Supplier involvement in NPD projects: the buyer's perspective on the complementary roles of social capital and social exchange for project performance

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Abstract

Purpose – Buying firms involve suppliers early in New Product Development (NPD) projects to benefit from their capabilities. The authors investigate the joint impact on project performance improvement, of the social capital established throughout the project, and the strategic preferred buyer/supplier statuses awarded prior to the project, from the buyer's perspective.

Design/methodology/approach – The authors propose a conceptual model underlining the complementary contribution to project performance of social capital dimensions and of preferred partners' statuses resulting from social exchange expectations. The model is analyzed with Partial Least Squares using 80 responses of purchasers and R&D managers involved in collaborative NPD projects with suppliers.

Findings – The relational capital built during the project has a positive central role, with a direct impact on NPD project performance and mediating effects through cognitive and structural capitals. The preferred partners' statuses have strong direct impacts on performance, and mediating effects that do not completely supplant the social capital's contribution.

Practical implications – The implications for the efficient management of supplier involvement are twofold. First, the authors encourage strategic investments of buying firms to acquire preferred buyer's status and to support preferred supplier programs. Second, the authors alert them on the importance of establishing trust and shared cognition during the project.

Originality/value – This study captures NPD project performance from the social angle of buyer–supplier relationship management. It demonstrates the complementarity of relationship management at the strategic and operational levels, before and during the project unfolding.

Keywords Social capital, Social exchange, Preferred buyer, Preferred supplier, New product development, Partial least squares

Paper type Research paper

1. Introduction

Faced with the increased competition, firms rely on resources beyond their boundaries to reap the benefits of their external environment (Doloreux *et al.*, 2021). Suppliers' resources and expertise are considered as the main contributors to the performance of manufacturers (Schiele, 2006). Industrial firms involve suppliers early in New Product Development (NPD)

projects to jointly define the technical specifications and frame the development process (Bidault *et al.*, 1998). Early supplier involvement (ESI) in NPD reduces technology uncertainty (Ahlskog *et al.*, 2019) and enables manufacturers to leverage suppliers' technical capabilities to improve product development performance (Wynstra *et al.*, 2001). This improvement includes lower product and project costs, better product and design quality (Ragatz *et al.*, 2002), improved manufacturability (Wu, 2021), shorter project lead times (Bidault *et al.*, 1998) and increased innovation potential (Kabadurmus, 2020; Schiele *et al.*, 2011). Nevertheless, other studies suggest that ESI in NPD projects does not necessarily enhance the development time nor the product quality, and can generate additional coordination costs (Wynstra *et al.*, 2001). Such conflicting results stem from an inappropriate management of the buyer– supplier collaboration (Ralston *et al.*, 2017; Xu *et al.*, 2021). In this sense, Kulangara *et al.* (2016) suggest that further investigation is needed regarding the effect of the relationships between the buyer and the supplier project teams on NPD project performance. Indeed, there is a dearth of research exploring the contribution of buyer–supplier relationship management on successful supplier involvement for NPD.

This supplier involvement requires the deployment of socialization mechanisms (Dowlatshahi, 1998) to efficiently manage NPD as the latter represents a decomposition of social processes (Tomes *et al.*, 1996). In a supply chain context, these mechanisms consist in structured exchanges between the buyer and the supplier to reach a satisfactory relationship for both partners, in terms of expected commitment and potential value creation (Schiele *et al.*, 2012). Based on these social interdependence processes that govern their relationships, the supplier grants a preferred buyer (i.e. preferred customer) status to the partner who demonstrates trust and commitment (Jenkins and Holcomb, 2021), and the buying firm awards a preferred status to the supplier with the highest innovative capabilities (Van Echtelt *et al.*, 2007) and who is most inclined to preferentially allocate his resources (Ellis *et al.*, 2012, Maestrini *et al.*, 2021). These mechanisms represent the core of the Social Exchange Theory (SET) (Blau, 1964), which, therefore, appears to be an appropriate lens to analyze the efficient management of buyer–supplier collaboration for NPD projects and explain their performance variation (Schiele *et al.*, 2012). Prior studies that adopted a SET perspective examined the effects of preferred buyer and supplier statuses on the collaboration from the strategic standpoint (Schiele *et al.*, 2015; Sieweke *et al.*, 2012). It seems relevant to empirically investigate the adequacy of these statuses determined by SET for ESI's efficient management to derive improved NPD project performance. These strategic preferred buyer and supplier statuses are awarded prior to the project, based on the partners' past exchanges and expectations of future performance (Cropanzano and Mitchell, 2005).

Nevertheless, the efficient management of NPD projects requires addressing not only this strategic level of the buyer–supplier relationship but also its operational level during the project (Van Echtelt *et al.*, 2007; Yang *et al.*, 2018). This operational efficiency relies on the deployment of socialization mechanisms throughout the buyer–supplier collaboration to consolidate trust and shared vision and hence build a social capital (Carey *et al.*, 2011; Saikouk *et al.*, 2021). The building of this capital enables the partners to reduce potential conflicts and promotes cooperative behavior (Behl *et al.*, 2021; Cousins and Menguc, 2006). While Social Capital Theory (SCT) is usually used to analyze the efficiency of buyer–supplier relationships (Lawson *et al.*, 2008; Zhang *et al.*, 2015), no study investigated how this capital affects the performance of NPD projects involving suppliers. Besides, this conceptual framework is suitable to examine the performance of buyer and supplier NPD project teams, as social capital of project units within these knowledge intensive contexts (Hong *et al.*, 2004) increases knowledge integration, leading to higher levels of project performance (Wang *et al.*, 2021).

Therefore, it appears that the socialization mechanisms structuring the efficient management of buyer–supplier collaboration for NPD combine the project strategic

management level through the assignment of preferred buyer/supplier statuses before the project, but also the operational level through the building of social capital during the project. While most studies on buyer–supplier relationships examined the contributions of either SET or SCT to collaboration and strategic partnerships (e.g. Schiele *et al.*, 2012; Zhang *et al.*, 2015), our research stands out by analyzing the joint impact of these theoretical perspectives, especially at the level of NPD projects in an ESI context from the buyer firm's standpoint. Indeed, literature mainly investigated the supplier's perception of buyer–supplier relationships such as technological innovation (Ellis *et al.*, 2012; Li *et al.*, 2022), performance assessment (Giannakis, 2007; Liao *et al.*, 2020) or trust (Tchokogué and Merminod, 2021). The few studies that examined the buyer's perspective focused on criteria and strategies of supplier selection (Gligor, 2020; Hartman *et al.*, 2020; Kannan and Choon Tan, 2006). Our research particularly considers the buyer's perception on socialization best practices that should be implemented in collaborative NPD projects and their impact on project financial and non-financial performance, as a positive perception promotes the relational commitment and collaboration quality of both parties.

Accordingly, we raise the following research question: *What are the joint contributions to NPD project performance of the preferred buyer and supplier statuses as perceived by the buying firm, and of the social capital associated with their collaborative NPD project?* To answer this question, we applied Partial Least Squares Structural Equation Modeling (PLS-SEM) to quantitatively assess a conceptual model. We used 80 responses collected from key respondents within buying firms, based on their prior experience in NPD projects involving suppliers. PLS-SEM was deemed appropriate to the characteristics of our sample and model, and to the exploratory purposes of this research consisting in investigating the joint contribution of SET and SCT to predict NPD project performance. Our findings contribute to industrial marketing management, and most importantly to the supply chain management field. Regarding the former, we investigate industrial buyer–seller relationships, particularly the purchasing and development processes adopted. Regarding the latter field, the novel inference of this study is uncovering the complementary roles of strategic and operational socialization mechanisms to efficiently manage buyer–supplier relationships at the collaborative NPD project's level. After introducing our theoretical foundations, we expand the hypotheses regarding the impacts of social capital and the preferred buyer/supplier statuses as perceived by the buyer on NPD project performance. Then, we explain our empirical approach and develop its results. Finally, this study is concluded with the discussion of its implications, limitations and research avenues.

