Purchasing and supply management empowerment in the new product development process

Robert Sroufe and Ryan Atkins*

Palumbo-Donahue School of Business,
Duquesne University,
600 Forbes Avenue,
Pittsburgh, PA 15282, USA
Email: sroufer@duq.edu
Email: atkinsr@duq.edu
*Corresponding author

Sime Curkovic

Western Michigan University,
1903 W. Michigan Ave,
Kalamazoo, MI 49008, USA
Email: sime.curkovic@wmich.edu

Abstract: In this study, we examine the role of collaboration during the new product development (NPD) process. Previous NPD research has investigated issues such as the timing and extent of involvement of suppliers and the purchasing and supply management (PSM) department in the NPD process, with mixed results. A potential answer for the mixed results is whether an empowered PSM department, i.e., one that can act on behalf of another party, controls the NPD process. To help understand this empowerment, we developed and tested a model using survey data collected from 216 companies. Our findings indicate that empowering the PSM department can improve NPD results internally, as well as externally through collaborative relationships. Furthermore, those factors that account for collaboration differences provide an essential context for researchers and management decision-makers.

Keywords: new product development; procurement/purchasing process; supplier management; structural equation modelling.

Reference to this paper should be made as follows: Sroufe, R., Atkins, R. and Curkovic, S. (2023) 'Purchasing and supply management empowerment in the new product development process', *Int. J. Value Chain Management*, Vol. 14, No. 4, pp.459–480.

Biographical notes: Robert Sroufe is the Murrin Chair of Global Competitiveness and Professor of Sustainability and Management at Duquesne University's Palumbo Donahue School of Business where he translates the value proposition of sustainability and its integration with business practices. He develops and delivers project-based, experiential learning curriculum within the #1 in the USA, and globally top-ranked MBA Sustainable Business Practices program. Winner of numerous teaching awards from the Academy of Management, Decision Sciences Institute, Production and Operations Management Society, and The Aspen Institute, he has published journal articles on the topics of environmental management systems, sustainable business

practices, and books on integrated management, high-performance buildings, and developing sustainable supply chains. His teaching includes topics, exercises, and training involving integrated management of sustainability across business functions and integrated bottom line (IBL) performance, change management, high-performance buildings, building-based learning (BBL), and strategic sustainable development.

Ryan Atkins is an Assistant Professor of Supply Chain Management at Duquesne University. He previously held faculty positions at Nova Southeastern University and the University of Georgia. He earned a B.S. in Business Logistics and International Business and a Masters in Manufacturing Management from Penn State University, and a Ph.D. in Supply Chain Management from Queen's University Belfast. His current research interests center on technology, ethics, and sustainability in supply chain management. He has several years' experience working in various supply chain management functions and is a certified Six Sigma Black Belt.

Sime Curkovic is a Professor of Marketing at Western Michigan University's Haworth College of Business. In addition to the research interests above, he also researches integrated global strategic sourcing. His research has appeared or is under review in the following journals: *Decision Sciences Journal*; *IEEE Transactions on Engineering Management*; *International Journal of Operations and Production Management*; *International Journal of Production Research*; *International Journal of Purchasing and Materials Management*; and *Journal of Quality Management*. His previous work experiences were with General Motors in the Midwest, Mexico and Germany. His dissertation on the relationship between total quality management and environmentally responsible manufacturing won three awards.

1 Introduction

The dynamic global economy has challenged manufacturers to become more agile. This challenge intensifies with the cycles of economic crisis and puts even more pressure on manufacturers to investigate strategies to remain viable. Additionally, new technology has brought about changes in the economy that offer the opportunity to increase the role of the purchasing and supply management (PSM) function in the new product development (NPD) process while simultaneously increasing the complexity of the process (Wehrle et al., 2021). Therefore, collaboration is vital at this stage (Emden et al., 2006).

However, a recent meta-analysis of research on supplier involvement in NPD showed that the literature is unclear about whether supplier integration in NPD generates positive results (Suurmond et al., 2020). Supplier involvement has a range of effects on NPD results running from negative (e.g., Eisenhardt and Tabrizi, 1995) to neutral (e.g., Cruz-Gonzalez et al., 2015) to positive (e.g., Wagner, 2012), with varying outcomes depending on the size of the firm (Silva and Moreira, 2021). While it is clear that product designs emerge from complex interactions between organisations (Engelseth and Jafari, 2018), a potential challenge in collaboration is that firms may not integrate effectively (Schiele, 2010). Sroufe (2018) sees this as an opportunity for integrated management, defined as value creation and the process of including performance measurement in close coordination between business processes, functions, groups, organisations, and systems.

