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Fluffy cuffs: SME's innovation in alliances with buyer firms

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Abstract Supplier firms, especially the more resource constraint SMEs, form alliances for product innovation. Supplier firms can try to push in creative inputs while needing to align them with the overall solution of the buyer. Our study zooms in on this push and alignment balancing act. Our theoretical model is informed by the attention-based view. It considers two centralization mechanisms, relationship intensity and formalized specifications of the buyer firm. Our dependent variable is innovation of the SME supplier. The model hypothesizes linear and non-linear effects by relationship intensity and the buyer's detailed and formalized specifications (e.g., functional principles, features, and design elements). Data collected from 279 European supplier SMEs reveals that moderate levels of "post-formational specifications" proposed by the buyer firm are associated with greater product innovation of the supplier. Interestingly, less product innovation results when the specifications of the buyer are either minimal or high. Stronger relationship intensity allows greater product innovation as it enables partners to capture more benefits from the post-formational specifications as they constructively work together.

Plain English Summary Suppliers collaborate with buyer firms for innovation. To coordinate innovation, firms can implement soft but also hard-formal mechanisms. A soft mechanism is greater relationship intensity. A hard-formal coordination mechanism pertains to post-formational specifications. These are preset by the buyer firm about detailed specifications related to product's functional parameters, features, and design elements. Interestingly, both extremes of either weak or detailed post-formational specifications limit innovation. Instead, medium levels post-formational specifications bring superior innovation guidance. Greater soft coordination of intense exchanges, frequent meetings, and good relations among firms supports product innovation. It limits the drawbacks of either low or high hard-formal post-formational specifications. The principal practical implication of this study is that SMEs in alliances with their buyer firms can boost product innovation, when having good relationship with their buyer and when receiving some formal guidance from the buyer firm. It is the "fluffy cuffs" that encourage innovation best.

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1 Introduction

The enactment of product innovation among SMEs is often accomplished in research-constrained contexts (Brouthers et al., 2015; Panizzolo, 1998) which demand prioritizing the most important future directions, paying attention to key problems, while also forming and governing alliances with other firms (Dickson et al., 2006; Robson & Bennett, 2000). The attention-based view (ABV) is increasingly recognized as relevant to the study of matters that demand greater decision maker's attention (Ocasio, 1997, 2005; Ocasio & Joseph, 2005), such as risky decisions, strategic alliances, and firm change (Haas et al., 2015; Ocasio & Joseph, 2018; Ocasio et al., 2018). ABV is a useful theoretical lens in highly sensitive settings as in family firms (Kammerlander & Ganter, 2015) or SMEs (Lybaert, 1998).

ABV proposes that decision makers prioritize a limited number of problems, opportunities, and threats and that problems receiving less attention are more likely to be poorly managed, bringing lower success (Haas et al., 2015; Ocasio & Joseph, 2018; Ocasio et al., 2018). Attention facilitates the solving of novel, risky strategic problems, especially when different persons are involved (Vuori & Huy, 2015). The important channeling of attention in SME (Ahmadi et al., 2021) might be triggered by specific centralization mechanisms as firms harmonize individuals' attention processes, e.g., through meetings, formal documentation, procedures, and evaluation templates as shown for family firms (Kammerlander & Ganter, 2015). In other words, centralization mechanisms are coordination mechanisms that represent the means or modes through which the alliance parties are interacting in a structural sense, and which allow to combine the diverse contributions of the allying firms. Of particular concern in the current research, the attention-based lens can inform centralization mechanisms in SME alliances.

Alliances define voluntary arrangements among firms pursuing mutual or at least compatible goals (Doz, 1996). Alliances can increase attention and improve understanding by firms that are bounded in their capacity to register and digest multifaceted information (Ocasio, 1997). Alliances can include coordination, collaboration, and interaction among managers of the allying firms, hence might include centralization mechanisms to achieve better information exchanges and coordination (Barnett, 2008). We argue that centralization mechanisms might be especially important for the ongoing (post formation) exchanges among SMEs and their alliance partners because they channel attention through updated information transfers and adaptations over the course of the alliance. SMEs will have only a general sense of matters such as the concept, features, and functionalities of the product at the beginning of an alliance (Brockman & Morgan, 2006; Roy et al., 2004). Firms might set up centralization mechanisms related to relationship intensity; for example, meetings in which they discuss the to-be-developed product or encounter detailed formal specifications about the to-be-developed product (Narayandas & Rangan, 2004). Detailed formal specifications can include specifications of product concept and attributes and can clarify the path forward by suggesting ways the firms should be allocating their time, efforts, and other resources (Pesch et al., 2021). The creation and interpretation of these formal specifications might heighten managerial attention toward innovation ends, specifically by preventing an otherwise not taken seriously or misguided development approach (Cao & Zhang, 2011). Still, the formal specifications might inappropriately turn attention toward less important matters or raise doubt about asymmetries embedded within the specifications for the benefit of one firm. For example, SMEs confronted by formalized specifications might find themselves in situations where attention does not matter much because the other firm has taken control of the development and has shifted attention to their own interests.

Due to the varied character of relationship intensity and detailed post-formational specifications (PFS), an important question is, how do these influence SME's product innovation? In the pursuit of this question, our paper first develops a model and then tests it empirically. Detailed product specifications can result from the interaction that takes place within the development

process. We first hypothesize that relationship intensity of the SME with the alliance partner has a positive influence on product innovation. Later, we hypothesize that the increase of attention by PFS will influence supplier's product innovation following an inverted-U-shape slope. We assume that stronger relationship intensity brings about the positive side of PFS. It increases the likelihood that the SME will achieve similar evaluative judgments and interpretations (Postrel, 2002). Thus, we hypothesize that greater relationship intensity will moderate the slope of the relationship between specification degree and the level of product innovation.

We conducted a set of eleven preliminary interviews with buyers and suppliers to understand more precisely how firms apply changes to joint product development. We use these to illustrate the conceptual background and hypotheses development. Our hypotheses are tested and largely supported by a sample of 279 supplier firms in the manufacturing sector with major operations in Europe, using the PLS approach to data analysis. Our results reveal an optimal level of PFS for achieving innovative products which can be further facilitated by greater relationship intensity.

We contribute to SME research that considers new product development alliances or using a different term product innovation alliances (Brouthers et al., 2015; Dickson et al., 2006; Pesch & Bouncken, 2018; Robson & Bennett, 2000). We demonstrate merits for SMEs when they achieve greater relationship intensity in an alliance. We reveal an equivocal value of formal specification by buyers on SMEs' product innovation (Cao & Zhang, 2011; Sheng et al., 2018). Attention associated with PFS can have an optimal level. SME that encounter product specifications which are either lacking in detail or overly constraining in detail will achieve less innovation. Best are medium levels of PFS combined with higher relationship quality, in other words "fluffy cuffs." Moreover, highly detailed product specifications, when they are not initiated in contexts of higher relationship intensity, can undermine the product development of SMEs.

