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When customer involvement promotes innovation performance: The moderating roles of coordination mechanisms with customers and external collaboration strategies

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ABSTRACT

This study examines the bright and dark side of customer involvement in new product development activities by analysing how the firm's coordination mechanisms with customers and its external collaboration strategy affect its innovation performance. While the innovation literature typically considers customers pivotal sources of innovation, we show that the relationship between customer involvement and innovation performance, measured by new-to-the-firm and new-to-the-market products and processes, is not linear and that there is a tension between involvement and dependence. We test our hypotheses using a unique dataset of 339 Italian knowledge intensive business services firms and find that firms that are able to leverage customer knowledge in the context of innovation use coordination mechanisms that strengthen the willingness of customers and organisational members to acquire and share knowledge, and develop external collaboration strategies that improve the variety of accessible knowledge for the firms.

1. Introduction

How can firms successfully use customer knowledge in the development of new ideas? While integrating customer insights fuels innovation processes and enhances understanding of user requirements (S. Najafi-Tavani et al., 2022; Z. Najafi-Tavani et al., 2020; Noordhoff et al., 2011; von Hippel, 1986), an excessive reliance on customer involvement risks overlooking the contingencies that shape its effective integration for the generation of novel ideas. Empirical evidence suggests that companies adept at synthesising customer inputs into their innovation efforts consistently outperform those struggling to integrate and capitalise on customer knowledge effectively (Foss et al., 2011). This underscores the importance of strategically managing customer involvement rather than treating it as a linear, one-size-fits-all model.

Prevailing perspectives in the customer involvement (Fang et al., 2008; Z. Najafi-Tavani et al., 2020) and open innovation (Chesbrough, 2003; Laursen & Salter, 2006) literatures stress the importance of involving customers in firms' innovation decisions, often emphasising the benefits of structured organisational procedures (Foss et al., 2011) and strong trust between partners (S. Najafi-Tavani et al., 2022). In this view, innovation is enhanced by leveraging customer knowledge, with the firm's organizational design and mutual trust mitigating (the unfavourable effects of) uncertainties in the close customer relationship. However, these studies often overlook critical, non-structural factors that influence a firm's strategic choices in optimizing customer involvement for innovation.

We argue that the effectiveness of customer involvement depends critically on coordination mechanisms, which differ from structural aspects like relationship quality (S. Najafi-Tavani et al., 2022) or relationship formalisation (Noordhoff et al., 2011). While constructs such as trust provide a high-level institutional framework, coordination mechanisms represent the concrete management and control practices that operationalise customer involvement, ensuring that customer behaviours are aligned with innovation objectives.[1] Without these

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[1] As proposed in previous studies (Hoetker & Mellewigt, 2009), we distinguish coordination governance mechanisms from structural governance (e.g. trust or formal rules). As administrative tools, these mechanisms facilitate practical collaboration, supporting a governance structure that enables firms to address safeguarding, cooperation, and coordination with customers (Homburg & Kuehnl, 2014).

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mechanisms, excessive focus on customer involvement may lead to an overreliance on narrow inputs, and prevent the integration of diverse knowledge sources that is essential for open innovation (West & Bogers, 2014). To maximise innovation outcomes, firms need to adopt a comprehensive approach, in which customer knowledge is part of a broader, interactive framework that combines both internal and external inputs. Coordination mechanisms foster continuous interactions through feedback loops and ensure that customer insights are woven into wider knowledge networks, enhancing the innovation process (Chesbrough, 2003; Laursen & Salter, 2006; Lazzarotti & Manzini, 2009). Without these mechanisms, firms risk overdependence on isolated customer feedback, losing the varied perspectives that are critical for open innovation (Bogers et al., 2017; West & Bogers, 2014).

Further, we emphasise the moderating role of external collaboration strategies, which expand the scope of knowledge inputs beyond customer insights. Excessive reliance on customer knowledge risks strategic myopia, as firms may become overly dependent on narrow, customer-specific inputs (Fang et al., 2008; Z. Najafi-Tavani et al., 2020; Noordhoff et al., 2011). Following previous studies on open innovation, we take into consideration other relationships, such as those with universities, suppliers, and external commercial collaborators (Colombo et al., 2021). By integrating external sources through academic or industry partnerships, firms enhance cognitive diversity and complement customer insights with broader perspectives that drive exploratory innovation (Colombo et al., 2021; Laursen & Salter, 2006). Therefore, the value of customer involvement depends on access to varied knowledge sources, which mitigates the risks of overdependence on customer inputs and strengthens the firm's open innovation strategy (Bogers et al., 2017).

To test our hypotheses we use a survey of 339 knowledge-intensive business services (KIBS) firms. KIBS firms rely heavily on customer involvement to drive innovation and sustain a competitive edge (Mina et al., 2014; Miozzo et al., 2016; Rodriguez et al., 2017) and they often adopt open innovation practices as a standard approach. These firms treat innovation as a continuous process, integrating it into their daily operations and carefully defining guidelines for customer engagement. KIBS firms also often act as knowledge brokers, bridging different structural holes to transfer knowledge and ideas across domains (Mina et al., 2014). For instance, professional services like consultants both generate and disseminate knowledge, while design firms draw from a variety of industries to provide solutions that combine existing knowledge in unique ways (Hargadon, 1998). Therefore, when developing customer involvement strategies, KIBS firms must evaluate both the mechanisms of their customer interactions and the diversity of accessible knowledge sources to effectively translate customer ideas into valuable innovations.

In the following we address, theoretically and empirically, how coordination mechanisms with customers and external collaboration strategies enable firms to optimise the innovation benefits derived from customer involvement. First, we present our theoretical framework. We then describe the data and methods, report our results, discuss their implications, acknowledge any limitations, and offer our conclusions.

2. Theory and hypotheses

2.1. Customer involvement: An open innovation perspective

Customer involvement represents a critical form of openness, allowing firms to tap into the valuable knowledge residing with users. By collaborating with customers throughout the innovation process, companies can better understand latent needs and transform those insights into novel products and services that resonate with the market (Cassiman & Valentini, 2016; Foss et al., 2011; Slater & Narver, 1998; von Hippel, 1986; Yli-Renko et al., 2020). However, excessive customer involvement also risks increasing complexity if there is misalignment in the firm's and customers' strategic orientations, capabilities, goals, and values (Fang et al., 2008; Noordhoff et al., 2011).

Extant research has primarily attributed such hazards to either the ambiguity generated by product newness or the inherent risks in business relationships (Z. Najafi-Tavani et al., 2020; Wang et al., 2020). Yet, these perspectives inadvertently overlook the challenges that lie not only in the complexity inherent in the combination of information and knowledge, but also in the uncertainty surrounding the collaborative relationship itself. From an open innovation perspective, customer involvement is more than a component of market orientation and it transcends participation in isolated practices (Slater & Narver, 1994). It encapsulates a broader paradigm of sourcing ideas beyond firm boundaries, co-creating with customers and partners, and successfully governing these external relationships (Bogers et al., 2017; Chesbrough, 2003; Lazzarotti & Manzini, 2009; West & Bogers, 2014).

Within this openness paradigm, accessing customer insights represents the informational dimension, enabling firms to enhance innovation outcomes by leveraging ideas and knowledge from external sources (Laursen & Salter, 2006). Simultaneously, the relational dimension involves building collaborative partnerships and integration mechanisms to productively synthesise customer inputs. Openness reflects a fundamental shift away from closed, internally focused innovation models. Open innovation empowers companies to share and co-create with external actors instead of jealously protecting ideas, technologies, and processes (Cassiman & Valentini, 2016; Chesbrough, 2003; von Hippel, 1986). This departure from insular, proprietary thinking unlocks new pathways for value creation and capture through reciprocal exchanges across organisational boundaries. By embracing both the informational access to customer knowledge and the relational governance of external collaborations, firms can more effectively translate insights into successful innovations while mitigating the associated risks (Uzzi & Lancaster, 2003).

For KIBS firms, which are inherently B2B entities, the discourse around customer involvement and its impact on innovation performance takes on heightened significance (Cabigiosu & Campagnolo, 2019). Collaborating with customers provides KIBS firms with access to valuable domain insights, but it also exposes them to unique informational and relational hazards that can undermine the benefits of openness. Addressing these challenges is paramount, as failure to do so can render openness to customers counterproductive for innovation endeavours. Generally, KIBS are perceived as facilitators, carriers, or even originators of innovation. Through their symbiotic relationships with customers, some KIBS assume roles as co-producers of innovation. To safeguard and capitalise on their innovative initiatives, KIBS often adopt strategies such as daily interaction with customers, whereby modest but sustained investments normalise innovation as a routine activity (Janssen et al., 2018). Alternatively, they may cultivate networks of relationships with external partners, thereby enhancing their indispensability within the service ecosystem (Rodriguez et al., 2017). This shift in focus necessitates a corresponding reassessment of critical factors, such as the roles played by coordination mechanisms with customers and the external network of partners that often surrounds KIBS firms. Such reorientation demands a substantial element of change within the innovation process, which occurs alongside the ideation or development of innovations (Lazzarotti & Manzini, 2009).