Schoenherr and Wagner (2016) investigated the early stages of the NPD process and found that highly similar firms experienced fewer problems and better outcomes. Of course, not all firms can be expected to share such similarities naturally. However, the purchasing and supply management (PSM) function can play an important role in aligning the interests of a buyer and its supply base (Schiele, 2010).

Mikkelsen and Johnsen (2019) proposed that NPD requires a mature procurement organisation that can interact effectively within the organisation in technologically uncertain environments. The PSM function can serve as a repository of knowledge (Luzzini et al., 2015) and can be used to keep tight control over suppliers (Brattström and Richtnér, 2014). Early research on purchasing's role in the NPD process was limited to involvement in individual projects (e.g., Ragatz et al., 1997). Later research has investigated different aspects of the NPD relationship, with PSM contributing to short-term results such as cost minimisation (Wynstra et al., 2000) and long-term impacts such as contributing to supplier selection and the development of technology roadmaps (Melander and Lakemond, 2018; Schiele, 2010). The longer-term processes provide the greater context within which the operational processes occur and are crucial to all NPD research.

Over time, the role of PSM has become more prominent in the NPD process. Yet, a research gap exists related to how central the role of the PSM is and how much power is given to the PSM function in this process. Therefore, the primary research question of this study focuses on whether the empowerment of the PSM function contributes to NPD success. The internal dynamics among functions such as PSM, research and development, manufacturing, and marketing can determine who makes the critical NPD decisions that drive the project's success (Brattström and Richtnér, 2014; Gonzalez-Zapatero et al., 2017). This study differs from prior work in this field in that we question whether the power granted to the PSM function impacts the cost and time attributes of performance, as well as the product performance, as opposed to organisational issues such as formalisation and centralisation of decision-making (Yan and Nair, 2016). The value of this research study is found in that we specifically question whether the empowerment of the PSM department works as an enabler of NPD. Without the department's empowerment, the PSM function's ability to shape the NPD process can be hindered.

Issues of empowerment, delegation, authority, and responsibility are fundamental principles in the management literature (Bell and Bodie, 2012). However, they have received limited research attention in the supply chain literature. We argue that granting the PSM function an increased scope of tasks, increased decision-making authority, and increased responsibility is a crucial aspect of the ability of the department to facilitate inter-organisational NPD.

In this study, we develop a conceptual model of indirect and direct relationships present in the PSM constructs of empowerment, alignment, integration challenges, and product performance, along with time and cost performance. We examine the role of PSM empowerment and collaboration as part of the NPD process based on an empirical study conducted through a survey of 216 firms. We then use structural equation modelling to model and test hypotheses, and our main results indicate that empowering the PSM function improves NPD performance internally and externally. Contributions of this study to the field include a new understanding of the role of collaboration, construct development, and theoretical development involving information processing theory in the PSM and NPD context. The following section reviews the NPD theoretical foundations,

before discussing the methods and analysing the data to present new contributions to the field, as discussed in the results.

2 Literature review

The NPD process is a significant task for organisations, providing opportunities for collaboration (Emden et al., 2006), risk reduction (Baghizadeh et al., 2022), and joint risk management (Jüttner et al., 2003; Sjoerdsma and van Weele, 2015; Van Echtelt et al., 2008; Yan and Dooley, 2013). The ability to deliver a stream of product and service innovations has become an important element of success in most markets (Baines et al., 2017; Souza et al., 2004), and this ability extends to supplier network involvement in product innovation (Mikkelsen and Johnsen, 2019). In addition, a stream of literature has shown the seminal role of collaboration (Emden et al., 2006) with supply chain partners, i.e., suppliers and customers in NPD (Laursen and Andersen, 2016; Song and DiBenedetto, 2008).

Supplier engagement in the NPD process is a well-established topic, but the role of PSM in this process is relatively under-researched (Picaud-Bello et al., 2019). There is a recognition within the literature that delivering innovative products and services requires internal skills that vastly differ from those used during production (Ceci and Masini, 2011; Datta and Roy, 2011), and PSM can have an impact in both areas. According to Knight and Harland (2005), PSM can fill six roles in NPD: innovation facilitator, coordinator, supply policy maker and implementer, advisor, information broker, and network structuring agent. Wynstra et al. (2000) categorised the roles of PSM as long term (development management and supplier interface management) vs. short term (project management and product management). Melander and Lakemond (2018) made a similar distinction between cross-functional leadership and the supplier interface as the critical roles of PSM in NPD. In terms of the outcomes of NPD projects, the PSM function can improve innovation and minimise ongoing costs (Schiele, 2010). PSM's continued strategic role is vital to providing a context within which NPD projects occur (Wynstra et al., 2000), to providing dynamic capabilities (Madhani, 2019), and to lay the groundwork for a successful project before the project has even been initiated (Picaud-Bello et al., 2019). Over time, a PSM function can build a strong supply base (van Echtelt et al., 2008) or portfolio of suppliers to support NPD (Wynstra and ten Pierick, 2000).