2 Theoretical background

2.1 Development of an attention-based view on SME alliances

The resource demands of product innovation can be significant, yet SMEs are often resource constrained, with alliances being pursued as means to overcome constraints (Brouthers et al., 2015; Panizzolo, 1998). The important channeling of attention in SMEs involved in alliances (Ahmadi et al., 2021) can be explained by the attention-based view (ABV) that focuses on decision maker's attention, "noticing, encoding, interpreting, and focusing of time and effort" (Ocasio, 2011, p. 1287). A key assumption is that poor attention can lead to the dismissal of relevant alternatives (Durand, 2003), while high attention can facilitate finding novel solutions and institutionalizations (Nigam & Ocasio, 2009; Cho & Hambrick, 2006; Yu et al., 2005). Attention goes back to the notion that individuals tend to "focus on one of multiple simultaneously available trains of thought" (James et al., 1890). Attention is assumed to be limited (Haas et al., 2015) and is socially and organizationally embedded (Hedden et al., 2008; O'Reilly et al., 2014; Overbeck & Park, 2006). Some issues, tasks, or domains attract greater levels of attention than others (Cho & Hambrick, 2006; Hughes et al., 2018). Moreover, individuals vary in how they filter and act upon stimuli (Ocasio, 1997; Piezunka & Dahlander, 2015). Still, greater attention might bring wrong focus and myopia (Czakon, 2022; Czakon & Kawa, 2018). The opportunities and threats of product innovation decisions (e.g., the selection of technology designs, and markets), including their positioning in the supply chain, demand managerial attention (Haas et al., 2015; Ocasio & Joseph, 2018). Alliances among firms pursuing product innovation demand information exchange and coordination (Ocasio & Joseph, 2018).

Managers from SMEs and their alliance partners draw attention to matters in multiple and variant ways. For example, managers will have varying interpretations of technologies, components of the product, rules in the process, objectives, and the market (Christiansen & Varnes, 2009; Porac et al., 1989; Ahmadi et al., 2021). The interaction of managers from different firms increases attention because decision makers more likely consider problems that are based on interpersonal relationships and similarities, such as joint problems in the supply chain (Bouncken & Barwinski, 2021; Bouncken & Tiberius, 2021; Espinosa et al., 2007; Quigley et al., 2007; Reagans, 2010). Alliances allow better access and digestion of complementary knowledge related to broader, complicated, and strategic problems. Different firms will

have unequal attention patterns, even partly incompatible perspectives (Drazin et al., 1999). Some of the contradicting or different logics of firms might bring attention, then be re-framed and further merge into overlapping knowledge about new solutions. The ABV argues that similarities among attendees of meetings increase decision maker's attention (Espinosa et al., 2007; Quigley et al., 2007; Reagans, 2010).

Managers pay higher attention to novel issues (Dutton et al., 2001), to problems that stand out (McArthur & Ginsberg, 1981), and to unfamiliar terrains, i.e., to matters that often invite innovation (Li et al., 2012). The pursuit of innovative products generally challenges taken-for-granted assumptions, approaches, and routines so that organizational members need to interpret information in a wider context and adjust the action to the context (Dougherty et al., 2000).

Organizational "centralization" mechanisms (e.g., meetings, procedures, and evaluation processes) can harmonize attention because they connect individuals in their attention processes (Barnett, 2008; Kammerlander & Ganter, 2015). In the course of the post-merger integration process, attention shifts and can depart from prior plans and so include deliberate and emergent behaviors (Yu et al., 2005). Particularly in alliances aimed at product innovation or including new product development, exchange evolves upon bilateral communication of interest, issues, inputs, outputs, and priorities in ways that were not covered by the initial contract (Czakon, 2009; Dwyer et al., 1987;).

In our initial interviews with managers in SMEs and their partners, one of our interviewees pointed toward the importance of interaction: "I am quite sure that the greatest added value of such alliances, especially in this research area is not about developing exactly this product or developing that service, but often a new topic develops somewhere in between (…) partners might actually be from completely different industries, but somehow when they sit together and discuss they realize they have the same problem and one has approaches that the other finds interesting and vice versa, and so out of this develops a new plan, which is perhaps even more profitable."

Managers interact and partially expose their knowledge and similarities so that differences in their knowledge become visible, thus facilitating attention that connects the individuals. Greater attention in personal meetings will activate the salient patterns. Collectively, these observations suggest that attention fueling joint development efforts in the presence of higher relationship intensity will lead to more innovative outcomes.

H1: Increasing levels of relationship intensity of SME (supplier) managers with their alliance (buyer) partners will be positively associated with product innovation of the SME.

2.2 Centralizing attention by post-formational specifications

Plans, processes, and system integration templates that are mechanisms for higher attention assist firm transitions (Yu et al., 2005). Alliances can improve and centralize attention by using formalizations (Barnett, 2008). As we discuss in the following, it is especially the provision of detailed, formalized product development targets and foci as the collaboration unfolds — i.e., post-formational changes in the inter-firm collaboration — that can ignite attention in SMEs. Alliances work upon initially formed contracts which state the targets and obligations of the involved firms (Cannon et al., 2000; Cao & Zhang, 2011). Formalized targets, metrics, and processes will steer attention and actions afterwards in the SME (Bouncken et al., 2016; Klimas & Czakon, 2022; Ocasio, 1997; Ocasio & Joseph, 2005; Pesch et al., 2021).

Interviewee E10 explained the situation as follows: "Additional performance functions were assigned, and we were also supported with tasks that were not previously part of the contract, e.g., hotlines or training courses." Firms communicate changes in crafting and using formal documents. These give detailed information and specify requirements. Buyer E5 elaborated regarding the written form of PFS: "In general, changes to requirements should be made in writing, as these should be clearly defined so that the service provider has the best chance to understand them." Buyer E9 sums up on the goal of creating an innovative new end-product by stating: "Ultimately, the specifications serve to optimize our cooperation and the end product and thus also innovation." Thus, PFS can be directed at specifying technical details

which are necessary for the delivered product to work in harmony with the buyer's planned new product. By giving detailed technical specifications the buyer can ensure that the final new product will meet his requirements.

SME interviewee E8 informed us about their perception of buyer specifications: "The customer specifies. Since we don't make our own products, we only make them for customers." PFS vary in detail regarding the design and functional details of the required solution. The supplier is then left in charge of creating the technical details. Interviewee E11, a buyer in an alliance with an IT service firm described the process: "We do not make our specifications of a technical nature, but we make our specifications regarding the clarity or the design of the product, ultimately the software implementation is then the service provider's job." Interviewee E3 made a similar statement: "For the solution we, of course, have specifications. Yes, but these are technical specifications." Interviewee E8 elaborated: "Specifications have to be made to constructively drive the innovation process and ultimately to obtain the optimum product or customer service from us. Specifications actually serve the purpose of improving innovation."

Specifications might draw attention to responsibilities for different roles and tasks of the parties associated with concept changes (Dahlstrom et al., 1996), some of them significant and possibly disturbing the previous taken-for-granted plans and routines. The interviews show that PFS are ambiguous. Intentions of using PFS can be grouped into two categories: The first one is reacting to required changes from regulations and lawmakers (as E4 describes in the following "for example, there are any changes in the law or any guidelines to which one must adhere as manufacturer or software operator") and the second is guiding suppliers in a new direction. The latter can be viewed as directing attention to important topics which are of value to the buyer and often important for the market. PFS dictated by the buyer makes suppliers struggle with their acceptance and implementation when the collaboration is not very strong. In these cases, suppliers often view PFS as an obstacle that slows progress when the buyer calls for new requirements for the product.

PFS are sometimes proposed in response to drawing attention to problems the firms did not want to or could not address during the initial start of the collaboration (Argyres & Mayer, 2007). The collaborative element of exchange can — but not necessarily will — allow these formal specifications to be seen in the light of positive mutual gains (Wilson, 1995). In cases where buyer and supplier work toward common goals, frequent communication, and mutual attention on PFS facilitate innovative outcomes, as E1 states: "The guidelines and specifications that we have defined together are also decisive for the success of the campaign or project."