2. Theoretical background
2.1 Preferred buyer and supplier statuses: a Social Exchange Theory (SET) perspective
Social Exchange Theory (SET) investigates the social processes that govern the relationships between individuals or groups. Its core explanatory mechanism is the relational interdependence that develops through the interactions of the exchange partners (Cropanzano and Mitchell, 2005). Both parties should perceive an attraction toward one another in order to initiate and develop their relationship (Mortensen *et al.*, 2008). Parties evaluate outcomes obtained from a particular exchange relationship in order to determine their commitment to this relationship or to the partners it entails (Schiele *et al.*, 2012). They qualify these outcomes by relying on present and past experience with comparable relationships and knowledge of the other party's similar partnerships (Maestrini *et al.*, 2021).

Hence, from the supplier standpoint, the latter evaluates the degree of its eventual previous involvement by the buyer in NPD, how well this partner fulfilled all the formal

agreements and informal promises, and if he possesses a substantial share in the supplier's sales (Ellis *et al.*, 2012). When the supplier is sufficiently satisfied with these elements, he awards this partner a *preferred buyer* status as this buyer is expected to provide him with high promising value (Schiele *et al.*, 2012). Preferred buyer status is a strategic prioritization by a supplier (Hüttinger *et al.*, 2012) and an allocation of unique privilege for buyers (Pulles *et al.*, 2016). Buying firms strive to become a preferred buyer for their key suppliers to derive greater benefits from the suppliers' capabilities (Jenkins and Holcomb, 2021). Prior studies considered this SET perspective of preferred buyer and examined the effects of this status on the collaboration from the strategic standpoint (Schiele *et al.*, 2015; Weller *et al.*, 2021). The benefits include increased availability of scarce materials (Nollet *et al.*, 2012), competitive prices (Patrucco *et al.*, 2020) and innovation promotion (Pulles *et al.*, 2014). Buying firms with such status obtain preferential resource allocation from suppliers that also serve competitors, leading to strategic competitive advantages (Pulles *et al.*, 2016). In the present study, we focus on the buyer perspective of collaborative NPD projects involving suppliers. Therefore, preferred buyer status in our case refers to the buyer's perception of preferred customership.

In fact, most literature considered the supplier perception on supply chain exchange relationships. They examined access to technological innovation (Ellis *et al.*, 2012; Li *et al.*, 2022), performance measurement (Giannakis, 2007; Liao *et al.*, 2020), selection strategies (Inemek and Tuna, 2009), or trust and reciprocity (Tchokogué and Merminod, 2021). The existing studies from the buyer's standpoint have mainly investigated strategies of supplier selection (Hartman *et al.*, 2020; Kannan and Choon Tan, 2006) and overlooked the buyer's perception of the collaboration unfolding for NPD. In this research, we particularly focus on the buyer's perspective on the socialization mechanisms that should be implemented in collaborative NPD projects and their impact on project performance. Indeed, while alignment in terms of financial benefits is important for effective supplier collaboration (Cannon *et al.*, 2010; Terpend *et al.*, 2008), working with a supplier based on agreed terms of trust, reciprocity and socialization will foster the project economic outcomes and quality performance (Inemek and Tuna, 2009).

Similarly, from the buyer standpoint, SET suggests that the more a supplier is willing to share his technological competencies and preferentially allocate resources to his buyer, the more the latter is inclined to award him a *preferred supplier* status (Schiele, 2022). Buying firms award preferred supplier status to a partner based on the extent to which their interests are fulfilled and on the appropriateness of the suppliers' characteristics (C.V and Routroy, 2016, 2018). Preferred suppliers are strategic partners who are likely to offer buying firms a renewed product performance at an advantageous price, as well as privileged service support and resources (Halley and Nollet, 2002, Maestrini *et al.*, 2021). Buyers establish long-term relationships with these suppliers (Ruben *et al.*, 2007), provide them with a preferential treatment and help them through technical assistance (Sieweke *et al.*, 2012). Reciprocally, suppliers aspire to acquire a preferred partner status to ensure long-term collaboration with the buyer (Sieweke *et al.*, 2012) and internal cost reduction (Ellis *et al.*, 2012), to increase sales (Corbett *et al.*, 1999), gain learning opportunities (Ramsay and Wagner, 2009), and improve investments and timely payments (Dries *et al.*, 2009). Literature has emphasized the strategic benefits of preferred supplier status. It helps buying firms acquire the industry best standards through specialized suppliers' knowledge and expertise (Ellis *et al.*, 2012), achieve competitive advantages in terms of cost reduction and enhanced innovation (Sieweke *et al.*, 2012), become resilient to the external turbulence (Carvalho *et al.*, 2012), reduce the opportunistic behavior of suppliers (Petison and Johri, 2008), and gain contract incentives from the suppliers (Rees, 2011).

In sum, most studies examined the preferred buyer and supplier statuses from the collaboration strategic standpoint and overlooked their contributions to NPD projects. Therefore, we particularly focus on this project-level and analyze, from the buyer's

perspective, the effects on NPD project performance improvement of the preferred partners' statuses established prior to the project. Indeed, these statuses are strategic positions awarded to the partners based on their past interactions and the expected future commitment (Cadden *et al.*, 2015). While literature has mainly taken the SET stance to examine the effects of preferred buyer and supplier statuses, Schiele *et al.* (2015) argues that social capital is a relevant theory that could increase the explanatory power of these impacts. Hence, we integrate this theoretical perspective in our study as detailed hereafter.

2.2 Social Capital Theory (SCT) in buyer–supplier relationships
Social capital refers to "*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*" [Carey *et al.* (2011), p. 278]. Nahapiet and Ghoshal (1998) defined social capital according to three dimensions: relational, cognitive and structural capitals. The *relational capital* focuses on personal relationships between actors through their interactions. It is often described in terms of mutual trust, communication quality (Pemartin and Rodríguez-Escudero, 2017) and obligations (Burt, 2009). The *cognitive capital* refers to the extent of shared identity among the actors. It is embodied in shared codes and paradigms, a shared vision and a set of common values (Nahapiet and Ghoshal, 1998). Finally, the *structural capital* refers to the way the actors organize their mutual interactions. It derives from proximity, and formal and informal meetings that create the opportunity for the team members to share tacit and explicit knowledge (Cohen and Prusak, 2001).

Social Capital Theory (SCT) is a beneficial lens for analyzing the social structures in supply chain relationships (Hartmann and Herb, 2014; Preston *et al.*, 2017). In the supply chain stream, this capital is considered as a valuable asset underpinning effective supply chain partnerships as its building supports operational efficiency through better conflict management, enhanced quality and cost savings (Behl *et al.*, 2021; Carey *et al.*, 2011). Scholars mainly highlighted the benefits of SCT to the buyer–supplier collaboration in general. They analyzed its influence on supplier development (Krause *et al.*, 2007), mass customization and product innovation capabilities (Zhang *et al.*, 2015). The present research extends these previous studies to an ESI context by examining the contribution of SCT to the performance improvement of NPD projects involving suppliers. Indeed, buying firms involve suppliers in NPD to gain access to their knowledge, resources and expertise for the development process (Blome *et al.*, 2014; Wang *et al.*, 2021). All along the project, they establish trust, align their cognitions and structure their exchanges, thus resulting in the accumulation of social capital for the NPD project.

Including SCT in our study in addition to the SET perspective of preferred buyer and supplier enables to consider the dynamics between the strategic and operational levels to efficiently govern the partners' relationship (Schiele *et al.*, 2015), especially in the context of collaborative NPD projects involving suppliers.