However, these efforts are not always successful, as the wrong partner can be incompetent or cause obstruction (Schiele, 2010). Conflict may occur in the NPD process between functions or between firms (Lynch et al., 2014), and the process can be harmed by factors such as differences in language and culture, location, or responsibility for the success of the project (Griffin and Hauser, 1996). To overcome these challenges, LeDain et al. (2020) identified a process for successful buyer-supplier NPD collaboration, including early communication, which leads to engagement in the process, cross-fertilisation of knowledge and skills; and socialisation mechanisms. Merminod et al. (2022) similarly identified social exchange factors that reduce glitches in NPD processes, including aligning effort, sharing identity, interfacing face-to-face, and supporting participation. Internally, information technology (Shou et al., 2023), and cross-functional integration are also beneficial (Gualandris et al., 2018), as the success of

NPD stems from the ability to integrate the knowledge and capabilities of internal and external parties.

Outcomes of the NPD process include but are not limited to the product's introduction, quantities and types of materials, and processing characteristics such as tooling. The NPD process determines capacity requirements, establishes product performance traits, and dictates outcomes such as cost and timing (Schoonhoven et al., 1990; Schiele, 2010; Song and DiBenedetto, 2008). Setting goals may require the consideration of multiple stakeholders, both internal and external to the organisation (Eisenhardt and Tabrizi, 1995; Gonzalez-Zapatero et al., 2017).

To reduce time and cost issues, managers have developed processes characterised by multi-functional teams purposefully utilising early and close information processing between members earlier in the design phase. Cross-functional teams and interactions lead to early supplier collaboration and manufacturing system integration (Johnsen, 2009; Schiele, 2010; Schoonhoven et al., 1990; Mikkelsen and Johnsen, 2019). The organisational structure surrounding decision-making in NPD is a fruitful avenue for future research. Moreover, it offers the research gap that we address in this study through our analysis of the empowerment of the PSM function.

2.1 Supporting theory

Creating a frictionless flow of information across collaborating teams is a critical predictor of success in the NPD literature (Ragatz et al., 1997, 2002). Firms organise and use information effectively when they execute tasks with high levels of uncertainty (Galbraith, 1973). In this way, Galbraith's information processing theory is a means for resolving uncertainty and operating under the premise that greater information processing capabilities lead to greater organisational performance. Information processing is linked to important outcomes, including project quality (Urbaniak et al., 2023), speed to market (Jayaram, 2008), and visibility and flexibility (Srinivasan and Swink, 2018). According to Veldhuizen et al. (2006), market information processing variables have different relationships to NPD outcomes. Conversely, a lack of sufficient information sharing has been reported as one of the main reasons for lack of collaboration and NPD failure (Sjoerdsma and van Weele, 2015; van Echtelt et al., 2008).

Because of the importance of information flow within and across firm boundaries, we see information processing theory as a theoretical foundation vital to NPD when framing elements of this study. Information processing identifies three crucial concepts: information processing needs (i.e., alignment and overcoming integration challenges), information processing capability (i.e., PSM empowerment), and the fit for optimal performance (internal and external information processing for direct and indirect performance effects). The flow of information and information processing not only help with managing uncertainty but also help to facilitate PSM and NPD interactions.

2.2 Construct development and hypotheses

PSM may affect NPD performance outcomes both directly and indirectly via improved supplier relationships. Therefore, we focus first on the direct outcomes (Hypotheses 1 and 2) and then on the indirect outcomes (Hypotheses 3 through 5).

2.2.1 PSM empowerment

The evolution from small, owner-operated businesses to large organisations necessitates an expansion from an individual owner, manager, and operator to a hierarchy, in which authority for various tasks is delegated and departments and individuals are held responsible for outcomes (Bell and Bodie, 2012; Hamman et al., 2010). In this process, delegation is the empowerment to act on behalf of another party through the assignment of tasks or goals, authority is the granting of rights to accomplish these tasks, and responsibility is the accountability of these departments or individuals for the results of these tasks. In an empowered environment, the delegation process is as follows:

1 select the individual with the required skills

2 define the task clearly

3 establish a timeline of progress on key deliverables

4 provide authority to accomplish the task

5 focus on the results rather than the method (Battles, 2005).

