course. This is normal. And we are also using waste heat-recovery technologies" (CS1e).
	Green energy	"We have two vessels with RNG dual fuel propulsion system. And we also have a battery system on the vessels. These both are for the reduced emissions" (CS1d). "For example, we have solar panels on top, not only on deck but also outside the cabin balconies. [...] And we also try to install rigid sails. The surface of these sails, we overlap with a soft solar panel, to utilize all possible exposed areas to connect with solar energy" (CS1c).
Health and safety issues	Infection control	"We have had a development program around infections onboard for a particular reason now, so looking at how we can mitigate the risks of getting, for example, COVID onboard" (CS1b). "We know the COVID-19 is becoming a very sensitive, very crucial topic for the future of cruise business. We are researching some new design guidelines to make a super infection-free solution onboard, including washers and monitoring if the passengers have flu, and all possible, such as air quality" (CS1c).
	Crew safety and ergonomics	"This ship is much more advanced than the owner's other ships. It requires less crew, and it's more easy for them to operate. Before, most of them were mechanical things, but nowadays, all of them are automations with computers inside" (CS1e). "What I'm looking for are ways to incorporate an optimal human–machine space that allows the operators or the crew members to operate in the most safe way possible, where the ergonomics are included. [...] And I'm looking to tap into [the supplier's] experience and competency to develop the most efficient vessels that incorporate the best ergonomics for the crew" (CC8).
Cybersecurity	Cyber-related concerns	"*Cyber Security Essentials*, there are different levels, but we chose a higher, a much higher level. [...] It means your ship has a certain level against cyberattacks" (CS1e).

designs that would lead to significant reductions in fuel consumption and, consequently, create less CO_2 emissions. Along with reducing the CO_2 emissions, customer firms mentioned other environmental issues that they are tackling, such as requirements for reducing sulfur oxide emissions, where the supplier is helping them.

Hence, many responsible innovations of the supplying firms are related to ship designs with better efficiency and reduced fuel consumption in comparison to their competitors' designs. The superior efficiency of the supplier's new designs is confirmed in model testing performed by a third party. For instance, successful responsible innovations of the supplying firms include lighter ship designs that lead to considerably less fuel consumption.

> How they design the structure, always to focus on keeping the weight of the vessel as low as possible. That's connected with fuel efficiency. (SC1e)

> We are leading when we see the figures what our products are having. I mean fuel consumption. We have 15% lower fuel consumption than competitor companies on our design. (FS2a)

In addition to more fuel-efficient designs, emissions reduction is addressed by other types of responsible innovations, such as various types of hybrid solutions with batteries and waste heat recovery systems. Such hybrid solutions allow the ships to enter and stay in port without running their engines for several hours, as described in the following interview quote:

> The cruise ships are using LNG as the main fuel. We are using a battery as a hybrid solution. Onboard the ship, we will also install a very large heat-recovery system. [...] These cruise ships are able to keep zero emissions for six hours not running their engines. It means these cruise ships can enter and stay in port for six hours without burning fuel. (CS1c)

Emission reduction is also sought after by innovations related to green energy, hence, using renewable energy sources onboard. For instance, the supplier is currently developing an eco-ship that uses both solar and wind energy, along with LNG fuel and battery and heat-recovery systems.

In addition to environmental issues, *health and safety issues* were also recognized as a grand challenge in the maritime industry. Particularly in the cruise business, the COVID-19 pandemic has compelled customer firms to request new innovative solutions from supplying firms. These include various ways to mitigate the spread of infections onboard, such as intelligent cabin control systems, automated air quality controls, and passenger temperature monitoring systems. Besides infection control, many other crew and passenger health and safety related issues are central for customer firms and, consequently, for the suppliers' responsible innovation development. For instance, customer companies are requiring more ergonomic ship designs, and consequently, the supplier firms are developing automated systems that make handling the vessel easier, safer, and more ergonomic, while also requiring fewer crew members to operate the ship.