3. Hypotheses' development
This study examines the joint effects on NPD project performance improvement, of the social capital in a collaborative NPD project involving suppliers, and the strategic preferred buyer/supplier statuses as perceived by the buying firm. These statuses are the manifestation of SET principles and are awarded prior to the project as a result of the social interdependence between the partners, based on each other's expected performance and quality of previous interactions (Cropanzano and Mitchell, 2005). As for the social capital, it accumulates and is built throughout the NPD project and is represented according to the three SCT dimensions, i.e. cognitive, structural and relational capitals. The hypotheses underlying these impacts are depicted in our conceptual model (Figure 1) and detailed below.
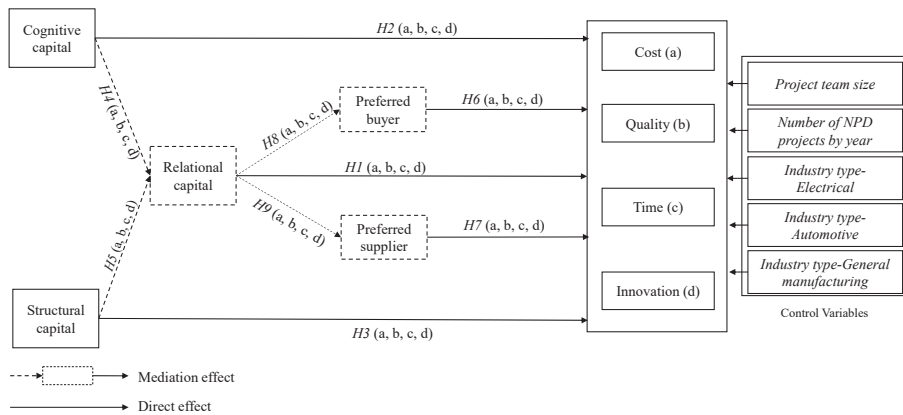
Figure 1.
Conceptual model

Source(s): Author's own work

3.1 Effects of social capital's dimensions on NPD project performance
Villena *et al.* (2011) emphasized the contribution of relational capital to reducing monitoring costs and improving cooperation within the relationship. Trust between buyers and suppliers leads to cost reduction and higher efficiency in problem solving (Fattam *et al.*, 2022; Saikouk *et al.*, 2021; Stuart *et al.*, 1998). Johnston *et al.* (2004) revealed that the level of a supplier trust regarding a buyer enhances innovation, quality, long-term and short-term costs, and buyer satisfaction. Thus, confidence in a partner's capabilities and commitment are key enablers to NPD speed and quality improvement (Kabadurmus, 2020; Maestrini *et al.*, 2021).

H1. In collaborative NPD projects involving suppliers, relational capital positively impacts project performance improvement (H1a cost, H1b quality, H1c time and H1d innovation).

Krause *et al.* (2007) represented the cognitive capital through shared values and showed its positive effects in improving product cost, quality, delivery and flexibility performance in an ESI context. Shared meanings are essential to ensure coordination and to improve project performance (Yang *et al.*, 2018). Finally, Parra-Requena *et al.* (2015) demonstrated that partners with a high degree of cognitive proximity tend to develop innovativeness.

H2. In collaborative NPD projects involving suppliers, cognitive capital positively impacts project performance improvement (H2a cost, H2b quality, H2c time and H2d innovation).

Structural capital encompasses formal integration and conflict management, which improve quality and cost savings (Stuart *et al.*, 1998), and lead to better product design and operational efficiencies (Cannon and Perreault, 1999). Also, it encourages information and experience sharing about new ideas and technology to identify potential problems upfront (Ragatz *et al.*, 2002; Yang *et al.*, 2018), hence improving product and process design quality and lead time (Lawson *et al.*, 2008), but also profitability and client's satisfaction (Lau, 2014).

H3. In collaborative NPD projects involving suppliers, structural capital positively impacts project performance improvement (H3a cost, H3b quality, H3c time and H3d innovation).

Beyond these direct effects, literature provides evidence for indirect impacts of relational capital. First, knowledge transfer and learning between partners are fostered by their social

compatibility and common goals, especially when mutual trust is established and shapes their exchanges (Lane *et al.*, 2001; Wang *et al.*, 2021). Also, based on shared norms and high communication quality, cognitive capital contributes to the collective innovation and helps the partners generate mutually beneficial outcomes (Matthews and Marzec, 2012).

> *H4.* In collaborative NPD projects involving suppliers, relational capital positively mediates the relationship between cognitive capital and project performance improvement (H4a cost, H4b quality, H4c time and H4d innovation).

Second, strong structural network ties between buyer and supplier firms result into mutual benefits in terms of reduced costs, superior ability to innovate and reduced NPD time, when the partners build a trustworthy relationship (Bidault *et al.*, 1998). Also, the use of structuring practices between both project teams creates interdependent social exchange when trust and respect are established (Fattam *et al.*, 2022; Saikouk *et al.*, 2021), thereby improving performance outcomes (Cousins *et al.*, 2008).

> *H5.* In collaborative NPD projects involving suppliers, relational capital positively mediates the relationship between structural capital and project performance improvement (H5a cost, H5b quality, H5c time and H5d innovation).

3.2 Effects of preferred buyer/supplier statuses as perceived by the buyer on NPD project performance

The efficiency of the exchanges within a buyer–supplier relationship is influenced by the expectations of performance improvement for both partners (Molm *et al.*, 2000), formalized through statuses of preferred buyer (Schiele *et al.*, 2012) and preferred supplier (Halley and Nollet, 2002). In the context of strategic collaboration, Ellis *et al.* (2012) showed the positive impact of preferred buyer status on accessing the supplier's new technologies. Also, Schiele *et al.* (2011) demonstrated the positive effect of this status on supplier benevolent pricing and supplier innovativeness contribution. In this vein, within collaborative NPD projects, the supplier may be more willing to bear uncertainty, invest resources and overcome conflict when the buyer is a preferred partner (Ellis *et al.*, 2012; Jenkins and Holcomb, 2021), which in turn, is likely to improve NPD project performance.

> *H6.* In collaborative NPD projects involving suppliers, the preferred buyer status as perceived by the buyer positively impacts project performance improvement (H6a cost, H6b quality, H6c time and H6d innovation).

Buying firms tend to develop strategic relationships with key suppliers to ensure a higher level of performance (Ellram, 1995). These preferred suppliers have substantial parts in the buyer's purchasing volume (Corsten and Felde, 2005). Most of the inputs provided by these partners (raw materials, components or systems) to the buyer's manufacturing process become core components of the buying firm's product offering (Miocevic and Crnjak-Karanovic, 2012). Purchasing firms establish Preferred Supplier Programs (PSP) (Dorsch *et al.*, 1998) to help selected suppliers through information sharing and technical assistance (Sieweke *et al.*, 2012), in exchange of performance and joint value creation (Zajac and Olsen, 1993). Such strategic investments of buying firms lead to concrete profit accumulation in NPD through reduced cost, better quality and more consistent delivery (Dyer and Singh, 1998; Swanson *et al.*, 2017). In fact, preferred suppliers are most likely to offer better product performance to the buyer at a profitable cost (Halley and Nollet, 2002). They contribute greatly to product quality and delivery performance and provide service support through cutting-edge know-how and frequent interactions (Ulaga and Eggert, 2006).

H7. In collaborative NPD projects involving suppliers, the preferred supplier status awarded to a supplier by the buyer positively impacts project performance improvement (H7a cost, H7b quality, H7c time and H7d innovation).

Preferred buyer status is awarded, based on previous interactions and expectations related to future business, to the partner that is trusted to have a significant contribution to performance (Dorsch *et al.*, 1998). A preferred buyer is designated when the supplier's trust and satisfaction on its behalf are high, as this buyer is likely to foster the supplier innovativeness and pricing behavior (Schiele *et al.*, 2012). Such status would improve the quality of relational exchanges and strategic alignment between both partners, thus fostering the NPD project performance in terms of time and quality (Ellis *et al.*, 2012; Jenkins and Holcomb, 2021). Drawing on these studies, it seems legitimate to question whether the positive effect on NPD project performance, of the *ex ante* preferred buyer status supplants the necessity to build and maintain a relational capital with the supplier during the project.

H8. In collaborative NPD projects involving suppliers, the preferred buyer status as perceived by the buyer positively mediates the relationship between relational capital and project performance improvement (H8a cost, H8b quality, H8c time and H8d innovation).

Preferred suppliers are partners that are identified by buying firms based on their joint accumulated relational capital (Ruben *et al.*, 2007). These trusted suppliers are automatically consulted when the buyer plans to start a co-development project (Wang-Mlynek and Foerstl, 2020). The buyer is more willing to listen to a preferred supplier, accommodate to his requests, and share more information and ideas (Laaksonen *et al.*, 2009), which enables him to reap the benefits of this supplier expertise and to improve the project performance (Bidault *et al.*, 1998). Hence, collaborating with a preferred supplier seems to supplant the benefits of investing to develop a relational capital with the latter during the project.

H9. In collaborative NPD projects involving suppliers, the preferred supplier status awarded to a supplier by the buyer positively mediates the relationship between relational capital and project performance improvement (H9a cost, H9b quality, H9c time and H9d innovation).

4. Research methodology
We collected data through a quantitative survey and relied on Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the model in Figure 1 as explained below.