These steps imply that the organisation and/or person has the autonomy to determine how to execute (Battles, 2005; Bell and Bodie, 2012). When an organisational unit is empowered, it is necessary for the unit to develop capabilities to carry out the desired outcomes (Bell and Bodie, 2012).

Previous research on delegation in management has focused on the principal-agent relationship in which principals hire agents because of perceived efficiency due to the agent's abilities or lower opportunity cost of time or effort. Research has focused on monitoring and incentivising agents to ensure alignment with the principal, given the potential for different incentives at each level. Decisions can even be delegated to shift blame to another party (Hamman et al., 2010).

The decision to delegate is a critical job for organisational leaders (Haselhuhn et al., 2017) and is crucial to empowering management (e.g., Amundsen and Martinsen, 2014). Appropriate delegation of authority has been linked to employee satisfaction (Wagner, 1994) and creativity (Zhang and Bartol, 2010). Importantly, delegation is a critical element of empowerment (Yukl, 2012).

There is evidence to suggest empowerment has positive effects on performance and organisational behaviour. Lee et al. (2017) found that empowering managers was effective at influencing employee behaviour. By empowering their employees, managers were more likely to be trusted. Their research demonstrated that when employees feel empowered, it is associated with stronger job performance, job satisfaction, and commitment.

We argue that empowering the PSM organisation provides the authority, flexibility, and incentives to facilitate internal integration. Empowered organisations are free to develop capabilities and processes that enable them to produce the desired outcomes. PSM empowerment is conceptualised in this research as providing the department with a high level of responsibility and decision-making authority for the NPD process, as well as an adherence to metrics as key performance indicators to assess the department's contribution to the NPD process. Successfully doing so necessitates the development of capabilities to manage the suppliers in the process. To empower the PSM department is to elevate the function, provide resources, nurture capabilities, attribute successes and

failures, and increase power (Haselhuhn et al., 2017). Elevating the PSM function in the NPD process, therefore, elevates the ability of a firm to process information, thus increasing its ability to stay on track internally in terms of schedule and budget.

H1 PSM empowerment leads to increased time and cost performance.

Whereas time and cost performance are primarily internal-facing metrics, product performance requires an understanding of the market along with standards to produce products of satisfactory quality (Urbaniak et al., 2023) and technical capability to satisfy customers. Fisher (1997) sees this capability as market mediation. We argue that an empowered PSM organisation has the authority and incentives to develop the capability to mediate the market through superior information processing. Furthermore, the ability to process both internal and external information can aid in developing superior internal knowledge of products, markets, and customer needs, thus enabling the development of innovative products.

H2 PSM empowerment leads to increased product performance.

2.2.2 Alignment

A significant obstacle in developing successful NPD performance outcomes is developing good communication among the parties (Henke and Zhang, 2010; Johnsen, 2009; Mikkelsen and Johnsen, 2019; Sjoerdsma and van Weele, 2015). An essential element of communication resides in the explicit specification of expectations involved in the project. Clear alignment of expectations can lead to more effective communication, lower development costs and lead times, and better performance outcomes (Tan et al., 1998). Alignment has also facilitated operational processes such as sales and operations planning (Oliva and Watson, 2011).

Alignment refers to consistency among strategic measures and activities (Melnyk et al., 2004) and information systems (Sanders, 2005). Specifically, we operationalise alignment as a construct with the following four items:

1 technical performance measures (e.g., quality, functionality, reliability, durability) were defined and agreed upon by both parties

2 business performance measures (e.g., schedule, cost) were defined and agreed upon by both parties

3 technology and intellectual property ownership were defined and agreed upon early in the relationship

4 performance expectations of each party were well defined.

Internal and external alignment is vital to maintaining consistency in goals throughout a supply chain. Our conceptualisation of PSM empowerment is consistent with organisational structure, internal relational behaviour (i.e., multi-functional teams and joint problem-solving to achieve a mutual understanding), information sharing (Gattorna, 2016) and focusing on customers (Jeong and Hong, 2007). Alignment is driven by "organizational structure, internal relational behaviour, customer relational behaviour, top management support, information sharing, and business performance measurement systems" (Wong et al., 2012). Firms that build a structure in which information is processed and shared effectively with suppliers are likely to gain a shared understanding

across firm borders, resulting in better external integration for more aligned goals and expectations.

H3 PSM empowerment leads to increased alignment with suppliers.

2.2.3 Integration challenges

Integration of systems and processes between partners is crucial for successful collaboration and NPD success (Sjoerdsma and van Weele, 2015; Yan and Dooley, 2013). The lack of compatible systems often requires creating ad-hoc solutions to convert information into a format accessible to the receiving technology or a format imported into both systems. This extra step is likely to increase the costs of engaging in joint development and the time required due to the additional technological fixes and additional steps.