Drawing on the open innovation perspective, we propose a model delineating the relational and informational trade-offs involved in customer involvement (Fig. 1). We argue that there are two critical contingencies for managing open innovation hazards with customers: (a) coordination mechanisms to facilitate knowledge sharing, incentive alignment, and relationship management with customers, and (b) external collaboration strategies to access complementary knowledge for idea evaluation and development. This study endeavours to shed light on these intricate dynamics and offer guidance on the optimisation of innovation benefits derived from customer involvement, all within the broader context of open innovation strategies.

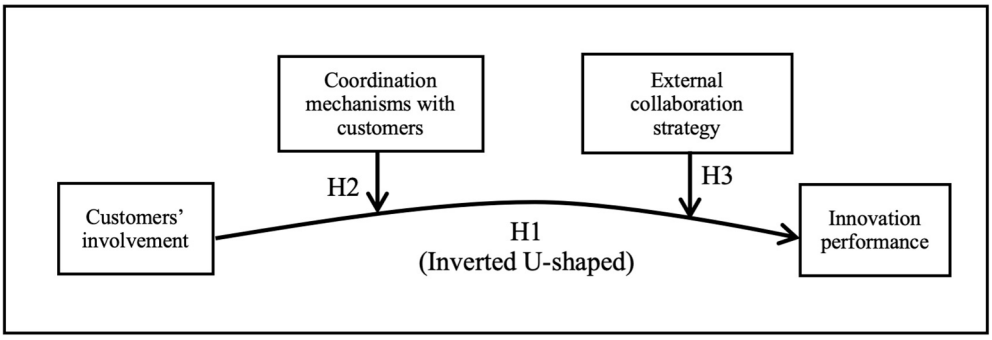

Fig. 1. Theoretical model.

2.2. The impact of customers' involvement on innovation performance

We define the extent of customers' involvement as the level of customer engagement in a number of firm innovation processes (Fang et al., 2008). For instance, customers may suggest ideas for new products or processes, provide feedback on how they might be improved, or help develop new knowledge bases. However, increasing customer' involvement entails a trade-off: the higher the number of activities in which customers are involved, the higher the complexity and value of the products and processes developed, and the higher the customer dependency that may negatively constrain a firm's innovation development (Fang et al., 2008; Foss et al., 2011; Z. Najafi-Tavani et al., 2020).

This trade-off highlights the informational hazards posed by excessive involvement. While customer participation provides useful market insights, overdependence risks restricted search processes, redundant information, and diminished creativity (Lane & Lubatkin, 1998). Once a certain threshold of customer involvement has been reached, overemphasis on customers may mimic a local search strategy, limiting the capacity to develop new products or processes outside of the customers' knowledge domain (March 1991; Uzzi & Lancaster, 2003). Firms may become overdependent, focusing their knowledge base on the expressed needs of current customers (Slater & Narver, 1998). Although customer immersion, screening, and matching customers' needs may decrease the cost of experimenting with new knowledge (Uzzi & Lancaster, 2003), such activities can also hinder the identification of novel opportunities that have not been articulated by customers. Therefore, while customers may be a valuable source of knowledge, firms must balance the benefits of market insights with the hazards of restricted search and the redundancy stemming from excessive customer involvement. For KIBS firms, a fundamental challenge lies in their role as co-producers of innovation with customers. An overly localised focus on customers risks reducing the firm's innovation-pushing capabilities and its capacity to seek the broadest levels of knowledge and expertise. This issue is strengthened by the firm's need to integrate a diverse array of capabilities and competencies—ranging from human expertise to technological resources—to address complex client problems (Miozzo et al., 2016). Compounded by the absence of formalised R&D structures, these firms face heightened complexities in effectively integrating external knowledge from multiple sources. Consequently, they grapple with uncertainties surrounding the evaluation of customer-generated ideas and the alignment of such ideas with their strategic innovation trajectories (Uzzi & Lancaster, 2003; Yli-Renko et al., 2020).

Moreover, while customers' involvement in the innovation processes motivates relationship-specific investments due to the potential for uncovering high-return opportunities (Madhok & Tallman, 1998), it also poses relational hazards. Close collaboration with customers often requires the specialised investment of managerial time, energy, and effort, and these are rarely transferrable to alternative uses or relationships. Moreover, although such dedicated investments can enable customers to access the firm's knowledge more easily (Lane & Lubatkin, 1998), the customers may then opportunistically leverage that knowledge in ways that are harmful to the firm, such as developing in-house solutions or sharing insights with competitors (Mudambi & Helper, 1998). As customer involvement in innovation increases, firms will find it increasingly difficult to control how their knowledge is used or to ensure appropriate knowledge sharing across joint projects (Molina-Morales & Martínez-Fernández, 2009). These relational hazards create uncertainty around the returns on involvement-driven investment due to risks of knowledge misappropriation, making it necessary for firms to balance the benefits and hazards of sharing the knowledge needed for co-creation. Such relational hazards can stem from the complexity and brokerage nature of B2B relationships. KIBS firms often broker knowledge and ideas across domains (Hargadon, 1998; Mina et al., 2014), filling an intermediary role that amplifies the strategic value of customer involvement but also increases the risks of knowledge misappropriation and imbalances in the co-creation process. Hence, we posit that a medium level of customer involvement creates informational and relational opportunities that foster a firm's innovation performance without incurring the dark-side effects of too much customer involvement. We therefore offer the following hypothesis:

H1: In KIBS firms, the extent of customers' involvement has an inverted U-shaped relationship with the firm's innovation performance.

2.3. The moderating role of coordination mechanisms with customers

While customer involvement creates opportunities for joint innovation, it also poses hazards like knowledge misappropriation and strained relationships that lack proper governance. We expect that coordination mechanisms with customers will moderate the inverted U-shaped relationship between customer involvement and innovation performance by flattening the downward portion of the curve.

In customer–supplier relationships characterised by interdependencies, information complexity, and diverse interests, governance is critical (Okhuysen & Bechky, 2009). When these relationships extend to innovation, continuous customer interactions require firms to have capabilities to identify, assimilate, and exploit customer knowledge (Cohen & Levinthal, 1990; Foss et al., 2011). We argue that coordination mechanisms play a vital moderating role by enabling governance and leveraging customer participation, allowing firms to sustain higher optimal levels of involvement before innovation performance starts to decline. Specifically, by increasing collaborative interactions, coordination mechanisms with customers empower firms to fully capitalise on promising co-innovation prospects. This maximises occasions for joint efforts and facilitates shared sensemaking to adeptly manage relationships amidst co-creation activities (Homburg & Kuehnl, 2014). By aligning expectations, incentives, and interactions, coordination integrates agreed service provision while controlling the risks of knowledge sharing.

For KIBS firms, coordination mechanisms with customers play a pivotal role in increasing the optimal level of customer involvement for the firm's innovation performance. Through their close collaborative

relationships with client firms, KIBS firms play diverse roles in facilitating innovation (den Hertog, 2000). They act as enablers by providing knowledge and expertise that clients lack. Additionally, they transfer innovative practices from one context to another, serving as carriers of innovation. In some cases, KIBS firms work jointly with clients, pooling their respective capabilities to co-produce innovative solutions (Janssen et al., 2018). This entails bundling and deploying a range of capabilities—human expertise, technological tools, and organisational processes—tailored to the client's requirements.

However, the open and distributed nature of innovation in services necessitates effective coordination mechanisms to manage the complexities of these relationships (Janssen et al., 2018). Crucially, coordination mechanisms with customers facilitate a deeper understanding of the clients' internal processes, requirements, and contextual nuances. This enhanced comprehension enables KIBS firms to develop more tailored and effective new business service solutions, which are optimally customised to address each client's unique needs. Additionally, coordination mechanisms play a vital role in facilitating knowledge exchange, mitigating relational hazards, and fostering transparency and trust between KIBS firms and their customers, even at higher levels of customer involvement (Haans et al., 2016; S. Najafi-Tavani et al., 2022; Noordhoff et al., 2011). Coordination mechanisms empower KIBS firms to capitalise on promising co-innovation prospects by increasing collaborative interactions, maximising occasions for joint efforts, and promoting shared sensemaking (Homburg & Kuehnl, 2014). By facilitating knowledge exchange and mitigating relational hazards, coordination mechanisms flatten the downward portion of the inverted U-shaped curve between customer involvement and innovation performance. This allows KIBS firms to sustain higher levels of customer involvement before innovation performance declines, enabling them to leverage their symbiotic relationships with clients more effectively. Accordingly, we expect the following:

H2: In KIBS firms, the use of coordination mechanisms with customers increases the optimal level of extent of customers' involvement for firm's innovation performance.

2.4. The moderating role of external collaboration strategies

While customer involvement enables co-creation opportunities, becoming overembedded in customer inputs risks strategic myopia stemming from an excessively narrow external search strategy (Laursen & Salter, 2006). Accordingly, we argue that broad external collaboration—particularly with partners such as universities, suppliers, and other collaborators with exploratory insights—will flatten the downward portion of the inverted U-shape (Haans et al., 2016).