4.1 Measurement scales' development
Table 1 reports the model's constructs and their measurement scales derived from extant literature. In addition to these latent variables, we included several control variables in the analysis. We chose the control variables that are the most associated with our research question (Kock, 2011) and that may cause nuisance regarding the results (Schjoedt and Sangboon, 2015). First, we considered the number of NPD projects per year to control for innovation dynamic of buying firms. Buyers are likely to introduce supplier innovation if their experience in NPD projects is important (Wagner, 2012). Then, we controlled for the size of the project team based on the natural logarithmic of the number of people included in the buyer and the supplier teams, since this variable might have a differentiated impact on ESI effectiveness (Salvador and Villena, 2013). Finally, three dummy variables were used to control for industry type (Kumar and Phrommathed, 2005) (Process Manufacturing, Discrete

Construct	Associated items	Item name	References
Within this project with this supplier			
Cognitive capital	Both parties agreed with what is in the best interest of the relationship	Cog-Cap1	Scale adapted from Tsai and Ghoshal (1998)
	Both parties shared the same business values	Cog-Cap2	
	This supplier shared our goals for this business	Cog-Cap3	
	Both parties shared the same ambitions and vision	Cog-Cap4	
	Both firms were similar in culture	Cog-cap5	
Structural capital	We organized social events	Struct-Cap1	Scale adapted from Cousins and Menguc (2006)
	We organized joint workshops	Struct-Cap2	
	We established cross-functional team dedicated to this co-development project	Struct-Cap3	
	The supplier was working directly with our project team in a shared place (co-location)*	Struct-Cap4*	
Relational capital	We had close interaction at multiple functional levels	Rel-Cap1	Scale developed by Kale *et al.* (2000)
	We established mutual trust at multiple functional levels	Rel-Cap2	
	We established mutual respect at multiple functional levels	Rel-Cap3	
	We had high levels of reciprocity	Rel-Cap4	
To which extent do you agree with the following statements?			
Preferred buyer	This supplier gives us preferential treatment	Pref-Cust1	Scale developed by Schiele *et al.* (2011)
	This supplier allocates more materials to my firm than to other buyers in times of scarcity	Pref-Cust2	
	Our firm is considered as a top preferred buyer of this supplier	Pref-Cust3	
	This supplier provides my firm with the best access to its innovations	Pref-Cust4	
Preferred supplier	This supplier is well ranked on our preferred supplier's list	Pref-Supp1	Based on Dorsch *et al.* (1998) and C.V and Routroy (2016, 2018)
	When needed, we support this supplier to ensure that its performances and its capabilities are in line with our competitive strategy*	Pref-Supp2*	
	We feel we are on the supplier's side*	Pref-Supp3*	
	We have made efforts for this supplier in the past	Pref-Supp4	
	We dedicate our best resources to this buyer–supplier relationship*	Pref-Supp5*	
Compared to other projects, the collaboration with this supplier in this project			
Cost	Enabled reducing product costs to a great extent	Cost1	Adapted from Rauniar and Rawski (2012)
	Enabled reducing equipment costs to a great extent	Cost2	
	Enabled reducing manufacturing costs to a great extent	Cost3	
Quality	Enabled achieving deliverables that matched buyer's needs	Quality1	Scale developed by Yang (2011)
	Enabled achieving deliverables that complied with contractual requirements	Quality2	
	Enabled achieving deliverables that met buyer's expectations	Quality3	

(*continued*)

Table 1.
Measurement scales

Construct	Associated items	Item name	References
Time	Enabled reducing total product development time	Time1	Adapted from Rauniar and Rawski (2012)
	Enabled bringing product to the market before our competitors	Time2	
	enabled developing product from concept to commercial production faster	Time3	
Innovation	Enabled developing creative deliverables	Innovation1	Scale developed by Yang (2011)
	Enabled producing innovative knowledge and know-how	Innovation2	
	Enabled generating new knowledge and problem-solving techniques	Innovation3	

Note(s): *: Item deleted during the factor analysis
Source(s): Author's own work

Table 1.

Manufacturing, Service). Hence, we could isolate the effects of control variables and analyze the links between the relational variables in the NPD context.

The items were measured on a 1–7 Likert scale ranging from "Not at all" to "A very great extent", or from "Strongly Disagree" to "Strongly Agree" as appropriate. In the full version of the questionnaire, each item was illustrated with practical examples and explanations to help the respondents understand its purpose. A pilot test of the questionnaire was performed with five academic experts, two project purchasers and 2 R&D managers to ensure its face validity.

4.2 Data collection
To determine an appropriate sample of respondents, we sent a pre-questionnaire to the alumni database of an Executive Master degree in Purchasing Management. 92 companies were identified based on manufacturing sector by ISIC Code and on their experience in terms of ESI practice in NPD projects. 50 companies agreed to participate to the study. Hence, we sent the survey's questionnaire to their purchasing managers and R&D managers. As the aggregate perception of the buying firm's project team is beyond the scope of the study, the input of either actor was sufficient to examine our research question. Each member has its own insight regarding the unfolding of the collaborative NPD project. These types of actors were chosen since they represent key members of NPD projects and directly interact with suppliers. On the one hand, R&D managers have an extensive view of the firm's supplier involvement activities and problems. Also, they provide guidance to NPD projects regarding the material handling systems and logistics' equipment manufacturer (Wagner and Hoegl, 2006). On the other hand, purchasing managers hold a significant position as gatekeepers, and influence the characteristics and quantities of the entering components and materials (Peprah *et al.*, 2016).

To minimize late respondent bias, three reminding emails were sent out over a 3 months' period. In the last round of data collection, we also performed a follow-up phone call of the respondents who did not open the questionnaire or did not finish the survey, in order to explain to them the importance of their responses for research and practice and hence encourage them to fill in the questionnaire (Sala and Lynn, 2009). In addition, no result was diffused before the closing of the collection process. As for social desirability bias, we reduced it first through the pilot test of the survey which enabled the rephrasing of items that might be of discomfort to respondents (Ried *et al.*, 2022). Second, we made sure to inform the participants that the data analysis will be anonymous (Brandon-Jones and Kauppi, 2018),

which is highly recommended given the susceptibility of supply chain managers on data confidentiality issues (Ried *et al.*, 2022). Furthermore, we stated in the survey's introduction that no specific numbers nor names of firms and employees will be revealed. Finally, we assured respondents that there are no right or wrong answers to encourage them to provide unbiased responses (Podsakoff *et al.*, 2012).

Respondents were asked to choose and report their opinion on one recent collaborative development project with a key supplier, either it was successful or not. In the introduction of the questionnaire, we explained that a key supplier has a substantial part in the buyer's purchasing volume (Corsten and Felde, 2005) and offers service support through regular close exchanges and highly specific expertise (Ulaga and Eggert, 2006). We also specified that the responses should refer to product development projects, i.e. projects that aim at designing a new product, manufacturing it and launching it into the market (Cooper, 1994). We achieved a final sample size of 80 responses, which represents a response rate of approximately 43%. Response rates in the field have generally been low (30%) (Van der Vaart and Van Donk, 2008). Table 2 summarizes the characteristics of our sample at the levels of respondents, firms and projects.

4.3 Data analysis

We mobilized the PLS-SEM method, which was deemed most appropriate to the purposes of this study. First, PLS-SEM works efficiently to estimate complex models such as the model in Figure 1 (Ringle *et al.*, 2015). Our model's complexity stems from its number of variables (manifest and latent), the introduction of mediating effects, and the simultaneous reliability and validity estimation of the measurement and structural models. Second, this characteristic of PLS-SEM is especially relevant when small sample sizes are used (Chin, 2010), as is the case in this research (80 responses). Third, PLS-SEM is suitable when the purposes of the study are exploratory and do not intend to confirm a pre-established theory as aimed by Covariance-Based SEM (Peng and Lai, 2012). This is indeed aligned with the objective of this research, which combines the SET and SCT theoretical frameworks in the particular context of collaborative NPD projects to predict project performance. We aspire to build the first theoretical propositions on the joint contributions to project performance improvement, of the exchange statuses and the social capital of a buyer–supplier collaboration in an NPD project.

All the constructs were modeled reflectively. In fact, the used items are non-exclusive manifestations of their associated latent variables (Petter *et al.*, 2007) that might be enriched by future studies. When analyzing such a fully reflective structural model, Chin (2010) points out that the number of responses must be more than 10 times the greatest number of links between a dependent latent variable and independent variables. Since this number is five in our model, our sample size (80) meets this constraint and enables the use of PLS-SEM.