Unsuccessful integration and a lack of compatibility can indicate one or more of the following: not a high priority, lack of understanding of how to manage change, no guidance given on roles, no management leadership or follow-up, lack of time or investment in training, no plan or accepted responsibilities, and no rewards to do so. A lack of compatibility and integration will likely lead to more mistakes and lower the final product or service quality (Pemartín et al., 2018; Song and DiBenedetto, 2008).

We operationalise integration challenges with the following three items:

1 lack of compatible development systems (e.g., CAD) between our partner and us

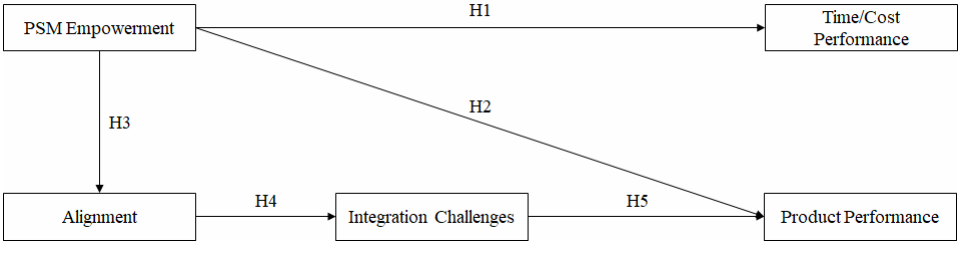
2 unwillingness of our technical staff to relinquish development or technology development responsibilities

3 lack of processes to integrate partners.

We argue that buyers and suppliers with aligned expectations have a clear vision of the end goals of the relationship and are more likely to spend the time and money required to overcome integration challenges.

H4 Alignment with suppliers leads to a reduction in integration challenges.

Figure 1 Structural model



Further, we posit that relationships with fewer integration challenges are better positioned to develop superior products and services. These firms have processes to integrate exchange partners, have compatible development systems, and are willing to share information. These factors point to a greater understanding of customer needs and a superior ability to produce innovative, high-quality products.

H5 Reduced integration challenges lead to increased product performance.

The preceding hypotheses can be integrated into a theoretical model, as indicated in Figure 1).

3 Methods

Empirical research is important in today's world as it is based on what practitioners experience. It is used to validate multiple hypotheses, increase knowledge, and advance a field of research involving business practices. This approach to the methods for this study can be reliable because it represents the real-life experience of practitioners. Additionally, data collection through empirical means such as surveys may be less biased because it can gather observable data and a repeatable process to produce verifiable results in future studies. In this study, we used a survey instrument to facilitate data collection, thus enabling empirical examination and testing of hypotheses. Next, we summarise the structure of the survey instrument and the attributes of the respondents before reviewing the data collection and sample, how we operationalise the research model, and then develop the measurement and full models for testing.

3.1 Survey design

In the development of the survey, much time was spent pretesting the survey with managers and subject matter experts to minimise ambiguity and reduce confusion in the questions and their interpretation (Davis, 1989). Because the items in the survey were newly created for this study, an initial pool of items was developed and submitted to industry and academic experts to evaluate their clarity and understandability. Items were subsequently reworded according to the feedback received. Respondents were asked to focus on collaborative efforts in NPD projects.

Measures of efficiency and product quality are the most common outcomes in new product development research in PSM (Johnsen, 2009). We operationalise performance along two dimensions. The first is time and cost performance, which represent the operational outcomes of the project. The construct is measured using three items:

1 lead time to product/service introduction has been reduced

2 product/service development costs have been reduced

3 product/service ongoing production costs have been reduced.

The second dimension is product performance, which is less operational and more strategic. The construct focuses on the outcomes of the product or service, specifically measured using the following three items:

1 quality of new product/service has increased

2 technical performance of new product/service has increased

3 customer satisfaction with the new product/service has increased.

3.2 Data collection and sample

To facilitate data collection, we identified 664 targeted respondents in the USA who worked for companies involved with professional supply associations such as the Association of Supply Chain Management (formerly known as APICS). The industries represented included: aerospace, automotive, chemical, consumer goods and electronics, food and beverage, furniture, industrial machinery, medical devices, metal fabrication, pharmaceutical, plastics and rubber, steel and aluminium, and semiconductor and electronic components. The cross-section of industries included in this sample helped to support the generalisability of results. Further, a cross-industry sample can explore differences in practices and theory outcomes across various scenarios and create more generalisable results (Podsakoff et al., 2003). The sample demographics are displayed in Table 1.