The third grand challenge brought up by the interviewees is related to *cybersecurity*. With more automated and digital systems onboard, ships have become vulnerable to potential cyberattacks. The Russian invasion of Ukraine that started in February 2022 has heightened the potential for cyberattacks even further (see, e.g., Stacey et al., 2022). Consequently, the customer companies in the maritime industry are paying significant attention to cybersecurity issues, and our studied supplying firms have looked for a reliable and capable partner to provide them with innovative solutions for higher levels of protection against cyberattacks.

5 | A MODEL OF CO-ACTIVE ISSUE SELLING FOR RESPONSIBLE INNOVATIONS TO ADDRESS GRAND CHALLENGES

Analyzing how customers' motivations were connected with the pathways they used in influencing supplier firms' responsible innovation helped us to theorize about co-active issue selling for responsible innovation to address grand challenges. Drawing on the findings presented in the preceding section, we developed a model of how customers sell the issue of grand challenges to suppliers and—importantly for the case of collaborative engagements between suppliers and customers in highly concentrated, knowledge-intensive sectors—how customers co-engage in responsible innovations. Our model is presented in Figure 1 and discussed in the following subsections.

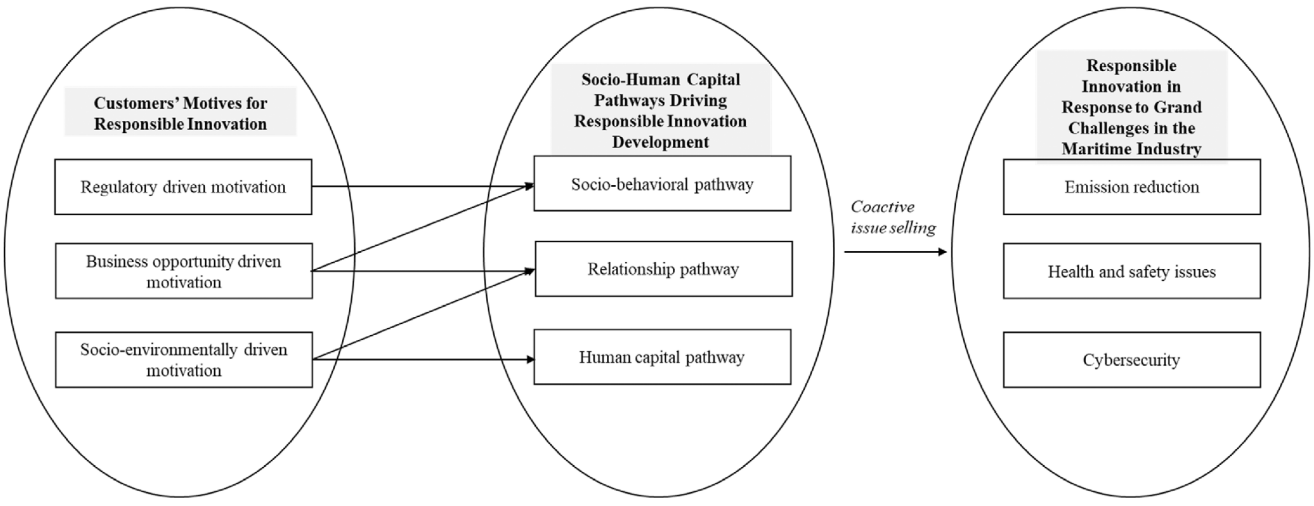

FIGURE 1 A conceptual model of co-active issue selling of responsible innovation for grand challenges.

5.1 | Motivation diversity helps bring grand challenges to the forefront

Our model starts with the motivations of customers that drive the issue selling. These are both reactive, as the regulatory compliance motivation conveys, and proactive, as well as extrinsic and intrinsic—targeting issue selling for profitability benefits (business opportunity driven motivations) or driven by environmental or social concerns that overrule profitability issues (socio-environmentally driven motivations).