5. Results

5.1 Measurement model's results

Following the recommendations of Gefen and Straub (2005) and Urbach and Ahlemann (2010), we performed an exploratory factor analysis (EFA) under XLSTAT (Addinsoft, 2016) to assess the constructs' unidimensionality and accordingly refine the underlying factor structure. The analysis revealed nine factors with eigenvalues greater than one that accounted for 89.11% of the total variance. One item related to Structural Capital and three items related to Preferred Supplier were eliminated (See Table 1) as they had loadings below 0.5 and high cross loadings with the other constructs (Hair *et al.*, 2006).

Then, we carried out several tests to check for an eventual common method bias resulting from the data collection approach (Podsakoff *et al.*, 2003). First, for method bias in general, we

Table 2.
Sample description

Properties	Category	Number of observations	%
Respondent properties	Respondent function – Purchasing managers	61	76.5
	Respondent function – R&D managers	19	23.5
Firm properties	Industry – Process Manufacturing – Metallurgy	2	2.5
	Chemicals	4	5
	Agrifood	2	2.5
	Discrete Manufacturing – Electrical	27	33.5
	Automotive	6	7.5
	Aerospace	2	2.5
	Mechanical	12	15
	Service (consulting, real estate, education) – Consulting	2	2.5
	Real estate	15	19
	Education	8	10
	Annual turnover in millions of euros – Less than 100	22	27
	From 100 to 500	20	25
	From 500 to 1000	18	22
	From 1000 to 10,000	10	13
	More than 10,000	10	13
	Annual purchasing turnover in millions of euros – Less than 50	32	40
	From 50 to 150	20	25
	From 150 to 500	16	20
	From 500 to 1000	12	15
	Number of purchasers – Less than 20	54	68
	From 20 to 100	20	24
	More than 100	6	8
	Number of NPD projects per year – Less than 10	40	50
	From 10 to 50	20	25
	From 50 to 100	20	25
Project properties	Number of projects according to the level of supplier responsibility – Consultation for suggestions regarding the design (White box)	20	25
	Co-development (Gray box)	36	45
	Full responsibility on development (Black box)	24	30
	Number of projects based on the timing of supplier involvement – Product concept selection	18	23
	Definition of product structure	30	38
	Detailed product and process design	20	25
	Industrialization	12	14
	Project team size – Mean number of buyer's project team members		5
	Mean number of supplier's project team members		4
	Characteristics of the Relationship – Mean distance between the partners		2188 Km
	Mean length of past relationship		4.2 years

Source(s): Author's own work

applied Harman's single factor test which consists in performing a factor analysis based on all variables (Rönkkö and Ylitalo, 2011). Bias is suspected when a component brings together most variables (>50%) (Harman, 1967). The test resulted into a 34.13% variance explained by the single factor. We also performed a marker analysis using the respondent's age as it is not theoretically related to any other variable in the study. Age as a marker variable has been employed in previous research for method variance assessment (Griffith and Lusch, 2007). The bivariate correlations between our marker variable and each of our multi-item measurement scales were negligible. In addition, when we related the estimated path model relationships with and without the marker, we found that all the theorized paths maintained their level of statistical significance. The results of these tests therefore suggest the absence of method bias from our study. Second, we particularly assessed late respondent bias through a t-test to verify that early and late respondents were not significantly different regarding their responses to the key questions of the research (Armstrong and Overton, 1977). Results showed no statistically significant difference between the means of the two groups ($p > 0.1 > 0.05$), suggesting that late respondent bias is not a concern in our study. Finally, we assessed social desirability bias by measuring the time used to answer each question. When participants provide socially desirable responses, they tend to spend less time and effort (Kaminska and Foulsham, 2016). Consequently, social desirability was found not to be an issue in this research.

Next, we conducted a confirmatory factor analysis under SmartPLS 3.0 (Ringle *et al.*, 2015) to assess *item reliability*, c*onstruct internal consistency* using composite reliability (CR) instead of Cronbach's alpha as recommended for PLS-SEM, and *construct convergent validity* by verifying the average variance extracted (AVE) of the latent variables. Table 3 summarizes the loadings of the retained items, which all significantly contributed to their associated constructs. Also, as shown in this table, CR of all constructs exceeded the threshold of 0.7 recommended by Henseler *et al.* (2009), and their AVE were greater than the minimum value of 0.5 (Fornell and Larcker, 1981). Finally, the retained items loaded higher on their intended construct than on the other constructs, and the correlation coefficients of each construct with the other latent variables were lower than the square root of its AVE (Table 4), thus indicating a satisfactory level of *discriminant validity* (Fornell and Larcker, 1981).

5.2 Structural model's results
To test the hypothesized effects of social capital dimensions and preferred buyer/supplier statuses on NPD project performance improvement, we analyzed three models. The first model (Table 5) gathers the direct effects of cognitive and structural capitals and their mediation though relational capital (H2, H3, H4, H5). The second model (Table 6) focuses on the direct effects of preferred buyer/supplier statuses on NPD project performance improvement (H6, H7). Finally, we analyzed in a third model (Table 7) the direct effects of relational capital and their mediation through preferred buyer/supplier statuses (H1, H8, H9).

As recommended in PLS-SEM, we first evaluated predictive accuracy of each of these three models by calculating the average R^2 for the endogenous variables at each step of the analysis and comparing it with the thresholds of weak (0.02), moderate (0.13) and substantial (0.26) accuracy (Cohen, 1988). The resulting R^2 values ranged between 0.0641 and 0.4683, exceeding 0.05, which is accepted in exploratory research (Mooi and Sarstedt, 2011). Then, the quality of each model was assessed using Goodness of Fit index (GoF), which is appropriate for reflective models (Henseler and Sarstedt, 2013). Wetzels *et al.* (2009) indicate that the values 0.1, 0.25 and 0.36 correspond to a small, medium and high GoF. Results ranged between 0.22 and 0.6064, which reflects medium to high model fit.

Finally, we assessed the significance of the structural paths within each model, by examining their associated t-values obtained from a bootstrapping procedure with 5000

Construct	Item name	Loading	CR	AVE
Cognitive capital	Cog-Cap1	0.7509	0.8945	0.6311
	Cog-Cap2	0.8798		
	Cog-Cap3	0.8072		
	Cog-Cap4	0.6738		
	Cog-Cap5	0.8436		
Structural capital	Struct-Cap1	0.6243	0.8	0.5745
	Struct-Cap2	0.8473		
	Struct-Cap3	0.7851		
Relational capital	Rel-Cap1	0.7586	0.9063	0.7082
	Rel-Cap2	0.8321		
	Rel-Cap3	0.8583		
	Rel-Cap4	0.9095		
Preferred buyer	Pref-Cust1	0.8363	0.8857	0.6599
	Pref-Cust2	0.7465		
	Pref-Cust3	0.8417		
	Pref-Cust4	0.8222		
Preferred supplier	Pref-Supp1	0.9096	0.8093	0.6819
	Pref-Supp4	0.7306		
Cost	Cost1	0.8234	0.8835	0.7171
	Cost2	0.8272		
	Cost3	0.8851		
Quality	Qual1	0.9128	0.9586	0.8854
	Qual2	0.9548		
	Qual3	0.9546		
Time	Time1	0.9056	0.9042	0.7591
	Time2	0.8039		
	Time3	0.8975		
Innovation	Inno1	0.8903	0.8971	0.7444
	Inno2	0.9075		
	Inno3	0.7844		

Table 3.
Measurement model
results

Note(s): Composite reliability (CR)
Source(s): Author's own work

sub-samples (Henseler *et al.*, 2009). The *t*-value must be greater than 1.96, which conveys a cutoff *p*-value of $p < 0.05$ for a two-tailed test (Chen *et al.*, 2013). Results of the hypotheses' testing are detailed in the next paragraphs for each of the three models. Regarding the impacts of the control variables, neither the buyer innovation dynamic nor the industry types had a persistent significant effect on any of the NPD project performance indicators. For the project team size, we found a persistently significant positive effect on project innovation performance improvement, indicating that the larger a project team is the more innovative are the expected outcomes.

5.2.1 Direct effects of cognitive and structural capitals and their mediation through relational capital. To test whether the buyer–supplier relational capital mediates the impacts of cognitive and structural dimensions on the four NPD project performance indicators, we performed a mediated multiple regression (Table 5) with three steps (Baron and Kenny, 1986). In each step, path coefficients must be significant before the next regression can be performed.