Table 1 Sample descriptive statistics (N = 216)

Annual revenue		*Number of employees*		*Markets company operates in*		*Job duties include*	
Under $10M	13	Under 50	8	Africa	46	Procurement	105
$10M–$49M	11	50–99	8	Asia	87	Supply chain leadership	63
$50M–$99M	18	100–499	20	Europe	88	Planning/scheduling	20
$100M–$499M	37	500–999	16	North America	125	Operations management	11
$500M–$999M	11	1,000–4,999	30	South America	72	Data analytics	8
$IB–$9B	60	5,000–9,999	31			OpEx	7
$10B–$49B	71	Over 10,000	125			Project management	7
$50B–$99B	5					Supply chain management	5
Over $100B	12					Logistics	4
						Sales	4
						Consulting	2
						Finance	1
						Human resources	1

Using a modified Dillman (1978) approach, three waves of mailings were sent electronically, with 216 responses obtained for a response rate of 32.5%. A survey of non-respondents suggested that they did not have time to fill out the survey within the window of time provided; or that a company policy prevented them from participating. When examining the responses, we found no response bias between the first half of the respondents and the second half of respondents on any of the items (Armstrong and Overton, 1977).

3.3 Operationalising the research model

The variables in the study were developed based on the literature review and discussions with managers. An exploratory factor analysis (EFA) was performed as we wanted to acknowledge the exploratory nature of developing new constructs. All of the variables loaded onto the expected factors, and there were no instances of cross-loading above 0.350 (Table 2).

Table 2 Exploratory factor analysis

	PSME	*ALIGN*	*CHAL*	*TCP*	*PRP*
PSME1	**0.689**	0.123	–0.041	0.121	0.196
PSME2	**0.747**	0.315	–0.045	0.050	0.100
PSME3	**0.721**	0.098	–0.014	0.208	0.112
PSME4	**0.779**	0.196	0.001	–0.015	0.115
ALIGN1	0.160	**0.804**	–0.095	0.076	0.037
ALIGN2	0.150	**0.784**	–0.113	0.036	0.131
ALIGN3	0.139	**0.665**	–0.050	0.052	0.202
ALIGN4	0.219	**0.768**	0.013	0.080	0.098
CHAL1	0.151	–0.175	**0.726**	0.012	–0.087
CHAL2	–0.053	–0.069	**0.774**	–0.113	0.010
CHAL3	–0.166	0.037	**0.750**	0.048	–0.122
TCP1	0.156	0.104	–0.079	**0.757**	0.048
TCP2	0.035	0.003	0.043	**0.820**	0.206
TCP3	0.117	0.097	–0.018	**0.778**	0.279
PRP1	0.088	0.184	–0.094	0.362	**0.758**
PRP2	0.213	0.139	–0.062	0.138	**0.871**
PRP3	0.242	0.179	–0.106	0.167	**0.787**

Note: Extraction method – principal component analysis.
Rotation method – varimax with Kaiser normalisation.

The data analysis was completed using structural equation modelling (SEM). SEM requires an analysis of the measurement model indicating the relationships between each construct and relevant manifest variables. In addition, the structural model shows the relationships among the constructs. The evaluation includes tests of convergent validity and discriminant validity, while the SEM tests for predictive validity (Jöreskog and Sörbom, 1982). With this study establishing the groundwork for measuring constructs, the following were considered critical when assessing a construct and its measurement properties: unidimensional, convergent, criterion-related, discriminant and nomological validity, and reliability. Utilising SEM for this study provides a method for managing relationships simultaneously while offering statistical efficiency and a test of the model's goodness-of-fit.

3.4 Measurement model

The measurement model was evaluated using several fit indices. We utilised one measure of absolute fit – the standardised root mean square residual (SRMR). We next used two measures of overall model fit that favour parsimonious models – the adjusted goodness of fit index (AGFI) and the root mean square error of approximation (RMSEA). We also considered one incremental index – the Bentler comparative fit index (CFI). AGFI was 0.902, which is above the threshold of 0.90. The RMSEA value was 0.041, which indicates a good fit since it is below the cutoff value of 0.05 (Byrne, 1994). The SRMR value was 0.046, less than the cutoff value of 0.08, indicating a good fit. The CFI was

0.967, which is above the cutoff value of 0.90. Finally, the X^2/df measure was 1.342, which is below the cutoff of 5.0.

Table 3 Correlations

	PSME	*ALIGN*	*CHAL*	*TCP*	*PRP*
PSME	**0.592**				
ALIGN	0.448	**0.630**			
CHAL	–0.097	–0.180	**0.566**		
TCP	0.284	0.209	–0.067	**0.683**	
PRP	0.403	0.318	–0.203	0.495	**0.779**

Note: Square root of AVE indicated in bold.