Combining these motivations shows how responsible innovation solutions to grand challenges are not merely based on institutional pressure (i.e., regulatory compliance; Kuhlmann & Rip, 2018; Nilsson, 2017) but also on customer engagements with other parties, driven by economic incentives (business opportunity driven) or by beliefs and values related to serving a higher cause (socio-environmentally driven). Our study reveals how the motivations differ among customers: whereas some customers may combine several of these motivations, others may only focus on complying with regulations. Yet, importantly, the various motivations drive customers to champion the grand challenges to their suppliers.

5.2 | Customers drive supply firms' responsible innovation development through different pathways

Having established three main motivations of customers, our model continues by depicting three pathways (socio-behavioral, relationship, and human capital) through which customers enhance suppliers' responsible innovation development. These pathways, and especially how they connect with the different motivations, create the means to understand the micro-foundations of issue selling related to grand challenges (cf. Voegtlin et al., 2022). The three pathways indicate various levels of collectiveness relative to the suppliers, thereby explaining what has previously been labeled as "open innovation," "lead-user innovation," and related concepts (cf. e.g., Chesbrough, 2003; von Hippel, 2006). More precisely, they provide orientation toward how active the customer is in the development of responsible innovations: from the socio-behavioral pathway whereby customers demand or support the supplier's development of responsible innovation, to co-engagement to co-develop with the supplier (the relationship pathway), and to the customer contributing with its knowledge to internally improve the supplier's competences (human capital pathway). Thus, the pathways reveal various activities and also levels of activation by the customer, whereby the customer may champion and demand or champion and contribute. Importantly, the pathways that customers follow seem to be somewhat related to their motivations.

Indeed, Figure 1 indicates how various motivations are connected with different pathways. The *socio-behavioral pathway*, whereby customers demand or support the supplier, often follows from regulatory driven and business opportunity driven motivations. This means that the customer tasks the supplier with solving the grand challenges through developing responsible innovations, and the customer's role becomes mainly the provision of guidance. The customer remains quite passive with solutions and focuses on necessities related to remaining profitable.

The *relationship pathway*, whereby the underlying supplier–buyer and personal relationships advance the innovation process, is connected with both business opportunity and socio-environmental motivations. Compared to the business opportunity motivations connected to the socio-behavioral pathway, the types of motivations here refer to what is best for business from a value chain perspective: the customer sees how the value chain needs to transform to address grand challenges. Additionally, the socio-environmentally driven motivations related to the relationship pathway are based on co-development, whereby risks are shared and innovations cross firm boundaries. As with the other pathways, the co-creation does not take away the fact that it is the customer who initiates change through emphasizing grand challenges. In the relationship pathway, this championing becomes enmeshed with the operational exchanges between the customer and the supplier.

Finally, the *human capital pathway*, with its focus on the customer's knowledge integration and the supplier's capability enhancement, is particularly connected with customers' socio-environmental motivations. Thus, this pathway not only concerns the customers' superior knowledge related to new solutions but also the customer's informed ambitions related to intrinsic, save-the-planet motivations. The human capital pathway in practice means that the customer extends its engagement with the supplier beyond the operational buyer–supplier relationship characterizing the relationship pathway and actively aims to improve the suppliers' capabilities and knowledge resources needed for responsible innovation development to tackle grand challenges.

5.3 | Co-active issue selling helps tackle grand challenges in the maritime industry

The co-active issue selling conceptualized in this paper broadly concerns pathways whereby customers exert influence over suppliers to create responsible innovations in response to grand challenges. Our model focuses on

the buyer–supplier relationship and moves issue selling beyond single-issue requirements of another party by putting issue selling into a cross-boundary firm setting (cf. Dutton & Ashford, 1993; Dutton et al., 2001, who conceptualize issue selling within organizations). Compared to issue selling within organizations, the buyer–supplier relationship setting means that the issue selling becomes an integrated part of trust and legitimacy (Lauche & Erez, 2022; Satterstrom et al., 2021), which in our relationship and human capital pathways reaches beyond attracting attention to an issue to including co-engagement in responsible innovation development. Co-active issue selling thereby builds on past engagement with a supplier and moves issues beyond reactive compliance based on institutional requirements, while also being forward-looking in nature. From the grand challenge point of view, the issue selling entails initiatives that are customer-driven through engagements that, in some cases, put financial goals aside (i.e., the socio-environmental motivations). The co-creation and knowledge integration between customers and suppliers allow the supplier to develop responsible innovations and hence, co-actively contribute to grand challenge solutions regarding cybersecurity, onboard health and safety issues, and environmental issues in the maritime industry.