One buyer informed about that PFS guide the supplier's attention toward the most important topics in product development. The buyer introduces PFS to educate the supplier and enable him to work autonomously on this basis. The PFS directs his attention toward the new goals. E5, a buyer firm, elaborated on this process: "I think the bottom line is that if you start out with the basics to make everyone aware of what is at stake, then it is easier to make the service provider do something then to let him act in his own sense of what should be the goal. So, the goal should not be to deal with it every day, but to make it so that he can act on his own initiative." Once clear requirements and objectives have been communicated there is less need for overview and frequent communication. PFS limit conflict by clarifying tasks and goals: "If you have clear requirements and clear objectives which are understood immediately then it can also function, if this is not given, then this will always require workshops and meetings or telephone conferences and partly then develop a tense relationship or turn into some kind of fight. …we have experienced this before."

Attention can be drawn to disadvantages when there are PFS initiated by one party. Requested changes bring new insights, uncertainty, and tensions between firms that can require participants to focus their attention to a possible gap between their expectations and the collaborative experience. The specifications can violate the SME's mutuality expectations, confuse them, or demand action requiring significant and costly changes to the new product development.

In essence, alliances — especially when they involve the dynamics of new product development — require ongoing attention because different decision makers will have their own perceptions and interpretations of the value and motives behind coordinated efforts aimed at novel outcomes. Attention processes within and between firms will increase and focus

on disadvantages when significant changes occur as the proposal of detailed PFS may violate partner expectations, confuse priorities, or demand doubtful action. When the supplier receives PFS, its decision makers and experts will attend to understanding the content of the additional formalized specifications, discussing it with others, and considering the context. While changes prompted by the establishment of newly detailed specifications can positively influence attention, decision makers and knowledge exchanges among them might also raise attention to doubt. Proposed changes might limit mutuality between the parties, especially when PFS are not mutually established in meetings but, instead, are promoted by only one of the parties to the relationship. Hence, PFS will raise attention but have ambiguous influences on product innovation. We hypothesize below which level of the specifications as indicated by the detail of PFS has a positive or negative influence on product innovation of the supplier.

2.3 Ambiguous constraints of post-formational specifications

The collaborative element in the exchange of the SME with its partner can enable increasing attention to new requests from others to be viewed in a favorable light (Narayandas & Rangan, 2004). Understanding that product development is only partially plannable (Roy et al., 2004), SMEs will not evaluate minor changes as a threat to the collaborative intent and the mutuality between firms. Minor changes in the collaborative setting potentially raise attention to changes, but will not necessarily disturb supplier's plans, organizational settings, investments in technology development, or market strategies involving the innovation. SMEs will perceive these proposed changes through the "zone of indifference" (Barnard, 1938) and accept PFS in an unquestioning manner not raising high attention. Nonetheless, the formal character of PFS signals importance which *activates* some attention in the receiving supplier firm, especially when those specifications are sufficiently detailed to result in their being consciously assessed as exceeding or implying constraint beyond the receiving firm's zone of indifference.

We learned that giving detailed specifications and clarifying the requirements is one of the main objectives of applying PFS. Considering the negative aspect of restricting suppliers' freedom in decision making, we analyzed how suppliers perceived PFS regarding clarification of their task. The majority of SME suppliers found PFS to be helpful, clarifying the partners' tasks in the alliance. Interviewee E1 stated: "our employees need clear tasks." And E6 stated: "It always provides clarity when you have specifications. A very important point." From the interviews, we also learned that PFS can lead to clearer concepts regarding required solutions. With every additional specification, the task becomes clearer and leads to a better understanding. Interviewee E3 told us: "With every new requirement a concept is written. The concept has to be created by both sides. Then, of course, the concept is coordinated, first among us. And then we think about how to offer it to the customer. So, it's like in a normal working process, that you just balance the concept, take the technical requirements of the customer and then offer the solution to the customer."

The developers of the formal specifications presumably pay close attention to what they write. Through formalizing and documenting product specifications, developers reveal to various degrees their understandings, biases, and assumptions, and they also potentially reveal hidden knowledge (Vlaar et al., 2007). PFS not only suggest emerging needs in the product development process of one party, but they also potentially activate strong attention processes in the other party and between the firms (Vlaar et al., 2006). The search for informational clues by the receiving party to the document triggers complex attention processes and understandings about product development (Täuscher et al., 2021). The (new) understandings put into the specifications can improve product development in the proposing (buyer) firm as well as in the (supplier) firm receiving the specifications. Thus, PFS will raise the attention of the supplier and improve activities toward aligned superior product development.

Yet, the buyer-firm-centered attention path challenges expectations and can cause confusion or uncertainty on the supplier's part. PFS forces the supplier to ponder what the formally proposed specifications in the documents indicate. Beyond the textual analysis, decision makers will enter social attention processes within the firm and with the buyer firm (again) to make sense of the detail in the PFS. The search for clarity will induce further communication. Pondering

about possible constraints in PFS, conversing about them, and transferring them among decision makers and experts can activate knowledge creation.

Minor or moderate specifications can facilitate connected work and create a coherent formal working template (Vlaar et al., 2007). Minor or moderate specifications provide more attention and coordination for product development than no specifications. Joint attention processes in the context of minor or moderately detailed PFS can breed more unitary views of reality, which may improve SME's product development (Roy et al., 2004; Vlaar et al., 2006). Minimally detailed PFS provide high autonomy to the supplier but at the expense of not fostering new insights through joint attention. Increasing the detail embedded within PFS, however, can prompt attention processes within and among the buyer–supplier firms and thereby enhance product innovation.

Still, the constraints of highly detailed PFS can invoke questioning and doubt in an SME. SME managers might concentrate on doubtful motives of the other or highly divergent priorities in product-market concepts, which jeopardize the innovation of the new product. The positive influences of PFS weaken if the proposed specification details strongly constrain autonomous attention processes, create rigidities, erode previous investments, and threaten the mutuality and collaboration between partners. When proposed project changes are significant, they create a gap between partner expectations and the situation at hand. SMEs will struggle with seeing the new request of the other in a favorable light (Narayandas & Rangan, 2004). SMEs confronted with detailed PFS might be reluctant to openly share knowledge. Doubts might dominate, hampering the openness and the goodwill needed for a coordinated effort between firms. The other firm's pressing for detailed PFS might be perceived by the SME as an initiative proposed out of self-interest, which could demotivate the partner from knowledge sharing and making additional innovation investments.

A buyer firm's advocacy for formal detailed PFS can prompt high levels of confusion, uncertainty, and skepticism of the SME, thereby damaging mutuality within the relationship (Bouncken & Barwinski, 2021). As suggested, such specifications have a high potential for activating attention in SMEs. Yet, the activation may be less connected with mutual interests because detailed, partner-proposed PFS constrain and stress the one-sided perspective of a firm regarding new product development. Buyer firms do not know everything about their SME supplier's potentials. New specifications developed from one firm's perspective might overstretch the goodwill existing within the relationship (Fredrich et al., 2022a, b). Developing strong PFS from the viewpoint of one party likely discounts or ignores the wishes and contributions of the supplier. The proposed guidelines and targets thus can be too restrictive, or ill-informed regarding the supplier's potential contributions to the product development (Roy et al., 2004). They bring attention to the negatives. Detailed PFS then reduce the search for new alternatives, and SMEs might feel restrained or distracted from their own prior development targets. SME suppliers may, thus, be demotivated to "walk the extra mile" with their contributions to the product development effort.

Beyond reducing the collaborative perception, the constraints by detailed PFS may impose unnecessary levels of rigidity on the supplier firm. Experimentation, attention, and receptiveness to new insights may be limited. SMEs might overlook, disregard, or misinterpret novel information, thereby reducing learning and the possibility of serendipitous innovation. The insertion of detailed PFS into the product development process, thus, has a potentially disruptive influence.