A broad collaboration strategy will flatten the downward portion of the curve by furnishing diverse knowledge that guards against the strategic myopia of overdependence on customers. A variety of insights from eclectic partners will allow firms to sustain greater customer immersion before negative performance effects arise. For example, forming diverse non-customer-based partnerships exposes firms to complementary knowledge flows that expand cognitive frameworks and avoid poor allocation of managerial attention, supporting the identification of valuable innovations that reside beyond the expressed needs of key customers (Laursen & Salter, 2006; Ocasio, 1997; Yli-Renko et al., 2020). Collaborating with a heterogeneous network of partners (e.g., design, communication, and marketing consultants, ICT consultants, commercial laboratories, professional firms, public organisations, universities or public R&D units, scientific parks, and other external sources) provides access to diverse perspectives that safeguard against the cognitive lock-in stemming from overdependence on key customer relationships. By combining insights across customers and diverse external sources, firms enhance their ability to recognise promising opportunities that call for fusion across domains (Cohen & Levinthal, 1990). Moreover, the firm's bridging of customers and diverse collaborators fuels the novel recombination of knowledge, allowing emerging opportunities to be identified and avoiding the hazards of myopia from excessive customer immersion (Cassiman & Valentini, 2016). Thus, broad external collaboration strategies can complement customer involvement by expanding cognitive frameworks to identify valuable innovations that go beyond expressed customer needs.

For firms immersed in key customers' needs, brokering knowledge across diverse external sources provides access to varied perspectives through which potential breakthrough innovations may be effectively evaluated. The combination of insights from engaged customers and complementary external partners enables more robust screening and assessment of opportunities by reducing the risk of myopia (Levinthal & Posen, 2007). Expanding collaboration breadth furnishes the diverse knowledge required to undertake multifaceted sensemaking when evaluating the promise and feasibility of emergent opportunities. This guards against the pitfalls of assessments anchored solely in the narrow context of embedded customers (Foss et al., 2011). Access to heterogeneous insights from a broader collaboration network fuels more informed evaluation of nascent innovations by exposing firms to a richer set of criteria beyond the projections of customers. Thus, bridging different external sources reinforces the benefits of co-creation by providing the requisite variety of perspectives to counterbalance the hazards of myopia, which can arise when screening and evaluating innovations through the restricted lens of entrenched customers.

Accessing multiple external knowledge sources augments a firm's internal capacities to develop breakthrough innovations by combining diverse inputs (Lane & Lubatkin, 1998). The value derived from integrating insights across varied external partners depends on the firm's absorptive capacity, which expands with greater customer involvement and familiarity (Cohen & Levinthal, 1990). For KIBS, combining technical inputs from different collaborators enables the co-development of tailored solutions to address complex customer problems (Lee & Miozzo, 2019; Yli-Renko et al., 2020). Through dialogues with engaged customers, firms can identify the opportunities that are most suitable for joint development using complementary knowledge from diverse partners (Cassiman & Valentini, 2016). Blending specialised knowledge equips firms with the requisite inputs to translate identified opportunities into innovative market offerings. By synergistically integrating insights from key customers and varied external sources, firms enhance their collaborative development capacities, avoiding the constraints of relying solely on internal skills and entrenched customer perspectives. Therefore, we expect that the cognitive diversity from broad collaboration will enable firms to extract greater benefits from customer involvement before the risks of restricted search and myopia emerge. Based on this reasoning, we offer the following hypothesis:

H3: In KIBS firms, a more highly scoped external collaboration strategy increases the optimal level of extent of customers' involvement for firm's innovation performance.

Fig. 1 summarises our key constructs and hypotheses.

3. Methodology

3.1. Sample and data collection

To test our research hypotheses, we utilised data drawn from a survey carried out between July and November 2009 on KIBS firms in the Veneto region (northeast Italy). This region was selected for its economic growth trends, particularly in the demand for KIBS services. The Veneto region boasts high rates of employment and GDP per capita, ranking among the most developed regions in Europe (Eurostat, 2022). Moreover, in 2008, it ranked third in Italy for the proportion of manufacturing firms with high-technology content, indicating its technological advancement. The region is characterised by the presence of numerous industrial districts, which are specific territories with product specialisations, primarily within low- and medium-tech industries such as furniture, mechanics, and fashion. Over time, these districts have shifted focus, enhancing product value by moving from manufacturing

to value chain activities like R&D, design, and marketing (Becattini et al., 2009). This transition has led to an increased demand for services, particularly from KIBS, which play pivotal roles in supporting SMEs' innovation strategies and market positioning (Malerba & McKelvey, 2020).

Although technology has advanced since 2009, the core dynamics in our study remain relevant. The KIBS industry is known for its evolutionary and enduring nature, characterised by a consistent emphasis on customer collaboration and innovation (Mina et al., 2014). While technological developments may have influenced the specific modes and channels of customer involvement, the overarching principle of customer centricity and the pivotal role of customer engagement in innovation processes persist as crucial drivers of success for KIBS firms.

Data were collected through phone interviews with KIBS entrepreneurs using a structured questionnaire that enquired about firms' structural characteristics, market strategies, and their entrepreneurship, organisation, and networking activities. The survey aimed to capture the innovation strategies of KIBS firms in Italy before the effects of economic recession. A total of 2,984 firms were selected randomly from the regional universe of 7,049 KIBS registered with the Italian Chambers of Commerce or present in the records of the Association of Professional Accountants. The sample was drawn using a proportional random sampling method based on the size of each sector within the population. We then made initial contact by phone through a specialist survey company. We followed suggestions by Dillman (2000) for maximising response rates. We specifically trained the survey company on how to interview these firms and ensure that all the questions were clear. Interviews then were conducted with each firm's managing director, or a member of the senior management team, or the lead for new service development within the firm. Ultimately, 512 firms responded. These were carefully balanced to represent various areas of specialisation, encompassing professional services, ICT, design, and communication services. The same data have been used in other recent academic articles focused on KIBS's knowledge protection strategies (Bolisani et al., 2013), service customisation (Bettiol et al., 2015; Cabigiosu & Campagnolo, 2019) and market extensions (Di Maria et al., 2012). In our settings we focused on innovation practices. After excluding observations due to high levels of missing data for variables related to innovation performance and customer involvement, we were left with a sample of 339 valid responses. Table 1 illustrates the sample distribution by KIBS specialisation in the Veneto region. To ensure the reliability of our final sample, we conducted a number of tests. First, we utilised the two-sample Kolmogorov-Smirnov test to compare the distribution of the final sample with the regional universe. The objective was to evaluate the equality of specialisation distribution between the two groups. The analysis revealed no significant evidence to reject the null hypothesis ($D = 0.21$, $p = 0.54$), indicating that the sample accurately reflects the population's specialisation distribution. Second, we controlled for potential sample selection bias by employing Heckman's (1979) procedure, as discussed in the robustness checks section. These additional tests increase confidence that our findings are not tainted by selection issues in the survey data.

Table 1
KIBS specialisation distribution in the sample.

		Population of KIBS firms in the Veneto Region (July 2009)		Final sample	
Ateco code	**Description**	**N**	**%**	**N**	**%**
62.01.00	Computer programming activities	1523	21.6 %	78	23.0 %
62.02.00	Computer consultancy activities	114	1.6 %	5	1.5 %
62.09.01/9	Other information technology service activities & Computer facilities management activities	173	2.5 %	9	2.7 %
63.11.11	Data processing for accounting purposes	420	6.0 %	15	4.4 %
63.11.19	Other data processing services	24	0.3 %		0.0 %
63.11.20	Database activities	45	0.6 %	2	0.6 %
63.11.30	Hosting and application service provisioning	8	0.1 %	0	0.0 %
69.10.10	Legal activities	8	0.1 %	2	0.6 %
69.10.20	Notary activities	3	0.0 %	1	0.3 %
69.20.00	Accounting, bookkeeping and auditing activities; tax consultancy	57	0.8 %	28	8.3 %
69.20.11	Accountant services	4	0.1 %	0	0.0 %
69.20.12	Bookkeepers and chartered accountant services	9	0.1 %	2	0.6 %
69.20.13	Auditing activities	7	0.1 %	1	0.3 %
69.20.20	Labour consultation services	30	0.4 %	1	0.3 %
69.20.30	Other management consultancy activities	19	0.3 %		0.0 %
70.22.09	Web portals	1591	22.6 %	69	20.4 %
63.12.00	Web portal activities	11	0.2 %	2	0.6 %
70.21.00	Public relations and communication activities	118	1.7 %	5	1.5 %
71.11.00	Architectural activities	10	0.1 %	0	0.0 %
71.12.00	Engineering activities and related technical consultancy	38	0.5 %	1	0.3 %
71.12.20	Technical testing and analysis services	91	1.3 %	3	0.9 %
73.11.01	Advertising campaign concept development	1,230	17.4 %	56	16.5 %
73.11.02	Marketing campaign and other advertising services	36	0.5 %	2	0.6 %
74.10.10	Fashion design activities	627	8.9 %	23	6.8 %
74.10.21	Graphic design activities for web pages	291	4.1 %	12	3.5 %
74.10.29	Other graphic design activities	72	1.0 %	4	1.2 %
74.10.30	Technical design activities	463	6.6 %	17	5.0 %
74.10.90	Other specialised design activities	27	0.4 %	1	0.3 %
	Total	**7,049**	**100.0 %**	**339**	**100.0 %**

3.2. Common method variance

We undertook several procedures to reduce and evaluate the magnitude of common method bias. We built our survey following *procedural remedies* for common method bias (Podsakoff et al., 2011). First, we created methodological and proximal separation between the dependent variable and predictors by putting the questions in different sections of the questionnaire and using a variety of response formats. The survey contained sections on the firm's data (control variables), market strategies, entrepreneurship, organisation, and networking activities (predictors), and service configurations and innovation (dependent variables). Second, as reported in Table 2, we used scale items tested and consolidated in previous literature. Wherever consolidated scales did not exist, we reviewed our wording with industry and academic experts to ensure the clearest formulation possible for each question.