6 | DISCUSSION AND CONCLUSION

6.1 | Theoretical contributions

This paper joins the discourse in the literature on sustainability innovation management regarding why and how firms adopt a responsible innovation approach, thus departing from a more traditional approach (Kuhlmann & Rip, 2018) to grand challenges. This issue is important because we need to develop a better understanding of how firms can direct innovation endeavors toward tackling "wicked" problems (Ranabahu, 2020), particularly because they are "the most important management problems of this century" (McGahan et al., 2021, p. 49). However, we extend this research issue to explain why and how customer and supplying firms in a notorious industry co-actively engage in crafting and enacting a responsible innovation approach to grand challenges. In so doing, we offer important theoretical contributions as well as implications for practice.

First, our research departs from the prevailing view that focuses on societal and regulatory pressures with regard to grand challenges (Nilsson, 2017) by pointing to the power of individual customers to motivate firms to engage in and responsibly address grand challenges. Specifically, anchoring our theorizing in issue-selling theory (Dutton et al., 2001), we contribute to the extant literature on responsible innovation and grand challenges by explaining the various motives of customers and how they propel their supplier firms to craft responsible innovation responses to grand challenges.

The conceptual model (see Figure 1) we developed of co-active issue selling for responsible innovation in grand challenges points to three key motivations—regulatory driven, business opportunity driven, and socio-environmentally driven—through which customers sell grand challenges and exert influence on firms to develop and enact responsible innovation responses. The findings of our case study indicate that customers can be powerful actors or champions for addressing grand challenges, where, in addition to the regulatory compliance-driven motives, customers would enhance the focus on grand challenges beyond what institutional pressure has accomplished in the past. The notion of *championing* entails behaviors involving significant individual sacrifice or that are meant to drive the value of a change to other insiders and outsiders of a firm (Herscovitch & Meyer, 2002; von Hippel, 2006). The champion customers are a persuasive voice that can shape the agenda of other firms with which they interact (in our case, suppliers) and influence the latter to find a sense of purpose in taking a responsible innovation approach to grand challenges. This shifts the discussion from the regulatory and institutional pressures (incentives or penalties) (Kuhlmann & Rip, 2018; Nilsson, 2017) that have rather limited potential to firms' more proactive engagement in grand challenge responses. In other words, our contribution complements the call for institutional (e.g., Gümüsay et al., 2020) and industry incubation (e.g., Agarwal et al., 2021) factors shaping the tackling of grand challenges by adding a micro-foundational lens underpinned by how individual customers drive supply firms beyond their internally stated, largely economically driven goals toward grand challenge solutions. Specifically, how customers see business opportunities and intrinsically push for responses to grand challenges indicate how more can be accomplished than through institutional pressures alone. In so doing, we also advance management research on grand challenges (e.g., Doh et al., 2019; Howard-Grenville, 2021; Voegtlin et al., 2022), especially in the context of business firms.

Second, we revealed three pathways—human capital, socio-behavioral, and relationship—that help facilitate the engagement of supply firms in grand challenges. This suggests that a customer's motivational foci may not be sufficient, given that the customer needs to provide human, behavioral, and relational resources to drive the supply firm to responsibly engage in grand challenges. Our research contributes to the extant literature by

delineating the types of motives and corresponding resources that customers need to provide when attempting to influence the supply firm to engage in grand challenges. For example, this study revealed that when the customer's engagement for grand challenges goes beyond for-profit benefits or regulatory compliance (i.e., the socio-environmental motives), human capital resources and established relational trust are a vital capacity for engaging the supplier.