In summary, the level of formal specifications will explain their ambiguous effects on product innovation. Zero levels of PFS enable SME supplier's development activity to proceed along independent paths. Yet, such independence and autonomy do not leverage the benefits of attention to coordinated efforts. It might only raise (too) low attention within or slightly above the zone of indifference. Attention processes within and between firms may not be activated to the detriment of the new product innovation. Low to moderately detailed PFS will stimulate attention within and between the firms. The provision of such details will often reflect learnings within the development process and become the bases for clear communications and coordinated efforts, thereby enhancing new product innovation. Yet, PFS can reach a detail threshold, after which doubts can be triggered in the supplier firm receiving those specifications. Questions about the mutuality of the relationship come into play, and experimentation into new possibilities declines. Potential contributions of the firm receiving

the specification to the joint development effort may be underestimated or misestimated by the buyer firm proposing the constraints. Collectively, such dynamics reduce the likelihood that the joint development efforts will result in the greatest new product innovation.

H2: The level of detail contained within PFS is related to SME supplier's product innovation in an inverse U-shaped manner, with the highest level of new product innovation occurring when the level of detail is moderate, and lower levels of new product innovation occurring when the level of detail is low or high.

2.4 Post-formational specifications and relationship intensity

So far, we assume that both relationship intensity and the level of PFS individually have an impact on product innovation. Here we propose that relationship intensity and PFS interactively affect productive attention toward product innovation. The positive effects of attention related to relationship intensity may lessen the negative impact of PFS at very low and very high levels. The presence of minimally detailed (low) PFS leaves many avenues for product development open. Yet, for product development initiatives to benefit from coordinated efforts, suppliers need to pay attention to targets, which may not have been fully conceptualized and specified at the time of the exchange formation (Roy et al., 2004). The joint attention in frequent and intense meetings might create the basis for new PFS or might help to clarify the demands of already created PFS. For example, Interviewee E11 specified: "In general I think you can never work closely enough together, (…), with a complex project I meet perhaps three times a week for a day workshop and always keep a written record of it."

Relationship intensity might "compensate" for minimally detailed PFS, thereby enabling the ultimate development of superior products. This is because interaction enables the allying firms to learn-as-they-go and navigate the development process as knowledge is gained toward joint desired ends. This compensation effect may, in essence, substitute in part for the valuable guidance and product development-related information that may have been contained in proposed PFS. Thus, increasing levels of interaction enable SME suppliers to achieve high levels of product innovation, even though PFS may be minimally detailed. We hypothesize:

H3a: High relationship intensity promotes new product innovation when post-formational specifications are low.

From interviewee E11 we learned about the importance of meetings to create trust, generate common understanding and clarify goals: "I think a lot depends on trust but of course also on a common understanding, if you have clear requirements and clear goals and you understand them immediately then it can also work, if this is not given, then it will always be reflected in the amount of workshops and meetings or telephone conferences (which are required to generate trust, clear goals and common ground)." Therefore, attention in meetings might also increase the likelihood that highly detailed PFS will ultimately lead to new product innovation because it can reduce the negative influences of detailed PFS on new product outcomes. Meetings might inspire the creation or understanding of detailed PFS. Thus, PFS will more likely have resulted from the collaborative attention and, consequently, be understood as intended by the receiving supplier firm. Then, any incompatibilities between the firms or misunderstandings regarding detailed PFS have a greater chance of eventual resolution. Moreover, interaction can promote a climate of trust, openness, and candor between the buyer and supplier firms. Thus, high levels of relationship intensity sustain the collaborative attention of joint product development initiatives and reduce possible doubts regarding the mutuality of interests. In short, greater relationship intensity reduces misinterpretation and promotes mutuality toward coherence between the partners when PFS are very detailed. Thus, increasing levels of interaction should reduce the negative impact of PFS on new product innovation when those constraints are highly detailed. We hypothesize:

H3b: When post-formational specifications are high, the negative impact of post-formational specifications on new product innovation diminishes as relationship intensity increases.

3 Methods

3.1 Sample and data collection

The first set of data comes from open qualitative interviews conducted with eleven companies active in buyer–supplier relationships. We interviewed both suppliers SMEs and their buyers to study how PFS are intended and received on the opposite ends. The interviews allowed us to gain an in-depth understanding of how PFS are used by buyers and which effects they have on the receiving supplier. In the interviews, we first clarified the form and goal of the specific alliance. We continued to ask buyers how they used PFS and why. We further enquired about the process of using PFS. On the SME supplier side, our questions focused on the acceptance and use of PFS. Our main goal was to understand the process of receiving new specifications and their effect on the innovation process. To find appropriate interview partners we first decided on specific types of alliances we were interested in. These alliances were either between manufacturing companies or between service companies and their customers. This allows us to cover a wide range of alliances. For the final sample, we only chose long term alliances that had been active for more than 1 year. The sample consists of 6 manufacturing and 5 service alliances. The interviews were conducted between May and June 2019 by two researchers and lasted between 30 and 60 min. We recorded and transcribed the interviews before analyzing them. Table 1 gives an overview of the interviewed alliances.

To test our hypotheses, we use data from 279 manufacturing suppliers with major business operations in Europe. Following the standard classifications of the SME, we limited our data set to firms with no more than 500 employees. We aimed to focus on four industries in which SME suppliers strongly contribute to innovation. Our study uses multiple data sources. First, to retrieve information, we targeted executives who indicated knowledge about their firm's long-term exchanges with buyers. We then requested a second key informant from the firm, who provided information about the outcomes and objective performance data one year after the first timepoint (t_1). Finally, we used secondary data (e.g., sales and number of employees) from the *Amadeus* database to complement our survey data on sales volume and number of employees. Of our key respondents, 30.1% belonged to a management board, 21.1% to marketing, 7.2% to R&D, 8.6% to production, and 33.0% to other corporate functions. The firms in the sample had on average 737 employees (median: 50) at the time of the first survey, an average sales volume of 247.2 million euros (median: 8.0 million euros) in the preceding business year (t_0), with an average rate of return of 18.6% (median: 15.1%). The firms operated within the alliance for an average of 85 months (median: 56 months).

Table 1 Interview sample description

Code	Focal firm (A) industry	Partner firm (B) industry	Employees A	Employees B	Alliance task
E1	Measurement technology	University	42	1620	Measurement Technology Projects
E2	Biotechnology	Biotechnology	11–50	800	Improve Essays
E3	SAP Consulting	IT and Services	8	15	Store SAP data in a separate database
E4	Medicine technology	Medicine technology	35	12	Swallowing diagnosis for stroke patients
E5	Software	Sensor technology	7	30	Technical connection of sensors
E6	Clinical diagnostics	Candor	800	10–12	Substrates for production
E7	Plastics technology	Stamping technology	100	130	Combination of plastics and punching technology
E8	Spring technology	Spring technology	200	200	Combination of different Production areas
E9	Tele-communication	Tele-communication	11–50	51–200	Supplement from various products
E10	Software	Software	21	518	Joint software development
E11	Medicine technology	IT and Services	60	30	Construction of digital round carts

3.2 Measurement

We measured PFS using items indicating the degree of detail the buyer specifies after the exchange contract has been established with respect to the (1) product design, (2) technical functions of the product, and (3) the overall concept of the new product (Bouncken, 2011). Relationship intensity (REL) was assessed with items focusing on (1) regularity, (2) close relationships, and (3) informal conversation (Hult et al., 2004). We measure the radicalness of the product innovation (Garcia & Calantone, 2002) — using items reflecting the degree to which new products (1) incorporate technology new to customers, (2) offer benefits new to customers, and (3) introduce new features to the market (Garcia & Calantone, 2002). For each latent construct, we use a reflective measurement model with three indicators on a five-point scale ranging from "total disagree" to "total agree" or, in the case of new product innovation, "no benefit" to "very much benefit."