We checked for common method bias (CMB) more formally by using Harmon's one-factor test (Podsakoff & Organ, 1986), which involves conducting exploratory factor analysis and examining the unrotated

Table 2
Measures and descriptive statistics.

		Measure	Mean	SD
1	*Innovation new-to-firm* *Innovation new-to-market* *Ref:* (Amara et al., 2010; Cabigiosu & Campagnolo, 2019; Doloreux & Shearmur, 2012; Rodriguez et al., 2017; Shearmur & Doloreux, 2013)	Number of products and processes that are new to the firm, adopted in the previous three years (2008–2006) Number of products and processes that are new to the market, adopted in the previous three years (2008–2006)	2.18 0.96	7.50 6.11
2	*Innovation new-to-market*		0.96	6.11
3	*Customers' involvement* (4 items) CR = 0.866; CA = 0.861; AVE = 0.621 Ref: (Fang et al., 2008)	1) Customers are an important source of learning for technological research and basic skills development. *Five-point Likert scale (Nothing–Very much)* 2) Customers are an important source of learning for new product and process development. 3) Customers are an important source of learning for improvements in existing services. 4) Customers are an important source of learning for entry into new market segments.	1.55	1.64
4	*Coordination mechanisms with customers* (6 items) CR = 0.594; CA = 0.523; AVE = 0.293 Ref: (Cruz-Ros & Gonzalez-Cruz, 2015)	1) The customer has a dedicated contact person at the company. *Five-point Likert scale (Never–Always)* 2) The customer interacts with multiple company representatives based on their request. 3) The customer can access services through a web platform provided by the company. 4) Periodic meetings are held between the customer and company to coordinate and review results. 5) Company personnel are temporarily transferred to the customer site. 6) Customer staff are temporarily transferred to the company site.	−0.04	0.56
5	*External collaboration strategy* (8 items) CR = 0.654; CA = 0.615; AVE = 0.270 *Ref:* (Laursen & Salter, 2006)	1) The firm utilizes design, communication, and marketing consultants as a source of information and knowledge. 2) The firm utilizes ICT consultants as a source of information and knowledge. 3) The firm utilizes commercial laboratories as a source of information and knowledge. 4) The firm utilizes professional firms as a source of information and knowledge. 5) The firm utilizes public organizations as a source of information and knowledge. 6) The firm utilizes universities or public R&D units that assist with R&D as a source of information and knowledge. 7) The firm utilizes scientific parks as a source of information and knowledge. 8) The firm utilizes other external sources as a source of information and knowledge.	1.34	1.62
6	*No. of Employees*	A continuous variable measuring the total number of full-time and part-time employees currently employed at the company. Values were reported directly by survey respondents for their respective companies.	6.28	8.17
7	*Firm's age*	A continuous variable indicating the number of years since the founding year of the company. Measured as the difference between the survey year and the reported founding year for each firm.	11.02	8.35
8	*% Bachelor Degree*	Proportion of a firm's employees with a college degree	37.06	36.35
9	*Number of founders*	The number of initial founders of the company	5.30	17.04
10	*Market effectiveness*	Perceptual measure of attainment of market share growth.	2.23	0.67
11	*Being part of a group (Use lead firm of a network = 1; Otherwise = 0)*	In providing a firm's service the firm has not coordinated with other suppliers, but engaged with the customer via the lead firm of a network	0.08	0.28
12	*Number of partners*	Number of collaborations at the local, national, and international levels	5.55	28.24
13	*IP patents (Patents are utilized…=1; otherwise = 0)*	Firm employs patents as a means of protecting its intellectual property.	0.04	0.21

Notes: No. of observations = 339. CR = Composite reliability, CA = Cronbach's alpha, AVE = average variance extracted.

solution to define how many factors are necessary to explain variance in variables. If the first unrotated factor accounts for a relatively small share of the total variance (not more than 50 %), the implication is usually that CMB is unlikely to be a significant problem. The total variance for a single factor in our analysis did not account for much of the variance (16.50 %). The results suggest that procedural remedies adopted during the creation of our research design were sufficient to eliminate potential problems linked to common method bias.

Finally, we used a marker variable approach suggested by Lindell and Whitney (2001) to test for common method variance. This approach is based on the comparison of pairwise correlations of key variables in the dataset. For this technique, a 'marker variable', which is theoretically unrelated to at least one variable in the study, is identified. Where the marker variable cannot be identified *a priori*, the variable with the lowest correlation with other variables is chosen as the marker. In such cases, the smallest positive correlation in the correlation matrix of variables used in the study is considered as a proxy for CMB. We utilised *indicator of the founder's motivation for continuing a family tradition* as a marker variable. We then estimated the correlations between all our relevant constructs and each of the variables and found that none of the correlations were significant ($p > 0.10$). The marker variable displayed its lowest correlation (0.0015) with the *coordination mechanisms with customers* variable and similarly low correlations with all other

constructs. Based on these analyses, there appears to be no reason to suspect significant CMB in our analysis.

3.3. Measures

Table 2 describes the measures in our study and provides summary statistics. Table A1 in the.

Web Appendix shows their pairwise correlations.

Dependent variable–Firm innovation performance. In line with established literature, we employed a comprehensive approach to evaluate firms' innovative performance, utilising two distinct variables that have proven instrumental in capturing innovation dynamics within the context of KIBS firms (Amara et al., 2010; Cabigiosu & Campagnolo, 2019; Rodriguez et al., 2017; Shearmur & Doloreux, 2013). The first variable measures innovation performance in terms of the number of new-to-the-market or significantly improved products or processes (*InnMrkt*) introduced over the past three years (2006–2008). An innovation is new to the market when the firm is the first to introduce it. This innovation type is commonly used as a proxy for radical innovation (Rodriguez et al., 2017). The measure relates to the KIBS firm's explorative capacity to discover new ways to satisfy existing customer needs or its ability to identify totally new customer needs. The second variable, innovation that is new to the firm (*InnFirm*), quantifies the number of products or processes which, although already on the market, were new to the firm's product portfolio and introduced during the past three years (2006–2008). New-to-the-firm innovations are innovations that have already been implemented by other firms. Previous work points out that this type of innovation can be regarded as the ability to monitor the market's evolution and imitate or incrementally improve and refine existing products, thereby generating incremental or exploitative innovation (Cappelli et al., 2014; Rodriguez et al., 2017).

By employing these two complementary measures, our study captures the multifaceted nature of innovation within KIBS firms, which often entails a dual focus on introducing new solutions to the market and on adopting or improving existing solutions.

Independent variables.

Customers' involvement. This variable uses a formative index that measures the extent to which a firm relies on its customers across four key innovation activities. In a method analogous to Fang et al. (2008), we used four binary items indicating whether the firm involves customers in its (1) technological research and improvement of basic competencies; (2) development of new products and services; (3) improvements in the service production process; and (4) entrance to new markets or segments. Involvement relates to knowledge exchange activities with customers, which take place in the context of relational attachments with the firm (Noordhoff et al., 2011). It thus diverges from participation, which describes engagement with the customer in an array of activities. We coded each innovation activity item as 1 if the customer is involved to a high degree, and as 0 if the customer is not so involved. The sum of the number of activities in which customers are involved was used to represent the breadth of customer participation. Since customer involvement is an additive measure, the assumption is that firms that rely on customers as a source of innovation in a greater number of areas have higher customer involvement than firms that do not. The items represent unique innovation activities and are not expected to correlate highly or demonstrate high internal consistency. To assess the reliability of this formative index, we examined the significance of the indicator weights, multicollinearity, and the construct's nomological network. We found that all indicators contribute significantly based on partial F tests (all $p < 0.01$). The variance inflation factors (VIFs) are below 2.98, indicating no issues of multicollinearity. Moreover, the construct demonstrates logical relationships with key outcomes like innovation performance ($r = 0.10$, $p < 0.10$), supporting its nomological validity. While Cronbach's alpha, AVE, and CR are not traditionally used to assess the reliability of formative measurement models, researchers have proposed calculating AVE/CR for formative indexes (Hair et al., 2020). Our customer involvement construct exhibited fairly high reliability scores, having a composite reliability of 0.866 and Cronbach's alpha of 0.861. The average variance extracted was 0.621, which is above the recommended 0.5 threshold. These tests supplement the qualitative evidence, facilitating comparison for readers who are more familiar with traditional measures.