Third, our research sheds light on the ways customers and supply firms interact in a manner that harnesses the latter to engage in grand challenges. Specifically, we extend research and theory on not only why collaborative endeavors (Adler et al., 2008) to solve big socio-environmental problems are difficult to form but also on the conditions in which such endeavors may yield positive outcomes (Bodin, 2017). To elucidate the value of *co-active issue selling* for driving engagement in grand challenges, we borrowed the notion of a co-active process from Myers's (2018) research, which explained the power of "a discursive learning process where individuals (i.e., a model and learner) intentionally share and jointly process a model's work experience(s) in interpersonal interactions to co-construct an emergent, situated understanding of the experience(s)" (pp. 613–14). Co-active issue selling describes a discursive problem-solving process where the customer uses various pathways to engage the supplier in responsible innovation—both more demanding and more relational—to not only accomplish a potentially joint innovation journey but, more importantly, to also develop a deep awareness of grand challenges. This co-activeness lies in the socio-behavioral and relationships pathways and is unveiled through the interactional dynamics between the customer and the supply firm. The co-active issue selling is thereby a key relational architectural mechanism by which social change can be promoted and enacted.

6.2 | Practical and policy implications

Our study offers at least three important practical implications. First, by revealing customer motivations for attempting to influence supply firms, practitioners and policymakers can develop formal and informal forces that shape particular motivations in order to yield corresponding outcomes. It also allows for careful contemplation about and sensemaking of the identities of the causes the customer serves or aspires to serve and why, and also how they translate these motives into an influential plan to drive responsible innovation engagement in grand challenges. For example, motivated in part by customers caring about sustainability, Amazon's announcement in June 2020 of the Climate Pledge Fund aimed to "support the development of sustainable technologies and services" by which Amazon and other companies may meet the commitment to be net zero carbon by 2040, redefining the firm's responsible innovation approach to grand challenges. Moreover, even if institutional-level forces work to maintain the status quo in mobilizing for grand challenges (Grodal & O'Mahony, 2017), practitioners' engagement with our proposed micro-foundational approach, guided by a customer-focused role, can drive firms' responsible innovation responses further.

Second, practitioners and policymakers can harness the power of the various pathways identified in our study as vital knowledge, behavioral, and relational resources to craft innovative and responsible responses to grand challenges. For example, the pathways have valuable implications for dealing with *new* versus *existing* supplying parties, in that customer parties aiming to address a grand cause can leverage the power of an ongoing relationship (or in combination with supporting behaviors) to influence existing supplying parties to address grand challenges. Additionally, when dealing with new supplying parties, knowledge-sharing and competence-building capacities are valuable resources to deploy (or in combination with supporting behaviors) to help develop the relationship for establishing trust and legitimacy aimed at responding to grand challenges. Further, the *size* of a customer party pushing for a grand challenge agenda does matter, as it can both facilitate and inhibit a customer selling the grand challenges' issues. Compared to large customer parties endowed with network and relational resources and also able to engage in demanding behaviors, a small-sized customer might be largely constrained in similar resources to do so, but can, however, leverage their superior knowledge resources and capabilities (as evidenced in our case study) as a valuable pathway to propel supplying parties toward responsible innovation to tackle grand challenges.

Furthermore, the *ownership structure* matters for a customer party pushing for a grand challenge agenda. As we focused on business firms in this study, the proposed pathways have implications for a privately owned family business or publicly owned firms. In most cases, private family-owned businesses are relatively small in size, but generally imbued with idiosyncratic human capital endowments (often handed down through family generations), and thus can uniquely serve as superior knowledge resources and capabilities (or in combination with relational resources) to address grand challenge issues. Publicly owned businesses, though often large in size, might be controlled by shareholder interdependencies, interests, or related constraints to seriously engage in

grand challenge solutions. However, they can leverage the proposed pathways expressed through socio-behavioral resources, such as demands and support (or in combination with human capital and relational resources), to address grand challenges.