Table 4 Constructs, items, and coefficient alphas

		Mean	*Std. dev.*	*Min.*	*Max.*	*Estimate*
PSM empowerment, $\alpha = 0.762$						
SCE1	Our supply chain organisation will take on increasing responsibility for supporting collaborative NPSD efforts	5.816	1.109	2.0	7.0	0.642
SCE2	Our supply chain team has as much input and decision making authority as the technical, engineering, and R&D staff do for selecting the appropriate collaborative NPSD partner.	5.256	1.442	1.0	7.0	0.645
SCE3	Our supply chain organisation is measured against established performance targets for our expected contributions to collaborative NPSD projects throughout the year.	5.004	1.690	1.0	7.0	0.687
SCE4	Our supply chain organisation has the capabilities to assess the willingness and readiness of our suppliers to be involved in collaborative NPSD projects.	4.901	1.649	1.0	7.0	0.754
Alignment, $\alpha = 0.805$						
ALIGN1	Technical performance measures (e.g., quality, functionality, reliability) were clearly defined and agreed upon by both patties	5.381	1.316	1.0	7.0	0.757
ALIGN2	Business performance measures (e.g., schedule, cost, etc.) were clearly defined and agreed upon by both patties	5.657	1.153	2.0	7.0	0.752
ALIGN3	Technology and intellech1al prope1ty ownership were clearly defined and agreed upon early in the relationship	5.679	1.212	1.0	7.0	0.604
ALIGN4	Performance expectations of each party were well defined	5.566	1.179	1.0	7.0	0.724

Table 4 Constructs, items, and coefficient alphas (continued)

		Mean	*Std. dev.*	*Min.*	*Max.*	*Estimate*
Integration challenges, $\alpha = 0.617$						
CHAL1	Lack of compatible design systems (e.g., CAD) between us and our partner	3.881	1.691	1.0	7.0	0.599
CHAL2	Unwillingness of our technical staff to relinquish design or technology development responsibilities	4.462	1.740	1.0	7.0	0.618
CHAL3	Lack of processes to integrate partner	4.806	1.532	1.0	7.0	0.587
Time/cost performance, $\alpha = 0.770$						
TCP1	Lead time to product/service introduction has been reduced	5.316	1.242	1.0	7.0	0.589
TCP2	Product/service development costs have been reduced	5.055	1.388	1.0	7.0	0.757
TCP3	Product/service ongoing production costs have been reduced	5.269	1.266	1.0	7.0	0.805
Product Performance, $\alpha = 0.858$						
PRP1	Quality of new product/service has increased	5.492	1.206	1.0	7.0	0.768
PRP2	Technical perfo1mance of new product/service has been increased	5.490	1.174	2.0	7.0	0.867
PRP3	Customer satisfaction with the new product/service has been increased	5.522	1.150	2.0	7.0	0.815

Note: All factor loadings significant at $p < 0.001$.

Next, the individual constructs were assessed for discriminant validity, indicating whether the constructs are discrete constructs (Bagozzi, 1980). The alpha coefficients were assessed for internal consistency within the constructs (Cronbach, 1951), and although the alpha value for one of the constructs was below the threshold of 0.7, there were no instances of significant cross-loading for the questionnaire items (Nunnally, 1978). The average variance extracted (AVE) square root was compared to the inter-construct correlations. The square root of AVE values was higher than the inter-construct correlations. All questionnaire items loaded as expected and were significantly related to their intended construct (Tables 3 and 4). Finally, the individual items were tested for normality, and all of the skewness and kurtosis values were within the acceptable ranges.

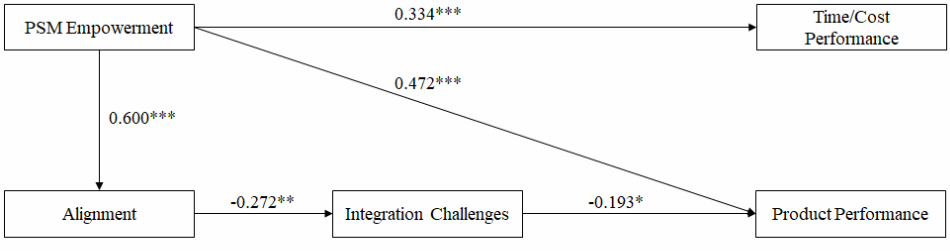
3.5 Full model

Next, the structural model was assessed using the same goodness-of-fit indices as above, and all of the indices were in the acceptable range (AGFI 0.900; RMSEA 0.040; SRMR 0.050; CFI 0.969), indicating a good fit for the overall model. Additionally, all of the individual relationships were significant and in the hypothesised directions, thus supporting all five hypotheses. Hypotheses 1 and 2 proposed direct effects between PSM Empowerment and the two performance outcomes. Hypothesis 1, between PSM Empowerment and Time and Cost performance, was positive and significant (0.334,