Coordination mechanisms with customers. We measured the frequency of use of various coordination mechanisms with customers using six items adapted from well-established scales (Cruz-Ros & Gonzalez-Cruz, 2015). Respondents indicated on a 5-point Likert scale (1 = never to 5 = always) how often each coordination mechanism was used. Higher values signify greater reliance on that mechanism. The six mechanisms captured were: (1) a single contact person for all needs, (2) multiple contacts based on request, (3) a web platform for interaction, (4) periodic meetings to evaluate results, (5) temporary personnel transfer to the customer, and (6) temporary personnel transfer from the customer. Scores on these six items were averaged to form the *coordination mechanisms with customers* construct, with higher values indicating greater reliance on rich coordination routines. While the reliability scores are modest, likely reflecting the diverse facets captured, supplementary analyses suggest that the coordination mechanisms with customers measure positively correlates with ancillary survey measures related to service quality and customisation. We interpret higher scores as reflecting a broader magnitude and richer constellation of practices, aimed at facilitating close relational coordination and mutual adjustment with customers (Palmatier, 2008). Additionally, in the Robustness Checks section we explored separately the moderating role of each item captured in the construct.

External collaboration strategy. This variable measures the breadth or coverage of firms' external collaboration strategies, and emphasises a firm's capability to explore and harness a diverse array of external knowledge sources. In a method analogous to Laursen and Salter, (2006), we captured firms' binary responses to eight items that measured their knowledge acquisition activities with specific external partners, namely: (1) consultants specialising in design, communication, and marketing; (2) ICT consultants; (3) commercial laboratories; (4) professional firms; (5) public organisations; (6) universities or public R&D units offering assistance in the R&D process; (7) scientific parks; and (8) other potential external sources. To operationalise this construct, we counted the number of types of external partners (ranging from 1 to 8) with which a firm actively engaged, thereby capturing the breadth or coverage of their external knowledge search strategy. This approach highlights firms' deliberate and systematic efforts to strategically navigate their engagements with different external partners, enriching their knowledge reservoir and propelling their innovation endeavours. The selected non-customer potential partners align with previous research on the benefits of different innovation linkages and their complementarities (Cassiman & Valentini, 2016). For example, consultants and R&D units may be sources of resource complementarities that eliminate bottlenecks and ground the exploitation of existing opportunities. Simultaneously, these knowledge sources complement the customer's role as a pivotal knowledge source for KIBS firms in the development of new products or processes (Rodriguez et al., 2017). This well-established measure has consistently exhibited decent reliability scores and enjoys widespread usage in innovation studies (Laursen & Salter, 2006; Mina et al., 2014; West & Bogers, 2014).

Control variables. We included several control variables at the firm and industry level. First, we controlled for innovation performance across different levels of a firm's resources, such as *number of employees*, *percentage of graduate employees*, *firm's age* and *number of founders*. Second, we controlled for the firm's *market effectiveness* because business growth is directly related to the extent of firms' innovation and to the diversity of their innovation efforts (Love et al., 2011). Third, we included a sector dummy for technology-related KIBS (T-KIBS, *Sector dummy* = 0) and professional KIBS (P-KIBS, *Sector dummy* = 1) (Lee & Miozzo, 2019). We controlled for the fact that when products and

services are offered to customers through a lead firm in the network, the chances of developing or commercialising new products decrease (Björk & Magnusson, 2009). For this, we used the dummy variable *being part of a group*, which is valued at 0 when the firm directly interacts with the customers and 1 when the firm is part of a network in which the leading firm mediates the relationship with customers. Previous studies have demonstrated that firm-level innovation is significantly influenced by local cultural, institutional, and economic factors, which vary across regions and should be accounted for to avoid biased estimates (Del Monte & Pennacchio, 2020; Doloreux & Shearmur, 2012). Given the overdispersion and heterogeneity present in the data, we used province-level dummies to capture these regional disparities, ensuring that both observable and unobservable local characteristics were properly controlled for in our model.

4. Results

4.1. Analytical procedures and results

The dependent variable in the regression model is a count variable, and the sample contains 339 observations. We initially considered using Poisson regression but rejected it because our dependent variables indicated overdispersion. Therefore, we applied a robust negative binomial regression model, the results of which can be found in Table 3. We started with the baseline models (Model 1) with only the linear effect of customers' involvement; the quadratic effect is presented in Model 2. The third and fourth models for each of the dependent variables (Models 3–6) include the moderating effects of the use of coordination mechanisms with customers, and the moderating effects of the external collaboration strategy (Allison, 1977).

Hypothesis 1 predicted an inverted U-shaped relationship between customer involvement and innovation performance in KIBS firms. Our results support this prediction but, importantly, the effects are observed only for one type of innovation performance: new-to-the-firm innovation (*InnFirm*). As shown in Table 3, the coefficient for the quadratic term of involvement was negative and statistically significant (Model 3: $\beta = -0.766, p < 0.01$; Model 4: $\beta = -0.719, p < 0.01$). This significant, negative quadratic coefficient provides clear initial evidence of an inverted U-shaped curvilinear relationship (Haans et al., 2016). However, this effect was not significant for new-to-the-market innovation (*InnMrkt*), as the coefficients for the quadratic term were non-significant in Models 5 and 6. This indicates that while customer involvement significantly affects the firm's ability to introduce new-to-the-firm products or processes (*InnFirm*), it does not have the same effect on breakthrough new-to-the-market innovations (*InnMrkt*). This is particularly important in the setting of service firms, where a co-creation logic might prioritise improved customer value rather than the new offering (Cabigiosu & Campagnolo, 2019; Doloreux & Shearmur, 2013; Love et al., 2011). The relative scarcity of radical innovations in KIBS firms (Amara et al., 2010; Miozzo et al., 2016) can make inferences about

Table 3
Robust negative binomial regression analysis for innovation performance.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	InnFirm	InnFirm	InnFirm	InnFirm	InnMrkt	InnMrkt
Intercept	0.924*	1.405**	1.397**	1.251**	−2.496**	−2.489**
	(2.021)	(2.943)	(3.067)	(2.658)	(−4.060)	(−4.355)
Independent variables						
Customers' involvement	0.212	0.433**	0.401*	0.394*	0.128	0.109
	(1.504)	(2.688)	(2.482)	(2.460)	(0.512)	(0.441)
Coordination mechanisms with customers	0.140	0.275+	−0.136	0.321*	1.002**	0.941**
	(0.874)	(1.778)	(−0.545)	(2.186)	(2.604)	(4.276)
External collaboration strategy	0.260*	0.332*	0.368**	−0.239	0.790**	0.206
	(1.966)	(2.466)	(2.650)	(−0.767)	(3.326)	(0.491)
Customers' involvement^2		−0.747**	−0.766**	−0.719**	0.155	0.236
		(−3.248)	(−3.403)	(−3.186)	(0.459)	(0.731)
Interactions						
Customers' involvement x Coordination mechanisms with customers			−0.182		−0.099	
			(−1.105)		(−0.470)	
Customers' involvement^2 x Coordination mechanisms with customers			0.442*		−0.072	
			(2.154)		(−0.250)	
Customers' involvement x Ext. collaboration strategy				−0.264		−0.405
				(−1.630)		(−1.280)
Customers' involvement^2 x Ext. collaboration strategy				0.498*		0.560
				(2.043)		(1.555)
Controls						
No. of employees	0.318	0.131	0.060	0.100	−0.689	−0.670
	(0.715)	(0.348)	(0.176)	(0.269)	(−1.255)	(−1.248)
Firm's age	0.235	0.271+	0.235	0.270+	0.299	0.280
	(1.434)	(1.817)	(1.614)	(1.900)	(1.240)	(1.190)
% Bachelor Degree	−0.147	−0.279+	−0.240+	−0.270+	0.048	0.076
	(−0.954)	(−1.880)	(−1.653)	(−1.816)	(0.211)	(0.332)
Number of founders	−0.242+	−0.238+	−0.342*	−0.277*	−0.150	−0.163
	(−1.711)	(−1.722)	(−2.493)	(−2.003)	(−0.686)	(−0.767)
Market effectiveness	0.659**	0.743**	0.752**	0.708**	0.350+	0.344+
	(4.317)	(5.226)	(5.387)	(4.917)	(1.807)	(1.809)
Sector (Dummy = 1)	−0.080	0.010	0.054	−0.059	1.341**	1.308**
	(−0.280)	(0.033)	(0.188)	(−0.200)	(3.100)	(2.938)
Being part of a group (Dummy = 1)	0.867*	0.671+	0.836+	0.693+	−0.802	−0.744
	(2.081)	(1.691)	(1.919)	(1.731)	(−1.356)	(−1.191)
Province-level dummies	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
lnalpha	1.607**	1.568**	1.555**	1.550**	2.486**	2.466**
	(12.173)	(12.077)	(11.934)	(12.147)	(12.950)	(13.133)
N	339	339	339	339	334	334
Log pseudolikelihood	−496.918	−493.016	−491.487	−491.081	−234.237	−233.690

Notes: Estimates are based on standardised variables; *t*-statistics are reported in parentheses.
Significance: $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$.

new-to-market innovations more challenging. This scarcity is reflected in our data, where we observe a notable difference between the means of *InnFirm* (M = 2.18, SD = 7.5) and *InnMrkt* (M = 0.96, SD = 6.11) variables. The lower mean and standard deviation for *InnMrkt* innovations suggest that these breakthrough innovations are less common and potentially more difficult to achieve in our sample of service firms. We focus our analysis of moderating effects on *InnFirm* due to its clear impact from customer involvement. This approach allows us to delve deeper into the more prevalent form of innovation in KIBS firms, providing more robust insights into the dynamics of customer-driven innovation in this context. Specifically, we examine how coordination mechanisms with customers and external collaboration strategies moderate the inverted U-shaped relationship between customer involvement and *InnFirm* innovation performance. This focus not only aligns with the empirical reality of innovation in KIBS firms but also provides a more nuanced understanding of how firms can effectively leverage customer involvement for incremental innovations, which form the backbone of continuous improvement and competitiveness in the service sector.