Third, the increasing pressure on firms to make a positive impact on the environment and society requires some collaborative efforts such that firms must jointly work with stakeholders (society) on grand challenges to make a positive impact. Our research directs the attention of managers and policymakers to the ways they can work collaboratively with customers to develop responsible innovation responses to grand challenges. We call this joint work a co-active issue-selling process in which both parties engage in generating and promoting new responses to responsibly addressing complex issues beyond the immediate boundary of the firm. Based on our setting in the maritime industry, on many occasions, customers were more proactive and knowledgeable about grand challenges than their maritime suppliers. These suppliers (e.g., as manifested in the Chinese parent company shipyards) were often stuck in regulatory reactive behaviors to grand challenges and, thus, had constrained responsible innovation developments and un(der)explored potential value co-creation efforts. However, as a result of customers' successful issue selling, herein through co-active issue selling, supplying parties engaged in moves directed toward responsible innovation to tackle grand challenges (as evidenced through the transformation of the Chinese parent company toward responsible innovation endeavors).

Fourth, a co-active issue-selling process can be expanded to a larger ecosystem of constituents who can harness the power of such a fertile platform to change others' courses of action (because they either would not want to lose the bandwagon ride or they would be inspired to redefine their approach), as well as develop new knowledge capabilities that can help the individual members in the ecosystem and the industry as a whole to act responsibly and build more compelling purpose-driven entities. This manifests a shift from a mere compliance orientation to a more prosocial approach, serving a meaningful purpose that is important for the whole.

6.3 | Limitations and future research

The study in this paper is based on a Chinese multinational company and its Finnish subsidiary in the maritime industry, in addition to their key customer companies around the world. Our case findings provided a rich contextualized explanation of co-active issue selling for responsible innovation in the business context. The different cultural settings of the customers and the suppliers may have impacted how motivations related to grand challenges were primarily the customers.' Nevertheless, for a wider comprehension of this phenomenon, future in-depth research spanning various study settings will be important. This would be applicable to research pondering the case findings in this study, but also contrasting research from other industries and geographies capturing co-active engagements that include, for example, for-profit firms in emerging/developing economies as customers. It would be important to investigate cultural aspects related to grand challenges issue selling and responsible innovation. Furthermore, future studies could investigate how supplying firms promote issue selling to effect responsible innovations in tackling grand challenges.

6.4 | Conclusion

Responsible innovation has emerged as a major area of interest in tackling grand challenges and ushering us toward a more sustainable future. However, we need to learn more about why firms embrace responsible innovation and how they respond to grand challenges. We endeavored to address this issue by demonstrating the role of customers in driving a firm's engagement with responsible innovation for grand challenges. In particular, we deem the power of individual customers driving collective efforts to be crucial, as it shifts current conversations on the role of customers in the innovation and sustainability domains by pinpointing the ways through which customers can define and push the strategic direction of their supplying firms toward responsible management in light of grand challenges. Our theoretical model and empirical findings, which build on the integration of issue-selling theory and the customer role from an innovation perspective, posit that the influencing factors for supplying firms to craft different forms of responsible innovation responses are enmeshed in three core customer motivations—regulatory, business opportunity, and socio-environmental. Crucially, in addition, these influencing factors are supported by three vital socio-human capital pathways—human capital, socio-behavioral, and relationship—which, in turn, produce a co-active engagement in tackling grand challenges innovatively and responsibly. Overall, we unpack new integrated insights into important, yet overlooked, factors of why and how customers and supplying firms develop a co-active engagement in grand challenges. We hope our study advances the current understanding of the role of customers in driving change in a firm's strategy and inspires future research on tackling grand challenges.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

ETHICS STATEMENT

The author has read and agreed to the ethical guidelines of the Finnish National Advisory Board on Research Integrity and the European Code of Conduct for Research Integrity for authors.

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