To analyze data, we use partial least squares (PLS) path modeling with "SmartPLS" (Ringle et al., 2015). To estimate standard errors and confidence intervals we perform 1000 bootstrap repetitions. Because some take a critical view of PLS path modeling (Rönkkö et al., 2016), we provide additional structural equation model (SEM) with "Mplus" (Muthén & Muthén, 1998–2012) to replicate the empirical findings.

We evaluate the overall fit of the model with the discrepancy between the empirical and the model structure-based indicator variance–covariance matrices, measured by the squared Euclidian distance (d_{ULS}), the geodesic distance (d_G), and the standardized root mean squared residual (SRMR) (Benitez et al., 2019). The values of d_{ULS} and d_G are both lesser than their 95% quantiles, and SRMR supports good model fit (Henseler et al., 2015; Table 2).

To assess the reliability of the measures, we evaluate Cronbach's alpha (α_{Cr}) and Dijkstra-Henseler's ρ_A. With α_{Cr}-values ranging from 0.85 to 0.88 the indicators reach good internal consistency. The ρ_A -values between 0.88 and 0.93 also support adequate composite reliability. With significant indicators loadings greater 0.7 all indicators are suitable and the resulting communalities greater than 0.5 means that the variability of the indicators is adequately captured by their latent constructs. The average variance extracted (AVE) is greater than 0.5, which supports a small amount of measurement error. To assess discriminant validity we evaluate the heterotrait-monotrait ratio (HTMT; Henseler et al., 2009). For all constructs the HTMT ratios are lesser than the value of 0.85 (Henseler et al., 2009), supporting discriminant validity.

Table 2 Evaluation of the overall saturated model fit

Discrepancy	Value	HI_{95}
$\mathbf{d_{ULS}}$	0.644	2.108
d_G	0.388	0.775
SRMR	0.040	0.072

3.3 Endogeneity testing

Both, SEM and PLS path modeling can be accompanied by the problem of endogeneity, and this can lead to biased estimation of path coefficients (Benitez, Henseler, & Roldán, 2016; Antonakis et al., 2014). To reduce the impact of potentially omitting causal variables, we include control variables in our modeling. We use the firm's age because older firms have greater inertia (Hannan & Freeman, 1984). Because flexibility in general and a firm's capability to adapt to environmental changes depends on firm size (Hannan & Freeman, 1984), we include the logarithm of employees. We controlled for firms' R&D intensity (R&D investments per sales), as greater R&D intensity is associated with higher innovativeness. The firm's position in the value chain and the branch of the firm were inserted as controls. On the alliance level, we controlled for the effects of interorganizational trust using a three-item, five-point Likert-type scale (see Table 3), as trust can be a crucial antecedent of inter-firm learning and new product development between firms (Lui, 2009). To counter the problems of common-method-variance and simultaneity we requested data from two respondents with a time lag of one year. The first respondent furnished information on the variables PFS and REL at time zero (t_0). One year later (t_1), we asked a second respondent to provide data on the dependent variable new product innovation.

Furthermore, we compute a parsimonious model without interaction terms and compare the results when estimated with 2SLS estimator (Kirby & Bollen, 2009). We use the technique

Table 3 Indicator statistics and measurement model evaluation

Constructs	Indicators	M	SD	SK	KT	WE	FL	α_{Cr}	ρ_A	AVE	HTMT
Post-formational specifications (PFS)	During the alliance process, our partner specifies in formal documents…							0.879	0.901	0.804	0.151
	…in *detail* functional principles of new products	3.218	1.215	−0.357	−0.744	0.310	0.864				
	…in *detail* design elements of new products	3.083	1.292	−0.196	−0.987	0.377	0.900				
	…in *detail* features to be included in a new product concept	3.179	1.236	−0.289	−0.836	0.425	0.925				
Relationship intensity (REL)	We meet regularly with our supply chain partner	3.827	1.071	−0.559	−0.602	0.491	0.927	0.847	0.924	0.764	0.385
	We are cultivating a close relationship to our supply chain partner	3.915	1.044	−0.717	−0.290	0.364	0.922				
	There are informal conversations between us and our supply chain partner	3.959	1.029	−0.923	0.353	0.274	0.763				
Product Innovation (Inno)	How much value does the relationship generate in the following fields?							0.870	0.875	0.795	0.183
	…new products incorporating technology new to customers	3.197	1.284	−0.288	−0.983	0.381	0.913				
	… new products offering benefits new to the customers	3.439	1.173	−0.606	−0.396	0.372	0.905				
	… new products that introduce many completely new features to the market	3.011	1.222	−0.150	−0.880	0.369	0.855				
Trust	Our partner keeps promises made to our firm	4.056	0.997	−0.940	0.291	0.556	0.939	0.872	0.922	0.778	0.242
	Our partner is always trustworthy	4.190	0.916	−1.116	0.979	0.390	0.913				
	Our partner has always been evenhanded in its negotiations with us	3.981	1.030	−0.887	0.205	0.156	0.783				

Columns show means (M), standard deviation (SD), skewness (SK), kurtosis (KT), weights (WE) factor loadings (FL), Cronbach's alpha (α_{Cr}), Dijkstra-Henseler's rho (ρ_A), average variance extracted (AVE), and heterotrait-monotrait (HTMT) ratio

of model-implied-instrumental variables (MIIV) (Bollen, 1996). In this technique, one indicator per latent variable from the structural model is used as a scaling variable in a multiple regression. The remaining indicators are used as instrumental variables for the scaling variables. This technique can reduce inconsistent estimates if the instruments are uncorrelated with the disturbance term of the regression equation (Kirby & Bollen, 2009). For the evaluation of model-implied-instrumental variables and the estimation with the two-stage-estimation (2SLS) approach, we use the packages MIIVsem (Fisher et al., 2016) and AER (Kleiber & Zeileis, 2008) in the statistical environment *R* version 3.4.3 (R Core Team, 2016). The Sargan-chi^2 tests the null hypothesis that the instruments are uncorrelated with the disturbance term, where a significant test statistic indicates a mis-specified model.

The specification tests for 2SLS estimation show that all scaling variables can be perfectly determined by the instruments, no instrumental variable is correlated with the disturbance term of the regression equation, and the estimation is valid. The test-statistic of 1.154 with 3 degrees of freedom in the Wu-Hausman-test reveals an insignificant result (p-value = 0.329). The Sargan-chi^2 value of 0.669 with 3 degrees of freedom is also insignificant (p-value = 0.880). The coefficients of the 2SLS regression exhibit the same significance and direction as the SEM with maximum-likelihood (ML) estimator.

3.4 Modeling

Table 4 shows the correlations between several controls and the model variables. With increasing age, the firms have significantly more employees, less R&D intensity, and more trust in the cooperation partner. Larger SMEs tend to generate more product innovation in their joint product development efforts with the buyer. Relationship intensity is significant related with interfirm trust, PFS, and innovation.