Moderating effect of coordination mechanisms with customers. Hypothesis 2 predicted that coordination mechanisms with customers would increase the optimal level of customer involvement for innovation performance. The results provide strong support for this hypothesis, indicating that coordination mechanisms expand the range of productive customer involvement. The regression analysis revealed a statistically significant positive coefficient ($\beta = 0.442$, $p < 0.05$) for the interaction term between the squared term of customer involvement and coordination mechanisms with customers. This positive and significant coefficient for the involvement squared–coordination interaction provides initial evidence of a flattening effect, in which coordination mechanisms reduce the negative impact of excessive customer involvement. In other words, firms that effectively coordinate with their customers can sustain higher levels of customer involvement without suffering the negative consequences typically associated with overinvolvement.

Moderating effect of external collaboration strategy. Hypothesis 3 predicted that external collaboration strategies would also increase the optimal level of customer involvement for innovation performance. The results support this hypothesis, with a statistically significant positive coefficient for the interaction between the squared term of customer involvement and external collaboration (Model 4: $\beta = 0.482$, $p < 0.05$). Similar to coordination mechanisms, external collaboration strategies exhibit a flattening moderation effect, allowing firms to benefit from higher levels of customer involvement without the typical downturn in innovation performance. This suggests that broader external collaborations bring in diverse knowledge, which mitigates the potential overdependence on customers and enhances the firm's ability to innovate incrementally through the integration of external insights.

Figs. 2 and 3 provide graphical representations of these moderating effects. Under conditions of low coordination mechanisms and low external collaboration, the relationship between customer involvement and *InnFirm* innovation follows a standard inverted U-shape, with diminishing returns after a certain point. Further slope analyses across different involvement levels confirm the inverted U-shape, with the turning point at 1.951 being well within the data range (see Section A2 in the Web Appendix). However, as both coordination mechanisms and external collaboration increase, the downward slope of the curve flattens, allowing for a wider range of customer involvement levels that still maintain high innovation performance. Additional slope analyses, detailed in Appendices A3–4, substantiate these moderation effects, showing that the turning point at which customer involvement begins to negatively impact innovation is pushed further out with higher levels of coordination and external collaboration.

These moderating effects do not extend to new-to-the-market innovations, highlighting that customer-driven improvements suit incremental rather than radical innovations. This suggests that while customer involvement and coordination mechanisms can effectively enhance innovation within the firm, they may not provide the necessary insights or drive for breakthroughs that redefine markets and create entirely new value propositions. Collaboration enhances the value of customer inputs for innovations that are new to the firm, but it may fall short in generating the kind of transformative, market-level novelty required for innovations that are new to the market. This suggests that broader collaboration, though beneficial for refining and improving existing offerings, might not provide the disruptive insights needed to achieve breakthrough innovations.

4.2. Robustness checks

We conducted several analyses to verify the identified relationship. First, we calculated variance inflation factors (VIFs) to determine whether multicollinearity existed in the analyses. In the regression equations (including control and independent variables, but excluding interaction terms), the average VIF was 1.23, with even the highest VIF values being lower than 1.68; these suggest no serious multicollinearity problems (Chatterjee & Hadi, 2006). Second, we addressed potential sample selection bias that could have arisen from the fact we had 339

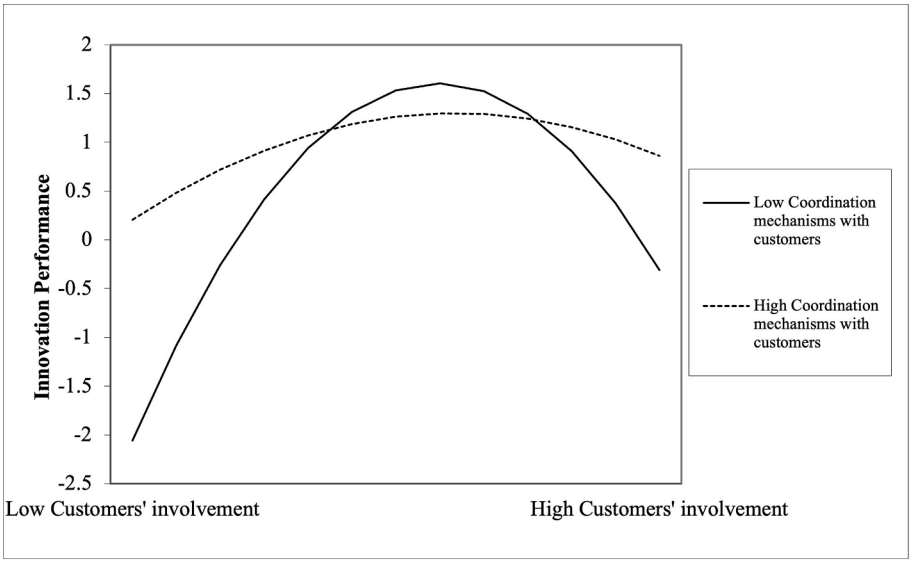

Fig. 2. Interaction of Customer Involvement and Coordination Mechanism on Innovation Performance (Innovation new to the Firm).

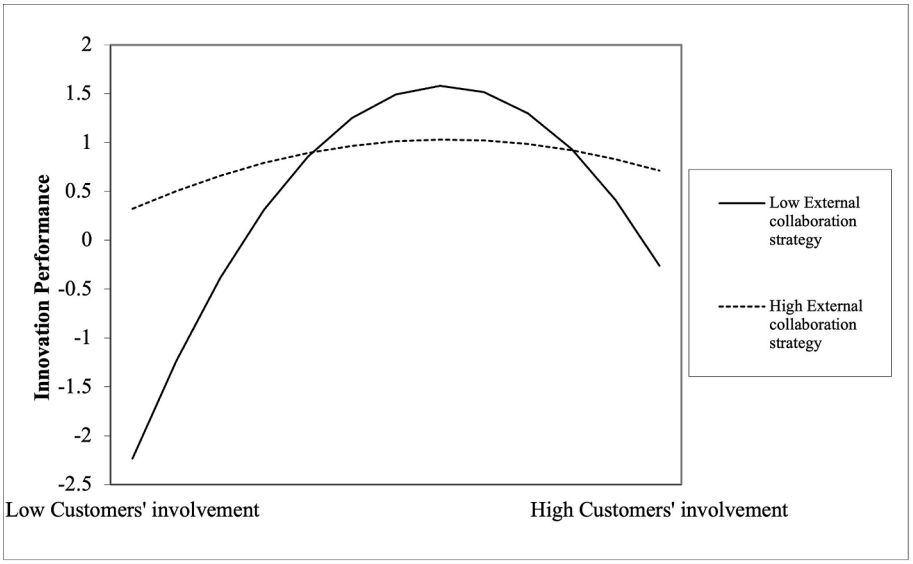

Fig. 3. Interaction of Customer Involvement and External Collaboration Strategies on Innovation Performance (Innovation new to the Firm).

observations with no missing values. We employed Heckman's (1979) procedure to test and correct for selection bias using all the available questionnaire responses. In the selection equation of the Heckman procedure, the dependent variable is binary, taking the value of 1 if a firm reported any form of innovation activity, and 0 otherwise. For the first-stage regression, we used general firm characteristics, such as the number of employees and firm age, as explanatory variables. Additionally, we included a variable that captures the significance of innovation objectives during the firm's founding phase. This variable, a dummy indicating whether the development of a product or service idea was an important motivation for the creation of the KIBS firm, is associated with the propensity to innovate and, more importantly, to the reporting of innovation efforts. The inverse Mills ratio calculated from Model 7 was then included in the regression to control for selection bias. The results from these additional tests, reported in Table 4 (Models 8–9), are consistent with the results from our main model. Moreover, the regression coefficient for the inverse Mills ratio turned out to be insignificant, minimising concerns about selection bias tainting our findings. Table 4 presents results for only new-to-the-firm innovation. The results for new-to-the-market innovation are provided in the Section 5 in Web Appendix.

Third, our dependent variable exhibited an excess of zeroes, so we used a zero-inflated negative binomial (ZINB) regression model, in which we estimated the probability of innovation through a logit model before estimating the negative binomial model (Wooldridge, 2015). The zero-inflation parameters used were the number of partners of the firm and the firm's use of intellectual property mechanisms. These factors are likely to influence the likelihood of a firm innovating a non-zero number of opportunities that already exist in the market. In our case, the Vuong statistic indicated that the negative binomial regression model was more appropriate than the ZINB model; the results from the single-equation ZINB models (Table 4: Models 10–11) confirmed all our hypotheses.