Step 1 consists in testing the direct effects of the predictor variables (cognitive and structural capitals) on the mediator (relational capital). It shows that cognitive (0.6852, $p < 0.001$) and structural (0.5511, $p < 0.001$) capitals positively affect relational capital.

	Cognitive capital	Structural capital	Relational capital	Preferred buyer	Preferred supplier	Cost	Quality	Time	Innovation
Cognitive capital	*0.7944*								
Structural capital	0.474	*0.758*							
Relational capital	0.669	0.5182	*0.8415*						
Preferred buyer	0.5279	0.2912	0.6193	*0.8123*					
Preferred supplier	0.3143	0.1402	0.4279	0.5598	*0.8258*				
Cost	0.4363	0.2071	0.5523	0.4332	0.3634	*0.8468*			
Quality	0.5952	0.3322	0.5715	0.584	0.3553	0.3812	*0.941*		
Time	0.5982	0.2216	0.3951	0.405	0.2806	0.4748	0.4826	*0.8713*	
Innovation	0.5099	0.3183	0.444	0.3679	0.2514	0.4903	0.4467	0.5803	*0.8628*

Note(s): The values in the matrix diagonal refer to the square roots of the constructs' AVE

Source(s): Author's own work

Table 5.
Direct effects of cognitive and structural capitals and their mediation through relational capital

	Cost			Quality		Time		Innovation	
	Step 1	Step 2	Step 3	Step 2	Step 3	Step 1	Step 2	Step 3	Step 2
Direct and mediated effect of cognitive capital									
Control variables									
Nb of NPD projects per year	0.082	−0.0791	−0.1205**	0.0022	−0.0053	0.0464	0.0467	−0.0674	−0.0742
Project team size	−0.0744	−0.126**	−0.0906	−0.017	0.006	−0.1286**	−0.128**	0.1496**	0.1641**
Industry type-Process Manufacturing	0.012	−0.0176	−0.0109	−0.009	−0.0022	0.0321	−0.0097	−0.04	0.0071
-Discrete Manufacturing	−0.0155	−0.0147	0.03845	−0.02	−0.0147	0.0482	0.015775	−0.04825	−0.028825
-Service	0.021	−0.0114	0.0363	0.043	0.0301	−0.044	−0.0817	0.055	0.0772
Direct effects									
Cognitive capital	0.6852***	0.4527***	0.1241*	0.6105***	0.3970***	0.6299***	0.6458***	0.4779***	0.3243***
Mediating effects									
Relational capital			0.4844***		0.3118***		−0.0245		0.2271**
Average *R* square	0.4683	0.2079	0.3345	0.3651	0.415	0.3922	0.3916	0.3119	0.335
GoF index	0.5754	0.3864	0.49	0.5685	0.3674	0.5446	0.5442	0.4815	0.4492
Direct and mediated effect of structural capital									
Control variables									
Nb of NPD projects per year	−0.004	−0.087	−0.1158*	−0.011	−0.0277	0.024	0.0155	−0.138	−0.0858
Project team size	−0.033	−0.107	−0.0632	0.023	0.044	−0.068	−0.0571	0.168**	0.1919***
Industry type-Process Manufacturing	0.0029	0.0026	0.0028	0.0016	−0.01056	−0.0109	−0.01816	0.0104	−0.00829
-Discrete Manufacturing	−0.004	−0.0015	−0.0022	−0.0247	0.0072	0.0019	0.02525	−0.03675	0.00415
-Service	−0.02	−0.004	−0.0082	−0.006	0.0324	−0.0148	−0.0817	−0.01	0.0683
Direct effects									
Structural capital	0.5511***	0.2564***	−0.1042	0.3529***	0.0736	0.2501***	0.0064	0.2872***	0.0536
Mediating effects									
Relational capital			0.6185***		0.5407***		0.4132***		0.4212***
Average *R* square	0.2904	0.0701	0.3331	0.1479	0.3356	0.0641	0.1783	0.1779	0.281
GoF index	0.4526	0.2232	0.4886	0.323	0.545	0.22	0.3656	0.3594	0.457

Note(s): *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$
Source(s): Author's own work

	Cost	Quality	Time	Innovation
Preferred buyer's direct impact on NPD project performance				
Control variables				
Nb of NPD projects per year	−0.06	0.0555	0.0791	0.019
Project team size	−0.0437	0.085	−0.0312	0.2356***
Industry type-Process Manufacturing	0.0104	0.01	−0.0369	−0.012
-Discrete Manufacturing	−0.00415	−0.013	0.0432	−0.0369
-Service	−0.016	0.0539	−0.0097	0.368
Direct effects				
Preferred buyer	0.4387***	0.59***	0.4245***	0.4063***
R square	0.2007	0.3493	0.2876	0.2671
GoF index	0.2784	0.5560	0.3759	0.4273
Preferred supplier's direct impact on NPD project performance				
Control variables				
Nb of NPD projects per year	−0.1203*	−0.0087	0.0374	−0.0239
Project team size	−0.0644	0.0656	−0.047	0.226***
Industry type-Process Manufacturing	0.00832	−0.0212	−0.0340	−0.1064
-Discrete Manufacturing	0.03165	−0.05635	0.0458	−0.11635
-Service	0.0469	0.0255	0.0022	0.0182
Direct effects				
Preferred supplier	0.3896***	0.3597***	0.2976***	0.2944***
R square	0.1581	0.2300	0.1962	0.1740
GoF index	0.3360	0.3392	0.2690	0.3587

Note(s): **$p < 0.05$, **$p < 0.01$, ***$p < 0.001$
Source(s): Author's own work

Table 6.
Direct effects of
preferred buyer/
supplier statuses as
perceived by the
buying firm

Step 2 tests the impact of the predictor variables on each of the four NPD project performance indicators to establish whether there is an effect to be mediated. For the cognitive capital, the results indicate that it is positively related to NPD project cost (0.4527, $p < 0.001$), quality (0.6105, $p < 0.001$), time (0.6299, $p < 0.001$) and innovation (0.4779, $p < 0.001$) improvements, thus satisfying Step 2 of the mediation test and providing *full support for H2(a,b,c,d)*. As for the structural capital, results show that it is positively related to NPD project cost (0.2564, $p < 0.001$), quality (0.3529, $p < 0.001$), time (0.2501, $p < 0.001$) and innovation (0.2872, $p < 0.001$) improvements, consequently satisfying Step 2 of the mediation test and providing *full support for H3(a,b,c d)*.

Step 3 examines the indirect effect through a regression of each performance indicator simultaneously on the mediator and on the predictor. The mediation test is successful if the mediator has a significant effect on the performance indicator and the significance of the link between the predictor and the dependent variable is reduced (Partial mediation) or no longer occurs (Full mediation). Thus, when relational capital is introduced as a mediator on the link between cognitive capital and NPD project performance improvement, its effects on cost (0.4844, $p < 0.001$), quality (0.3118, $p < 0.001$) and innovation (0.2271, $p < 0.01$) are shown to be significant, with the effects of cognitive capital on NPD project cost (0.1241, $p < 0.05$), quality (0.3970, $p < 0.001$) and innovation (0.3243, $p < 0.001$) remaining significant. Hence, the results provide evidence of a positive partial mediation effect in the case of cost, quality and innovation improvements, and *partially support H4(a,b,d)*. As for time improvement (−0.0245, $p > 0.1 > 0.05$), relational capital is not significantly related to it while the cognitive

Table 7.
Direct effects of relational capital and their mediation through preferred buyer/supplier statuses as perceived by the buying firm