We determine the path coefficients in a model with control variables, relationship intensity (REL), linear and non-linear terms of post-formational specifications (PFS), and the interaction term of REL with PFS. In the PLS path model and in the SEM we determine the nonlinear term of PFS and the interaction term by using the product indicator approach (Kenny & Judd, 1984) in a parsimonious set of mean-centered product indicators (Lin et al., 2010; Becker et al., 2018). Furthermore, in SEM, we estimate a model with the latent moderated structural equations

Table 4 Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1 Firm's age	1															
2 Firm's size	0.40 ***	1														
3 R&D intensity	-0.11 *	-0.01	1													
4 OEM	0.11 *	0.14 **	-0.02	1												
5 Supplier	-0.07 †	0.02	-0.05	-0.43 ***	1											
6 Trade	0.01	-0.03	-0.08 **	-0.24 ***	-0.04	1										
7 Service	-0.08 †	-0.13 **	0.07	-0.23 ***	-0.02	0.26 ***	1									
8 Electro	-0.01	0.18 **	0.00	0.03	-0.04	-0.00	0.02	1								
9 Machine	0.02	-0.14 **	0.00	-0.10 †	0.01	0.20 **	0.17 *	-0.13 ***	1							
10 Packing	0.08	0.12 *	0.00	-0.04	0.02	-0.03	-0.04	-0.09 ***	-0.05 ***	1						
11 Trust	0.15 *	0.00	-0.03	-0.02	-0.04	0.01	0.03	0.03	0.02	0.01	1					
12 REL	0.05	0.08 †	-0.03	-0.02	-0.00	0.05	0.03	0.07 †	-0.09 †	-0.05	0.50 ***	1				
13 PFS	-0.07	0.05	0.00	-0.02	-0.02	-0.03	-0.02	0.08 †	-0.19 ***	-0.14 **	0.04	0.21 ***	1			
14 PFS (squared)	0.15 **	0.03	-0.01	0.08 †	-0.13 **	0.05	-0.07 †	-0.06	0.06	0.05	0.05	0.01	-0.21 **	1		
15 PFS x REL	0.16 *	0.04	-0.02	0.02	-0.05	0.04	0.06	0.01	0.09	-0.05	0.09	0.01	0.03	0.20 *	1	
16 Inno	-0.08	0.12 *	0.18 ***	-0.01	0.07 †	-0.04	0.03	0.17 ***	-0.12 *	-0.08	0.10 †	0.26 ***	0.14 *	-0.16 **	0.07	1

Correlations are significant (two-sided) with p-values ≤ .10†, ≤ .05*, ≤ .01**, and ≤ .001***

(LMS) approach (Kelava et al., 2011; Klein & Moosbrugger, 2000). The resulting prediction of product innovation (Inno) follows the equation:

$$\widehat{NPS} = \gamma_0 + \gamma_1 REL + \gamma_2 PFS + \gamma_3 PFS^2 + \gamma_4 REL \times PFS \quad (1)$$

To provide evidence for a U-shaped relationship we check the three-step procedure suggested by Lind & Mehlum, 2010). This procedure requires that (1) the estimated coefficients are significant and of the expected sign, (2) the slope tests on both ends of the data range are significant, and (3) the turning point is located within the data range (Haans et al., 2016). The significant coefficient of the nonlinear (squared) term of PFS will indicate that the influence of post-formational specification on new product innovation is dependent by the intensity of PFS. This typically indicates a U-shaped (or inverse U-shaped) relationship. A significant interaction term of REL with the (linear) term of PFS will indicate that the intensity of REL leads to a shift of the turning point in the PFS–Inno (Haans et al., 2016).

4 Results

In the first hypothesis, we assume that relationship intensity promotes the NPS of the SME supplier. The significant path coefficient of REL on Inno (γ =0.240; t=3.687; p=0.000) supports H1 (model 1 in Table 5). The second hypothesis proposes an inverse U-shaped relationship between PFS and product innovation of the supplier firm. We find an insignificant path coefficient for the linear term (γ=0.017; t=0.267; p=0.395) and a significant negative coefficient for the nonlinear term of PFS (γ=−0.145; t=2.336; p=0.010).

With a slope of 0.575 (t=2.396; p=0.008) for the lowest level of PFS (−1.925) and a slope of −0.460 (t=2.086; p=0.019) for the highest level of PFS (1.642) we can prove that the curve is sufficiently steep at both ends of the PFS-range. Thus, the assumed inverted U-shaped relation of H2 is supported (Fig. 1).

H3a-b focus on the interaction of REL and PFS. With H3a we assume that REL achieves high levels of NPS despite the presence of minimally detailed PFS. The significant interaction term PFS x REL indicates

Table 5 Results from PLS path modeling using product indicator approach (model 1), structural equation model (SEM) with product indicator approach (model 2), and SEM with latent moderated structural equation approach (model 3) (N=279)

	Model 1				Model 2				Model 3			
	Est	S.E	t-value	p-value	Est	S.E	z-value	p-value	Est	S.E	z-value	p-value
Firm's age	−0.094	0.060	1.562	0.059	−0.069	0.070	−0.990	0.322	−0.062	0.063	−0.975	0.329
Firm's size	0.110	0.061	1.795	0.036	0.081	0.070	1.154	0.249	0.075	0.069	1.087	0.277
R&D intensity	0.183	0.043	4.278	0.000	0.267	0.082	3.252	0.001	0.259	0.062	4.152	0.000
OEM	0.025	0.065	0.392	0.347	0.055	0.064	0.864	0.387	0.057	0.066	0.869	0.385
Supplier	0.076	0.057	1.328	0.092	0.114	0.062	1.823	0.068	0.106	0.057	1.854	0.064
Trade	−0.015	0.062	0.249	0.402	−0.015	0.063	−0.236	0.814	−0.015	0.066	−0.223	0.823
Service	0.019	0.065	0.298	0.383	0.038	0.063	0.602	0.547	0.035	0.066	0.527	0.598
Electro	0.106	0.048	2.204	0.014	0.123	0.061	2.008	0.045	0.120	0.051	2.382	0.017
Machine	−0.072	0.072	1.001	0.159	−0.073	0.063	−1.149	0.251	−0.070	0.074	−0.956	0.339
Packing	−0.057	0.067	0.846	0.199	−0.033	0.062	−0.531	0.595	−0.033	0.073	−0.446	0.656
Trust	−0.002	0.066	0.035	0.486	−0.032	0.083	−0.382	0.703	−0.020	0.087	−0.227	0.820
REL	0.240	0.065	3.687	0.000	0.311	0.084	3.705	0.000	0.302	0.087	3.467	0.001
PFS	0.017	0.062	0.267	0.395	0.003	0.072	0.048	0.962	0.011	0.077	0.148	0.883
PFS (squared)	−0.145	0.062	2.336	0.010	−0.193	0.072	−2.669	0.008	−0.183	0.078	−2.337	0.019
PFS x REL	0.114	0.085	1.340	0.090	0.170	0.077	2.207	0.027	0.147	0.074	1.990	0.047
R^2	0.185	0.041	4.519	0.000	0.242	0.060	4.034	0.000	0.252	0.061	4.110	0.000

Columns show standardized path coefficients (Est.), standard errors (S.E.), t-/z-values, and p-values. Global model fit indices of model 2 are: χ^2(df)=417.121 (296); RMSEA=0.038; CFI=0.952; SRMR=0.053

that the estimated influence of REL on product innovation is not independent from PFS. So, by taking the first derivative of Eq. 1, we extract the pure (marginal) effect of relationship intensity on new product innovation against post-formational specifications:

$$ME(REL|NPS) = \gamma_1 + \gamma_4 PFS \quad (2)$$

The marginal effect of REL on product innovation is significant for the most range of PFS. For extremely low values of PFS (values lesser than the sample mean minus one standard deviation), which is true in 22.2% of the sample, the marginal effect of REL on product innovation is insignificant (Fig. 2; Table 6). So, we reject H3a.

With H3b we assume that high REL can reduce the negative influences of PFS on product innovation. The significant positive interaction term shows that with increasing REL the turning point of the curve shifts to right. This means that the negative influence of PFS on product innovation diminishes with increasing REL and supports H3b.