Fourth, a key challenge is potential endogeneity from reverse causality. Specifically, in the context of KIBS, customers may more frequently enter into collaborations with more innovative firms because of their knowledge and abilities (Miozzo et al., 2016). Although this reverse-causality explanation of our results is a possibility, the threat of endogeneity in our empirical model is likely to be minimal for several reasons. First, we included several firm-level covariates—including experience (the firm's age), knowledge (percentage of employees with a bachelor's degree), and size (number of founders)—to control for much of the unobserved heterogeneity in firms' individual abilities to generate innovations. Second, customers' involvement in the innovation process lies beyond the degree of control and influence the firm has on its open innovation network. As highlighted in other studies on open innovation, the innovation outcome cannot be viewed strictly as input for openness to customers' participation (Morgan et al., 2018).

Although this result helps rule out endogeneity, we followed recent recommendations (e.g., Busenbark et al., 2022) and conducted an Impact Threshold for a Confounding Variable (ITCV) analysis. This approach estimates the level of bias necessary to invalidate our results. In our main models, which exemplify the curvilinear effects of customer involvement, the ITCV analysis shows an invalidation threshold of 22.32 %. This indicates that to overturn our inference, 76 questionnaires would need to be attributed entirely to bias. Additionally, the ITCV for the squared term effect is 0.0303, meaning that a confounding variable would need to have a partial correlation of 0.174 with both the squared term and firm performance to invalidate our findings; this figure is higher than that of the strongest control variable (market effectiveness) in our model.

Finally, we explored how the different coordination mechanisms with customers used by KIBS firms play distinct roles in facilitating knowledge sharing and innovation (Foss et al., 2011). Coordination mechanisms with customers based on personal interactions (e.g., having a single client contact person, using different contact points based on requirements, temporarily transferring clients into the firm) compensated more effectively for suboptimal use of customer knowledge by providing access to clients' tacit, complex knowledge (Okhuysen & Bechky, 2009). In contrast, the use of web platforms seemed to hinder the firm's ability to leverage customer involvement to identify new opportunities (see Section 6 in Web Appendix).

These results reveal a key distinction between coordination via direct personal contact versus IT-enabled mechanisms in terms of their capacity for governing inter-firm interactions. While personal interactions afford the flexibility to dynamically adjust to emergent customer needs, traditional IT solutions merely frame how the parties operate, relying on willing compliance rather than autonomous enforcement. This aligns with the findings of Doloreux and Frigon (2020), who highlight that the use of general ICTs shows no univocal influence on innovation performance in KIBS firms for two possible reasons. First, some technologies are widely adopted and no longer represent a competitive advantage; second, they are more useful for optimising existing processes than for driving new forms of innovation. However, recent scrutiny of novel IT architectures like blockchain suggests these have potential to reshape how KIBS providers autonomously codify and execute predefined rules governing customer involvement (Lumineau et al., 2021). Such systems

Table 4
Robustness tests.

	Model 7	Model 8	Model 9	Model 10[a]	Model 11 [a]
	Innovation active (D = 1)	InnFirm	InnFirm	InnFirm	InnFirm
Intercept	0.776**	1.400**	1.252**	2.110**	1.833**
	(7.765)	(3.023)	(2.663)	(4.283)	(3.755)
Independent variables					
Customers' involvement		0.400*	0.394*	0.391*	0.388*
		(2.321)	(2.273)	(2.433)	(2.446)
Coordination mechanisms with customers		−0.135	0.321+	−0.270	0.237
		(−0.457)	(1.777)	(−1.036)	(1.507)
External collaboration strategy		0.370*	−0.238	0.299*	−0.295
		(2.133)	(−0.705)	(2.171)	(−0.968)
Customers' involvement^2		−0.766**	−0.719**	−0.912**	−0.816**
		(−2.826)	(−2.686)	(−3.850)	(−3.558)
Interactions					
Customers' involvement x Coordination mechanisms with customers		−0.181		−0.157	
		(−0.956)		(−0.940)	
Customers' involvement^2 x Coordination mechanisms with customers		0.441+		0.482*	
		(1.724)		(2.282)	
Customers' involvement x Ext. collaboration strategy			−0.264		−0.243
			(−1.482)		(−1.582)
Customers' involvement^2 x Ext. collaboration strategy			0.498+		0.461+
			(1.937)		(1.960)
Controls					
No. of employees	−0.105+	0.105	0.062	−0.103	−0.102
	(−1.871)	(0.236)	(0.149)	(−0.327)	(−0.349)
Firm's age	0.038	0.269+	0.234	0.222	0.190
	(0.563)	(1.645)	(1.511)	(1.558)	(1.397)
% Bachelor Degree		−0.269	−0.239	−0.417**	−0.350*
		(−1.574)	(−1.351)	(−2.637)	(−2.377)
Number of founders		−0.277	−0.342+	−0.183	−0.262+
		(−1.553)	(−1.675)	(−1.162)	(−1.776)
Market effectiveness		0.708**	0.752**	0.662**	0.712**
		(4.628)	(4.858)	(4.871)	(5.243)
Sector (Dummy = 1)		−0.063	0.053	−0.148	0.020
		(−0.190)	(0.163)	(−0.497)	(0.070)
Being part of a group (Dummy = 1)		0.694	0.836	0.599	0.764+
		(1.350)	(1.558)	(1.579)	(1.774)
Province-level dummies		*Included*	*Included*	*Included*	*Included*
Instruments					
Innovation Significance in Founding Phase	−0.286*				
	(−2.210)				
Inverse Mills ratio		−0.009	−0.003		
		(−0.034)	(−0.011)		
Geographical expansion					
IV Control Variable 1					
Inflated model					
Intercept				−1.076*	−1.258*
				(−2.003)	(−1.968)
Number of partners				−6.045**	−6.575*
				(−2.583)	(−2.400)
IP patents				−16.896**	−17.188**
				(−20.122)	(−17.760)
N	459	339	339	339	339
ll	−1507.688	−491.487	−491.081	−484.734	−484.655

Notes: Standardised variables; *t*-statistics in parentheses.[a] Robust zero-inflated negative binomial regression

mark a departure from the governance properties of traditional IT and could potentially overcome some of the limitations of impersonal, IT-enabled mechanisms in fostering effective customer participation for innovation.

5. Discussion and conclusions

Overall, our study both confirms several previous influential works and advances the open innovation and customer involvement literature in certain respects. First, it reaffirms the initial insights of Laursen and Salter (2006) who found a curvilinear relationship between customer involvement and innovative performance, and Fang and colleagues (2008) who suggested that the relationship between the two 'is more complex than is first apparent' (p. 322). Our findings align with these studies, demonstrating that while customer involvement can enhance innovative performance, there is a threshold beyond which the benefits diminish.

Moreover, our findings highlight a crucial distinction between incremental and radical innovation processes. While customer involvement significantly affects the firm's ability to introduce products or processes that are new to the firm, it does not have the same effect on breakthrough innovations that are new to the market. This distinction is critical for understanding how customer involvement functions within KIBS firms. The significant effect of customer involvement on new-to-the-firm innovations suggests that customers play a key role in helping firms adopt or refine existing solutions, leading to incremental innovations. This aligns with the co-creation logic often observed in service industries, where customer feedback is primarily leveraged to improve existing offerings rather than drive breakthrough innovations (Cabigiosu & Campagnolo, 2019; Doloreux & Shearmur, 2013; Love et al., 2011). In contrast, the lack of a significant relationship between customer involvement and new-to-the-market innovations suggests that

customer input may be less influential in fostering the types of radical innovation that lead to entirely new market offerings. This is consistent with previous evidence suggesting that firms may find it challenging to leverage customer involvement for innovations that are truly groundbreaking (Homburg & Kuehnl, 2014; Morgan et al., 2018). Radical innovation rarely comes from consumers and getting closer to users does not make it more likely (Verganti, 2011).

Second, by joining the most recent conversation on managing the relationship with customers to counterbalance the risks associated with excessive customer involvement, we both confirm and add to the mechanisms that enable a strong relationship without diminishing the innovative performance returns. While prior studies emphasise institutional mechanisms (Foss et al., 2011; Noordhoff et al., 2011), our research highlights how coordination mechanisms serve as actionable management and control practices that operationalise customer involvement. These practices ensure that customer behaviours align with the firm's innovation objectives. Our findings show that governance mechanisms such as customer-aligned incentives and regular knowledge sharing not only prevent excessive involvement but also optimise the innovation-enhancing potential of customer relationships. This advances the literature by offering concrete tools to address overdependence (Homburg & Kuehnl, 2014; Z. Najafi-Tavani et al., 2020). Moreover, these mechanisms mitigate relational hazards and create conducive conditions for successful innovation. They help flatten the downward slope of the inverted U-curve by preventing excessive customer involvement from devolving into detrimental overdependence, which undermines the diversity of perspectives essential for open innovation (Bogers et al., 2017; West & Bogers, 2014).

Third, our findings differ from previous studies that focused on the role of absorptive capacity and relationship quality (Morgan et al., 2018; S. Najafi-Tavani et al., 2022). In line with open innovation principles, we explore how firms engage with a diverse ecosystem of external knowledge sources (Eisingerich et al., 2008; Laursen & Salter, 2006; Lee & Miozzo, 2019). By introducing external collaborations as a moderating factor, we demonstrate how strategic myopia can be counteracted by fostering cognitive diversity through broader partnerships (Laursen & Salter, 2006; Ocasio, 1997). In particular, combining depth (gained from customer involvement) with breadth (provided by diverse external knowledge sources) enhances opportunity recognition and resource recombination capabilities, both of which are key to open innovation frameworks (Doloreux & Shearmur, 2013; Rodriguez et al., 2017). Broader collaboration scope serves as a essential complement, reinforcing open innovation insights on search breadth while optimising the innovation benefits derived from customer involvement.