	Cost			Quality		Time		Innovation	
	Step 1	Step 2	Step 3	Step 2	Step 3	Step 2	Step 3	Step 2	Step 3
Direct effect of relational capital and its mediation through preferred buyer									
Control variables									
Nb of NPD projects per year	−0.0049	−0.1278*	−0.1162*	−0.0226	0.0134	0.0172	0.0448	−0.0706	−0.0459
Project team size	0.1348	−0.074	−0.0677	0.0519	0.0695	−0.0535	−0.0423	0.2032***	0.2124***
Industry type-Process Manufacturing	0.047	0.011	0.002	−0.006	−0.0026	−0.027	−0.0228	0.00136	0.0029
-Discrete Manufacturing	−0.0772	−0.0239	0.0102	−0.0414	−0.0438	0.0217	0.0062	−0.0576	−0.0551
-Service	0.1228	−0.0471	−0.0143	0.0285	0.0204	−0.0345	−0.053	0.0475	0.0524
Direct effects									
Relational capital	0.6369***	0.5692***	0.4884***	0.5757***	0.3355***	0.4204***	0.2446**	0.4525***	0.3346***
Mediating effects									
Preferred buyer			0.1271		0.3781***		0.2683**		0.1911*
Average R square	0.4061	0.3284	0.3382	0.3300	0.4155	0.2816	0.2708	0.2826	0.3068
GoF index	0.5175	0.4854	0.4924	0.5405	0.6064	0.369	0.4075	0.4582	0.4768
Direct effect of relational capital and its mediation through preferred supplier									
Control variables									
Nb of NPD projects per year	0.2045**	−0.1278*	−0.143**	−0.0226	−0.0345	0.0172	0.0098	−0.0706	−0.0735
Project team size	−0.0249	−0.074	−0.0735	0.0519	0.0529	−0.0535	−0.0536	0.2032***	0.2049**
Industry type-Process Manufacturing	−0.0038	0.011	0.0036	−0.0059	−0.00288	−0.0271	−0.02048	0.00136	0.00467
-Discrete Manufacturing	0.0806	−0.0239	0.00995	−0.0414	−0.04145	0.0217	0.01155	−0.0576	−0.0596
-Service	−0.0025	−0.0471	−0.0104	0.0285	0.0391	−0.0345	−0.0332	0.0475	0.0556
Direct effects									
Relational capital	0.4308***	0.5692***	0.4986***	0.5757***	0.5195***	0.4204***	0.3589***	0.4525***	0.4034***
Mediating effects									
Preferred supplier			0.1664**		0.1344*		0.1285		0.1212*
Average R square	0.2689	0.3284	0.3506	0.3300	0.3454	0.2816	0.1895	0.2826	0.2958
GoF index	0.3795	0.4854	0.50144	0.5405	0.5529	0.369	0.3777	0.4582	0.4684

Note(s): *p < 0.05, **p < 0.01, ***p < 0.001
Source(s): Author's own work

capital's impact on it (0.6458, $p < 0.001$) remained significant, consequently providing *no support for H4(c)*.

When introducing relational capital as a mediator between structural capital and NPD project performance indicators, results show that it positively and significantly impacts NPD project cost (0.6185, $p < 0.001$), quality (0.5407, $p < 0.001$), time (0.4132, $p < 0.001$) and innovation (0.4212, $p < 0.001$), with structural capital's effects on these performance indicators remaining no longer significant, hence providing *full support to H5(a,b,c,d)*.

5.2.2 Direct effects of preferred buyer/supplier statuses as perceived by the buying firm. Table 6 shows that the preferred buyer status as perceived by the buying firm is positively and significantly related to NPD project cost (0.4387, $p < 0.001$), quality (0.59, $p < 0.001$), time (0.4245, $p < 0.001$) and innovation (0.4063, $p < 0.001$) improvements, hence providing evidence of *full support to H6(a,b,c,d)*. The preferred supplier status awarded by the buyer also has a positive and significant impact on NPD project cost (0.3896, $p < 0.001$), quality (0.3597, $p < 0.001$), time (0.2976, $p < 0.001$), and innovation (0.2944, $p < 0.001$) improvements thus *fully supporting H7(a,b,c,d)*.

5.2.3 Direct effects of relational capital and their mediation through preferred buyer/supplier statuses as perceived by the buying firm. We conducted mediated multiple regressions to test hypotheses H8 and H9 (Table 7) using the approach explained in paragraph 5.2.1. Relational capital positively and significantly impacts preferred buyer (0.6369. $p < 0.001$) and supplier (0.4308, $p < 0.001$) statuses, therefore satisfying step 1.

Step 2 is also verified as relational capital is significantly and positively related to NPD project cost (0.5692, $p < 0.001$), quality (0.5757, $p < 0.001$), time (0.4204, $p < 0.001$) and innovation (0.4525, $p < 0.001$) improvements, hence providing *full support to H1(a,b c, d)*.

Step 3 requires that upon the introduction of the perceived preferred buyer status as a mediator for H8 and of the awarded preferred supplier status as a mediator for H9, their impacts on the four NPD project performance indicators are found significant, while the effects of relational capital on them are reduced (Partial mediation) or no longer take place (Full mediation). Results show that for H8, preferred buyer status as perceived by the buyer is positively and significantly related to NPD project quality (0.3781, $p < 0.001$), time (0.2683, $p < 0.01$) and innovation (0.1911, $p < 0.05$) improvements, with relational capital's effects remaining significant for quality (0.3355, $p < 0.001$), time (0.2446, $p < 0.01$) and innovation (0.3346, $p < 0.001$), thus providing evidence of positive partial mediation and *partial support of H8(b,c,d)*. For cost performance improvement, the effect of the perceived preferred buyer status was not significant (0.1271, $p > 0.1 > 0.05$) while relational capital's impact on cost remained significant (0.4884, $p < 0.001$), thus *not supporting H8(a)*.

For H9, the preferred supplier status awarded by the buyer is positively and significantly related to NPD project cost (0.1664, $p < 0.01$), quality (0.1334, $p < 0.05$) and innovation (0.1212, $p < 0.05$) improvements, with relational capital effects remaining significant for cost (0.4986, $p < 0.001$), quality (0.5195. $p < 0.001$) and innovation (0.4034, $p < 0.001$), hence providing evidence of positive partial mediation and p*artial support for H9(a,b,d)*. For time performance improvement, the effect of preferred supplier status was not significant (0.1285, $p > 0.1 > 0.05$) while relational capital's impact on time remained significant (0.3589, $p < 0.001$), consequently *not supporting hypothesis H9(c)*.

6. Discussion and conclusion
6.1 Theoretical implications
By investigating the industrial buyer–seller relationships in the context of collaborative NPD projects involving suppliers, we shed the light on the socialization processes adopted to foster the project success and their impacts on NPD project performance based on the buyer's perception. As such, this research contributes to the SCM field first by considering the

buying firm's perspective, while most literature on supply chain exchange relationships investigated the supplier's standpoint (Ellis *et al.*, 2012; Li *et al.*, 2022; Liao *et al.*, 2020; Tchokogué and Merminod, 2021). It also complements the few studies that examined the buyer's outlook on supply chain contexts and mainly emphasized the strategies and criteria for supplier selection (Gligor, 2020; Hartman *et al.*, 2020; Kannan and Choon Tan, 2006). Indeed, in our research, we demonstrate the importance of the buyer's perception of socialization mechanisms that foster the NPD project success. A positive perception of the relationship's social aspect is valuable given the powerful role of buyers as order-givers in collaborative NPD projects, and is considered as an antecedent to the buyer's relational commitment and willingness to adjust to the supplier (Inemek and Tuna, 2009).

A second key implication of this research is the underlining of the complementarity between the social assets at the strategic and operational levels of a buyer–supplier relationship throughout an NPD project. Our results extend, to the NPD project context, prior studies that adopted either SET or SCT and focused on the effects of their associated constructs on buyer–supplier strategic collaborations (Carvalho *et al.*, 2012; Patrucco *et al.*, 2020; Zhang *et al.*, 2015). The present study emphasizes the necessity to combine both perspectives, to efficiently manage the collaborative NPD project. We also enrich previous research on the contingency factors that affect supplier integration in NPD (Kabadurmus, 2020; Lau, 2014; Van Echtelt *et al.*, 2007) with social contingent factors, and complete the work of Park *et al.* (2015) who analyzed strategic and operational issues of supply chain configurations.

More particularly, this study suggests two main contributions to be discussed in light of the literature. The first contribution concerns the relevance of using the SCT to explain the impact of an appropriate buyer–supplier relationship management on NPD project performance improvement. The second point underlines that, although the preferred partner statuses representing the SET in buyer–supplier relationships are valuable, they do not entirely supplant the benefits stemming from the development of a joint social capital during the project. These contributions are detailed in the next paragraphs.

6.1.1 Relational capital: a crucial dimension to foster NPD project performance. Our results unveil *direct positive impacts of cognitive, structural and relational capitals on NPD project cost, quality, time and innovation performance*, thereby extending the conclusions of previous studies (Behl *et al.*, 2021; Johnston *et al.*, 2004; Krause *et al.*, 2007; Parra-Requena *et al.*, 2015; Pemartin and Rodríguez-Escudero, 2017) to the ESI context.