The SEM with product indicator approach (model 2 in Table 5) and SEM with latent moderated structural equations approach (model 3 in Table 5) offer nearly identical results, suggesting that the results are robust estimates.

5 Discussion and conclusion

SMEs are often resource constrained and consequently form alliances for innovation (Robson & Bennett, 2000). We focused on soft and hard coordination mechanisms and hence on the question of how the quality of relationships and post formational

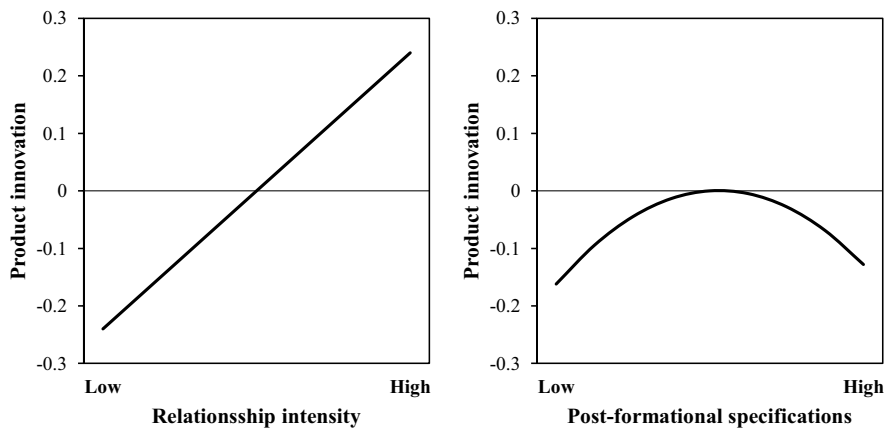

Fig. 1 Influence of relationship intensity (left) and post-formational specifications (right) on product innovation. The labels of low vs. high correspond to +/− one standard deviation of the sample means of the relevant construct

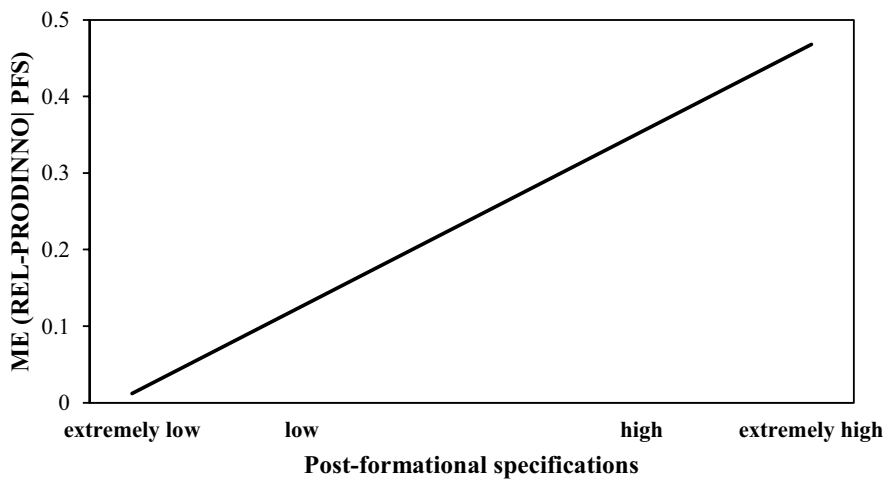

Fig. 2 The marginal effect of relationship intensity on product innovation. At t1 conditional by post-formational specifications (PFS). The labels of low vs. high correspond to +/− one standard deviation, and extremely low vs. extremely high correspond to +/− two standard deviations of the sample mean

Table 6 Marginal effect of relationship intensity on product innovation ME(REL|Inno) against post-formational specifications (PFS) ($N = 279$)

PFS	ME(REL|Inno)	S.E	*t*-value	*p*-value
−1.000	0.126	0.103	1.222	0.111
−0.750	0.155	0.088	1.762	0.039
−0.500	0.183	0.075	2.437	0.007
−0.250	0.212	0.067	3.157	0.001
0.000	0.240	0.065	3.685	0.000
0.250	0.269	0.070	3.838	0.000
0.500	0.297	0.080	3.697	0.000
0.750	0.325	0.094	3.447	0.000
1.000	0.354	0.111	3.194	0.001

The PFS values of −1.0 and +1.0 correspond to +/− one standard deviation of the sample mean. For 62 of the 279 cases in the sample are the values of PFS lesser than −0.96. The ME(REL|NPS) for PFS = 0 is equal to the direct effect of relationship intensity on product innovation in Table 5

formalizations in ongoing alliances of SME suppliers and their buyer partners can improve and centralize attention toward novel ends (Barnett, 2008). Innovation demands information exchange and coordination among firms, thus continued attention and significant development-related adaptations by firms after the initial set up. SMEs within product innovation alliances will often have only a general sense of matters such as the concept, features, and functionalities and set further formal specifications as the development process unfolds (Joshi, 2017; Sheng et al., 2018). We clarify the ambiguous effects of the more hard and formal detailed PFS within the product development of SME supplier firms with their buyers (Roy et al., 2004). We connect these with soft factors related to higher relationship quality.

In brief, results show that attention following moderate levels of constraints by PFS are associated with the highest levels of product innovation. We also find that more intense and frequent meetings contribute to product innovation across all levels of PFS detail, but most positively at the low and high ends of the scale. We show how relationship intensity contributes to product innovation, theorizing about interpretations of and reactions to the proposal of PFS by the supplier firm (Christiansen & Varnes, 2009). This guides our image about "fluffy cuffs." Fig. 3 shows that PFS have a progressively positive effect on product innovation when relationship intensity is high. Controversy, product innovation progressively decreases with PFS when relationship intensity is low.

The current research results have several principal theoretical implications. First, this research brings the ABV to SME and alliance research, specifically supporting the relevance of both informal and formal centralization mechanisms and threshold effects of specifications in buyer–supplier alliances and supplier's product development (Ferguson et al., 2005; Sheng et al., 2018). Attention processes are triggered within particular high ranges of stimuli; some stimuli can be too subtle to invoke such processes. We find that (1) relationship intensity and the proposal of PFS operate as triggers of attention processes within the context of buyer–supplier exchanges. Further, (2) the

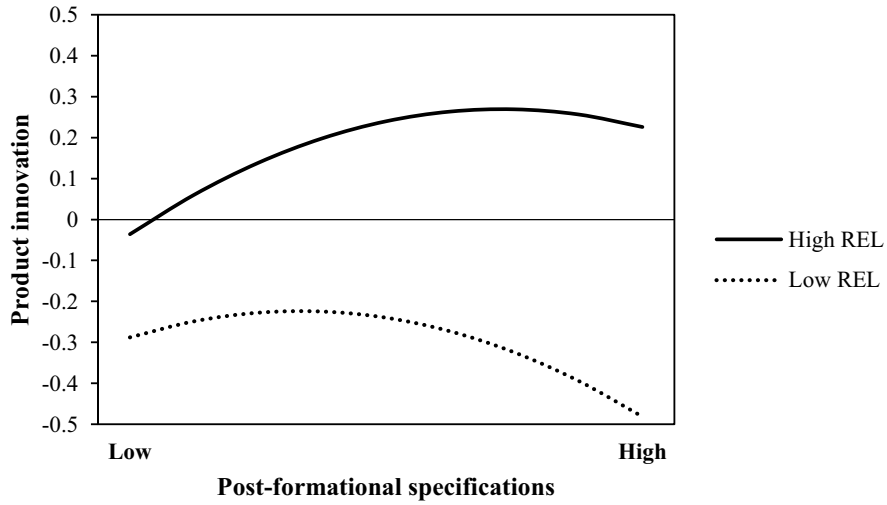

Fig. 3 Interaction of post-formational specifications (PFS) with relationship intensity (REL) on product innovation. The labels of low vs. high correspond to +/− one standard deviation of the sample means of the constructs

degree of detail in PFS will be constructive to the new product development up to a point — the threshold — after which increasing levels of detail will have adverse effects on new product innovation. Lastly, (3) attention processes triggered by constraints in the proposal of PFS can generate favorable outcomes when the firms meet often and intensively.