While prior research has often focused on dyadic relationships, our findings emphasise that collaborating across a heterogeneous network of partners—such as universities and competitors—introduces the knowledge variety needed to counterbalance the risks of myopic customer convergence (Rodriguez et al., 2017). This network multiplexity enhances cognitive distance, allowing firms to sustain differentiated innovation trajectories while optimising customer relationships (Muller & Zenker, 2001). By clarifying these contingencies—namely, coordination mechanisms with customers and external collaboration strategies—our model identifies the conditions under which firms can amplify the innovation-enhancing effects of customer involvement, mitigate its associated risks, and achieve superior performance through open innovation practices.

In conclusion, by highlighting the pivotal role of governance mechanisms and the balancing effects of external collaborations, our study provides actionable insights that fill gaps in the open innovation literature, particularly regarding the risks of excessive customer involvement.

5.1. Theoretical implications

Our findings have significant theoretical implications. First, we move beyond the traditional input–output accounts by delving into the nuanced dynamics of managing openness in innovation. While innovation literature has traditionally supported the idea that collaboration for innovation with customers represents a fundamental aspect of service firms' innovative performance (Miozzo et al., 2016), our study develops a contingency model that highlights the circumstances under which customer involvement will maximise a firm's product and process innovation performance. Specifically, our study offers nuanced, cross-level analysis demonstrating how coordination mechanisms with customers and external collaboration strategies enable KIBS firms to overcome the potential pitfalls of excessive customer openness (S. Najafi-Tavani et al., 2022; Noordhoff et al., 2011). This contingency perspective advances understanding of how specific capabilities govern the informational and relational hazards of excessive openness, enabling balanced partnerships (Fang et al., 2008; S. Najafi-Tavani et al., 2022; Noordhoff et al., 2011). By integrating these structural and strategic contingencies within a comprehensive framework, our research provides vital insights into leveraging customer involvement for enhanced innovation performance. Crucially, our findings underscore the importance of a holistic open innovation approach that transcends linear, unidirectional models of customer involvement. We show that facilitating continuous customer interactions through robust coordination mechanisms with customers, and integrating these insights within broader external knowledge networks are imperative for translating user inputs into successful innovations (Chesbrough, 2003; Laursen & Salter, 2006; Lazzarotti & Manzini, 2009).

Second, our research provides actionable governance insights by elucidating how coordination mechanisms with customers (e.g., key points of contact) can be effectively implemented to improve relationship strength, enhance understanding of customer needs, and promote the absorption of first-hand information (Homburg & Kuehnl, 2014; Z. Najafi-Tavani et al., 2020). Crucially, these mechanisms facilitate the experimentation of novel knowledge while mitigating the risks of rigid overdependence on customers. By elucidating how structural capabilities like coordination influence innovation, we advance governance perspectives on navigating involvement uncertainties.

Third, our focus on KIBS provides new context-specific insights into the tensions of openness, given the pivotal yet precarious role customer relationships play in innovation (Morgan et al., 2018; Slater & Narver, 1998). The highly customised nature of KIBS offerings, which integrate firm expertise with customer needs, amplifies both the strategic value and the risks of customer involvement (Bettencourt et al., 2002). Unlike standardised outputs, the co-creative process in KIBS relies on continuous knowledge exchange, creating heightened uncertainties around appropriability and the opacity of how inputs transform into service solutions. These dynamics expose KIBS firms to significant risks of overdependence on customer perspectives, potentially limiting their ability to explore novel opportunities and sustain innovation performance (Morgan et al., 2018; Noordhoff et al., 2011; Wang et al., 2020). Our findings indicate that innovation performance is strongest when KIBS firms balance deep customer engagement with a heterogeneous network of external knowledge sources. Acting as knowledge brokers, KIBS firms rely on insights from diverse domains to create tailored solutions, but their typically small size and lack of formal R&D units make them particularly vulnerable to overreliance on a few customer relationships (Hargadon, 1998; Mina et al., 2014). By examining how coordination mechanisms and external collaboration strategies mitigate these risks, we contribute to the broader discourse on optimising customer involvement strategies. Specifically, our study sheds light on how firms can navigate the dual challenges of leveraging customer relationships for co-creation while maintaining the cognitive diversity essential for sustaining innovation in KIBS and other B2B service contexts (Eisingerich et al., 2008; Miozzo et al., 2016).

While our study is focused on KIBS, the dynamics investigated likely generalise to other innovation settings where firms engage in B2B relationships involving customised product and service design (Shearmur

& Doloreux, 2013). However, contingencies related to knowledge intensity, service versus product offerings, and B2B versus B2C collaboration may alter the observed dynamics, presenting opportunities for future research to explore potential asymmetries in how customer involvement impacts innovation across contexts. The contingencies identified in this study, such as coordination and collaboration strategies, provide a framework for investigating variances in optimal integration and governance of openness across contexts.

Finally, our multilevel lens integrates diverse theoretical fronts on managing involvement risks (Chesbrough, 2003; Foss et al., 2011; Laursen & Salter, 2006; S. Najafi-Tavani et al., 2022). We show how coordination mechanisms with customers and external collaboration strategies act as organisational and strategic levers to optimise customer participation. These levers buffer a firm against the downsides of involving customers in the innovation process, hedging against risk and avoiding redundancy among diverse relationships (Foss et al., 2011), while also being effective in protecting firms against opportunism (Noordhoff et al., 2011). This dual dimension of openness, which focuses on the integration of customers and a variety of external knowledge sources, offers a richer understanding of how firms can leverage targeted capabilities to effectively harness customer participation for enhanced innovation performance.

5.2. Managerial implications

Our results also suggest some managerial implications. First, they underscore the contingent significance of engaging in collaborations with customers. Whereas prior research has concentrated on identifying the optimal level of customer involvement, we assert that firms must assess the robustness of the underlying structural framework and adopt a strategic approach that can facilitate efficacious customer engagement (Homburg & Kuehnl, 2014; Z. Najafi-Tavani et al., 2020). Therefore, firms should manage customer involvement with a portfolio-oriented perspective (Laursen & Salter, 2006; Rodriguez et al., 2017). The services provided by KIBS firms are often the outcome of joint effort by the service provider and the customer (Bettencourt et al., 2002) and in order to develop new products and processes, KIBS firms need in-depth understanding of their customer's organisation, business, and strategy, and they must adapt their services to the customer's requirements. Therefore, although customers play a principal role, we maintain that firms should complement that involvement by developing relationships with other actors (Rodriguez et al., 2017). Specifically, the more a firm aims at involving customers in a variety of innovation-related processes, the more it should sustain that choice with mechanisms that promote willingness to acquire and share knowledge with its customers. Although such willingness can increase risks of opportunism and dependence on customers, the mechanisms can provide complementary knowledge and mitigate the risk of customer opportunism (Fang et al., 2008; Noordhoff et al., 2011; Wang et al., 2020).

5.3. Limitations and future research

Our study, while providing valuable insights, has certain limitations that affect the generalisability and interpretation of the results. First, the sample was confined to a single country and consisted exclusively of KIBS firms. This strategic choice allowed us to control for environmental differences and focus on firms that are accustomed to collaborating with customers. Although we believe our theory will hold in other empirical contexts, future research could compare the production process of knowledge-intensive services with those of B2C settings to distinguish commonalities and differences in their managerial approaches to innovation.

Second, our study employed the number of new products and processes developed by firms as the dependent variable, Although this is an important and frequently used measure, it is only one aspect of a firm's innovative output. Future studies could focus on other measures of creativity, performance, or success. We acknowledge here that such measures are difficult to gauge because of a lack of objective data and their typically complex processes.

We measured customer involvement as a combination of relationship strength and breadth. Future studies should examine the extent of customers' involvement in terms of the strength versus breadth of these relationships, and study how these dimensions separately affect new product performance. Furthermore, we treated the extent of customers' involvement as a single construct with uniform effects on firm innovation processes. More research should be conducted into which activities of such processes would benefit most from customers' involvement.

Finally, our findings suggest that the interface that coordinates customer collaboration can shape innovation outcomes. While affirming core concepts about customer centricity, our study provides some initial evidence on the potential limitations of traditional IT coordination mechanisms in fully capitalising on customer knowledge inputs. As the KIBS sector continues to evolve rapidly, future research could expand upon our understanding by explicitly examining how technological paradigms such as digital platforms and AI/analytics might transcend previous constraints to facilitate optimal customer engagement for innovation. Recent studies exploring how the unique attributes of new technologies shape customer engagement dynamics over time are warranted, building upon our insights regarding technology's role in governing inter-firm knowledge integration (Lumineau et al., 2021).

CRediT authorship contribution statement

Stefano Li Pira: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization, Data curation, Methodology, Visualization. **Anna Cabigiosu:** Writing – review & editing, Writing – original draft, Conceptualization, Investigation, Project administration, Resources. **Diego Campagnolo:** Writing – review & editing, Conceptualization, Investigation, Project administration, Resources, Writing – original draft.

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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbusres.2025.115292.

Data availability

Data will be made available on request.

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