Additional to these direct effects, *relational capital acts as a positive partial mediator of the cognitive capital*'s *impact on NPD project cost, quality and innovation performance improvements*. In contrast to prior literature (Oh *et al.*, 2004), this partial mediation implies that although relational capital is crucial for the project performance, it cannot completely explain the benefits of the cognitive capital. Our cost performance results, which are consistent with the findings of Carey *et al.* (2011), suggest that when buyers and suppliers have congruent goals and values, improvements in product cost can be achieved, both independently of, and indirectly through, relational capital. However, unlike these researchers, we found that relational capital is only a partial positive mediator on innovation performance improvement. It seems that in a co-development context, the security and reciprocity within the relationship afforded by a high level of relational capital is not the primary prerequisite for capturing innovation. The work of Phillips *et al.* (2006) might explain this result. The authors suggest that the best way to develop real innovative solutions is to extend the collaboration beyond the firm's usual supply chain boundary. This means that trust and reciprocity are not the main catalysts for improving NPD project innovation performance. Surprisingly, *relational capital did not mediate the impact of the cognitive dimension on time performance improvement*. We were expecting that the construction of a shared understanding would require time at the beginning of the project,

but that this time deficiency would be compensated once the partners are aligned, and trust is established.

Then, our findings show that *relational capital acts as a positive full mediator to structural capital's impact on NPD project cost, quality, time and innovation performance improvements.* Such results suggest that when high levels of trust within the buyer–supplier relationship take place, structural ties become shallow and not crucial to foster the project success in contrast to the critical role of relational capital. The study of Villena *et al.* (2011) demonstrating an inverted curvilinear relationship between structural capital and operational performance provides support to this finding. The authors state that when structural ties are strong, information sharing might become trivial and even harmful to the buyer "*given the lack of learning derived from the overloading of information, the greater difficulty in decision making, and the expenditure of resources to maintain frequent, diverse interactions*" [Villena *et al.* (2011), p. 565].

6.1.2 Preferred partner status: an accessory role compared to investments on social capital. Our study first proves that *being a preferred partner directly contributes to enhancing the overall project performance,* thus echoing the conclusions of previous research (Jenkins and Holcomb, 2021; Schiele *et al.*, 2011; Swanson *et al.*, 2017). Then, our findings show that working with a pre-identified preferred partner partially explains the necessity to invest in building and maintaining a relational capital during the NPD project.

In this respect, Halley and Nollet (2002) provide an explanation to the positive *partial mediation of the preferred supplier status awarded by the buyer.* The authors suggest that from the standpoint of the large order-giver, the contribution of a supplier to his integration in NPD is not entirely due to his status. They posit that the sense of dependency resulting from the partners' long-term agreements can generate an illusion of security leading to logistic inertia. Hence, since a preferred status is mainly given to the supplier for a matter of long-term operational excellence, it seems that the positive effect of relational capital on the performance of short-term NPD projects cannot be entirely achieved through this preferred supplier status. As for *the positive partial mediation of the preferred buyer status as perceived by the buying firm*, Corsten and Felde (2005) state that trust and commitment are the premises of a good buyer–supplier relationship and that, even in an NPD project involving the supplier's preferred buyer, relational capital will act as the primary safeguard against opportunism in such a power-driven context. Finally, our results show that the preferred buyer status does not explain any of the relational capital's benefits on cost performance neither does the preferred supplier status for time performance. Further research might provide an understanding to these particular findings.

In sum, although the preferred buyer and supplier statuses result from an *ex ante* deep trust and contribute to the success of the supply chain integration, they cannot entirely explain the benefits of investing on an in situ relational capital between the buyer and the supplier throughout the NPD project. High dependency on strategic alliances with suppliers hinders efficient supplier risk management in an NPD context (Wang-Mlynek and Foerstl, 2020). In this vein, Bidault and Castello (2009) found a curved linear relationship between mutual trust within the development project team and its innovativeness, demonstrating a positive link between both constructs. But the curve reaches an optimum and declines, suggesting that too much trust might be harmful to innovativeness.

6.2 Managerial implications
First, our study provides directives to grasp the benefits of social capital for an improved management of buyer–supplier relationships in NPD projects. Indeed, buying companies must strive to build a social capital with the supplier during the NPD project through goals' alignment and reciprocal exchanges, supported by cross-functional teams and operated in

social events. Nevertheless, it is recommended that the partners organize workshops and gatherings only until trust is installed in the relationship for NPD. Beyond this situation, reinforcing ties through intense exchanges would no longer be required between the partners to improve performance. The buyer and the supplier should implement dense interactions only to set the project back on track when/if it drifts from its target performance, therefore avoiding information overload during the NPD project. While trust and reciprocity completely supplant the benefits of structural exchanges at advanced stages of the project, they do not replace the necessity to align business values and vision among both partners. In this respect, the project initiation phase should be carefully managed to align the buyer's and supplier's strategy and objectives. Then, the partners must verify and ensure the coherence of their cultures and vision throughout the project unfolding. A competent partner who has the right cognitive alignment is better than one who does not possess it, even though he is trustworthy.

Second, this research guides buyers towards the operationalization of the preferred buyer and supplier statuses awarded prior to the project, to capitalize on these strategic positions. On one side, we urge buying firms to acquire a preferred buyer status in order to considerably benefit from the supplier's capabilities and rare resources for NPD. Buyers should make sure to fulfill the formal and informal arrangements all along their relationship with the supplier and to demonstrate commitment to an efficient collaboration for the upcoming NPD project, so as to acquire this trustworthy status awarded prior to the start of the project. On the other side, it is highly beneficial for buying firms to involve a preferred supplier for NPD, as the latter will allocate rare resources and offer preferential treatment to his partner during the project. We particularly encourage buyers to invest in preferred supplier programs through technical assistance and learning opportunities, which would increase the supplier's trust in the buyer, and his devotion for NPD. Nevertheless, the buyer and the supplier must work toward maintaining, during the NPD project, the initially established trust stemming from their pre-established preferred statuses. In this respect, they should ensure mutual respect and reciprocity at all levels of interactions within the project. Each partner should continuously question its trust in the other party. The awarded preferred status should be subject to regular reconsideration throughout the NPD project.

6.3 Limitations and future research

This study encompasses some limitations that could be subject to future work avenues. A first limitation concerns the collected records that represented only the buyer side of the collaborative relationship. The approach of focusing on insights from one specific partner in buyer–supplier relationships has long been and is still widely adopted in supply chain research (e.g. Chen *et al.*, 2019; Wieteska, 2020). Also, this one-side data is consistent with our research question and did not affect the robustness of our findings and their validity to academia and practice. Nevertheless, we advocate that exploring the social capital dimensions and the preferred partnership status from the supplier standpoint might be an interesting complementary avenue to this work. Second, we ignored the nationality of the supplying firms for the NPD projects considered in this research. Although this missing information could not affect our analysis of the buyer–supplier relationship, we suggest expanding our investigation by considering the cultural belonging of the two partners, since trust and consequently both the relational capital and the preferred partners' statuses might be culturally contingent (Yuki *et al.*, 2005). This exploration would help identify the disparity of perceptions regarding best practices among the different communities.

Third, the highlighted impacts on our study might differ according to the level of supplier involvement within NPD projects. Further works may explore an eventual differentiated impact in white box, grey box and black box settings. Fourth, future research can help

identify any potential weakness in our application of the PLS-SEM method. Indeed, this approach was the most appropriate for the exploratory purposes of our research but has received some criticism (Hair *et al.*, 2019). Therefore, other studies might apply a quantitative approach for confirmatory purposes to reassess our model. Finally, three out of five items were eliminated during the factor analysis for the preferred supplier status, thus suggesting the inadequacy of the literature scales used to measure this construct. Indeed, given the dearth of studies on preferred supplier in the specific collaborative NPD context with suppliers, we transposed scales established in configurations other than ESI, to NPD projects involving suppliers. Although the use of a two-items' construct is accepted in SCM (e.g. Birou *et al.*, 2019; Molinaro *et al.*, 2022; Yang *et al.*, 2021) and did not affect the robustness of our findings, a relevant research avenue would consist in developing measurement scales suitable to the peculiarities of collaborative NPD projects involving suppliers.

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