We argue that the absence of specifications or the proposal of minimally detailed PFS by the buyer partner may not induce much conscious thought — attention — by decision makers and experts in the receiving supplier. However, increasing detail specificity will likely be met with increasingly careful consideration until a tipping point is reached where the decision makers in the receiving firm begin to question if there is an implicit message behind the specifications as they consider the precise information contained in the specifications. The matter of why precise constraints are being proposed may not always be obvious to the receiving (supplier) firm. The current study results suggest that negative effects of detailed PFS on new product innovation can occur when the buyer proposes constraints that potentially violate norms regarding what constitutes an "acceptable" degree of guidance. We believe that the high level of formality and detail is especially difficult for SMEs because they often operate and innovate on the basis of greater flexibility and mutual adaptation and less on formal systems. We also believe that the negative effects of very low guidance from the buyer is difficult for smaller suppliers who just do not know the direction of the innovation processes. Their relative smallness and resource constraints will limit their abilities to just innovate in diverse directions.

There are likely at least two processes that are triggered in the presence of a "threshold level" PFS. First, the motives behind the proposal of the constraints may be questioned, given that the details outlined may redirect or otherwise control the receiving supplier firm's level and type of involvement in the development project. This is particularly visible when the relationship intensity of the SME supplier and its buyer is low and does not allow a joint creation or discussion of PFS. Second, creative and exploratory processes may be essentially capped or truncated based on the level of PFS, with the remaining innovative effort now targeted in specific directions (Argyres & Mayer, 2007; Faems et al., 2008). In either case, the outcome of the collaborative effort may suffer because of either (1) misunderstanding or mistrust of the partner's efforts to control the project or (2) premature commitment to targets that may be suboptimal and, perhaps, not formulated in full consideration of both parties' potential contributions to the collaborative effort.

A second and related theoretical implication of the current results is that product development of the supplier SME is most successful when exchanges are updated during the development process by one or both of the parties to the effort, but that update should assume a somewhat general (versus highly specific) form. Under such circumstances, the buyer and SME supplier firms retain degrees of freedom to navigate through the development process in manners that allow in-progress learning and course correction as needed. Constraints that are somewhat general or indefinite in character allow for a greater latitude of action, which can facilitate adaptation as the partners inevitably encounter unanticipated contingencies while experimenting with new possibilities or resource combinations that portend superior product outcomes. In short, because of the ease with which strategic redirection and improvisation may occur in their presence, ambiguous, indefinite, or more general targets and guidelines can enable innovative initiatives to unfold in opportunistic manners as new and promising development paths are discovered (Brockman & Morgan, 2006, Bassoff, and Moorman, 2001).

A third theoretical implication of this study is that relationship intensity within the development process is critical to the supplier's realization of product innovation. It brings the fluffiness and openness of exchanges. Intense relationships can bring attention to connecting some of the firms' prior knowledge bases in manners that directly support outcomes (Simonin, 1999; Vlaar et al., 2007). Relationship intensity brings and facilitates attention and then understanding of one's partner's strengths, weaknesses, biases, and motivations. Attention to clearly and accurately interpreting signals is key to potentially maximizing each firm's commitment and contribution to the exchange. Notably, relationship intensity during the development process enhances the positive effects of PFS on product innovation. We believe that especially SME who tend to be more flexible, less formal, and more reliant on social relationships demand better relationship quality in alliances, too (Clauss & Bouncken, 2019; Fredrich et al., 2022a, b). The

relationship climate creates a positive effect under circumstances when those specifications might otherwise adversely affect product innovation (i.e., in the presence of highly detailed specifications). Thus, as a fourth primary theoretical contribution, this research demonstrates how relationship intensity enables buyers and especially SME suppliers to leverage the benefits of proposing and adopting PFS regardless of the level of detail present in such constraints. We enrich and specify previous alliances research which focused on alliance experience, rather than measuring the intensity of interaction for this very alliance. We also add insights about SMEs in such product innovation alliances (Bouncken et al., 2022). We show how SMEs are able to creatively proceed in the presence of variously detailed and, accordingly, directive guidance (Vlaar et al., 2007). Fundamentally, relationship intensity seems to compensate for the proposal of no or very modestly detailed PFS during product development, and it makes increasingly detailed PFS more likely to result in new product innovation.

The implications should be judged in light of this study's research limitations. Three limitations are particularly noteworthy. First, while attention is the primary mechanism used to explain the curvilinear effects of PFS on new product innovation, we can only assume the existence and relevance of this mechanism to our results. That is, we do not and cannot claim that we have directly demonstrated evidence of attention through our results. Secondly, while all measures used in this study are published scales that have been successfully employed in prior research, the usual qualifications associated such primary data collection instruments apply here. Third, there might be myopia (Czakon & Kawa, 2018) that limits the lessons from the attention-based view. Myopia goes hand in hand with a too limited view of managers or firms (Czakon, 2022; Czakon & Kawa, 2018). Hence, greater focused attention can breed myopia as a downside. Czakon and Kawa (2018) show that the too narrow view related to myopia limits considering the sufficient breadth of relevant actors and relationships within a firm's network. Furthermore, Czakon and Kawa (2018) find that managers rate vertical relationships along the supply chain much higher as compared to the value network, and direct relationships much higher as compared to indirect ones. Hence, also our study might be subject to myopia because also we do concentrate on direct and vertical relationships.

Future research building on the current results is suggested in three areas. First, studies are encouraged on the matter of how buyer–supplier outcomes are affected by the level of detail specified at the formation stage. Perhaps early agreement on detailed project specifications aligns partner interests, assures the allocation of appropriate resources to the project, and communicates a viable path forward. As such, the details of the development may need to change to ensure the best outcomes as learning occurs during the process. Future research might identify the conditions under which detailed early plans or other constraints promote versus hinder innovation.

Second, the factors that trigger positive versus negative attributions within the attention process of buyer–supplier exchange are worthy of additional study. The current research identified the proposal of PFS as a factor that signals importance and initiates the attention process. Such specifications were theorized to switch from having positive to negative effects on outcomes according to whether their level of detail exceeded an acceptable (to the receiving firm) threshold of constraints. Future research might investigate the possibility that other such thresholds exist within buyer–supplier exchange and what this means for SMEs. An example could be the partner firms' absorptive capacity for organizational learning (Zahra and George, 2002). That is, perhaps the partner firm's absorptive capacity must exist at certain minimum levels for joint development outcomes to exceed those that might be achieved individually.

In conclusion, innovation emerges in buyer–supplier exchanges. Firms should discuss the details with great appreciation for their implications. The proposal of constraints as the innovation unfolds aligns efforts, channels resources, and affects attention and learnings that occur. However, the difference between drawing attention to guiding a project and controlling a partner may be a minor one, and largely a matter determined by the individual partners' unique perspectives and their interaction. Moreover, PFS can facilitate innovation, but the unique partner perspectives in these interactions will often determine the favorability of innovation outcomes.

Third, to avoid myopia on the part of the researcher (Czakon & Kawa, 2018), future research might analyze the breadth and the focus of attention of SMEs to different partners in networks and innovation ecosystems.

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