t = 4.288), and Hypothesis 2, between PSM empowerment and product performance, was also positive and significant (0.472, t = 7.067). Hypotheses 3–5 proposed an indirect effect of PSM empowerment product performance via alignment and a reduction in integration challenges. Hypothesis 3 was positive and significant between PSM empowerment and alignment (0.600, t = 9.893). Alignment between firms reduces integration challenges, as indicated by the negative and significant result (–0.272, t = –3.050). Finally, when integration challenges are low, product performance is enhanced, as indicated by the negative and significant relationship between the two constructs (–0.193, t = –2.564). The results of the structural model are in Figure 2.

As a robustness test, we tested two additional structural models. The first included only direct relationships from PSM empowerment to all other variables. In contrast, the second had direct relationships from PSM empowerment, alignment, and integration challenges to the two performance variables. The robustness of our model is supported in that all of the goodness-of-fit metrics were superior in the hypothesised model.

Figure 2 SEM results



Goodness of Fit Indices	
Adjusted GFI:	0.900
RMSEA Estimate:	0.040
Standardized RMR:	0.050
Bentler CFI:	0.969
X^2/df:	1.342

Note: ***p≤0.001; **p≤0.01; *p≤0.05

4 Discussion

Successful supplier integration in NPD requires strong relationships and information sharing through multiple phases of the NPD lifecycle (Emden et al., 2006). This study's findings align with earlier work by Schoenherr and Wagner (2016), stressing the beginning of collaborative engagements (i.e., the highly uncertain phase preceding the formal product development) and extending through to the product's release. The front end, in particular, requires relationship characteristics that go beyond what can be achieved through formal contracts, requiring more collaborative and integrated relationships (Laursen and Andersen, 2016; Zhao et al., 2014). This integration can help firms overcome differences and achieve homophily related to supplier selection (Schoenherr and Wagner, 2016). Conversely, low levels of integrated management, i.e., the inability to successfully integrate suppliers into the NPD process, can be a barrier to exchanging and processing information. While progress has been made in research on the benefits of such integrated relationships, the relationship-building process remains

nuanced and is an opportunity for further investigation. In particular, our study differs from prior work in the field and fills a gap in the literature by exploring the organisational characteristics that underlie these relationships.

In alignment with Mikkelsen and Johnsen (2019), which showed that a mature PSM organisation is necessary to integrate suppliers into NPD, our research shows that elevating the level of PSM empowerment can also affect the success of NPD projects. While this finding indicates that PSM maturity and empowerment can both be precursors to NPD success, further questions may be raised regarding the interplay between maturity and empowerment, and whether one factor may be an antecedent of the other. We view PSM empowerment as a form of commitment, as the elevated status of the function requires the investment of resources. Johnsen (2009) previously identified leadership commitment and internal cross-functional collaboration as important topics in successful NPD, and Cooper et al. (2004) identified long-term commitment and resource commitment as drivers of NPD success. This research builds upon these examples and advances the literature by integrating organisational decisions into research on the NPD process and by identifying the differential outcomes from these decisions.

Beyond these internal issues, NPD project success is significantly impacted by interorganisational issues such as early supplier involvement, information exchange, design collaboration, infrastructure, trust, relation-specific adaptations, and communication (Jayaram, 2008; Sjoerdsma and van Weele, 2015; Song and DiBenedetto, 2008). However, in building relationships, challenges may arise that prevent the frictionless flow of communication (Ragatz et al., 2002). There can also be a 'competitive side of collaboration' caused by conflicting objectives, price reduction pressure, and excessive engineering changes, but investing resources for innovation that benefits both firms and sharing technology without the assurance of an order can reduce this conflict (Henke and Zhang, 2010). Early investments in NPD-based relationships may be viewed as a 'leap of faith' [Mikkelsen and Johnsen, (2019), p.1], and our research supports the notion that the early groundwork in a relationship can have positive long-term returns. Similar to the previous research, we showed that relationship integration challenges reduce product performance. Moving the literature forward, we showed that these challenges could be overcome by better aligning with suppliers, which can result from an empowered PSM function.

Previous studies such as Yan and Nair (2016) and Schiele (2010) highlight that NPD research should not be focused solely on individual projects but should incorporate the broader buyer-supplier relationship and internal organisational factors. Formal elements of the NPD process such as collaboration in the front end of NPD projects (Wagner, 2012) and investments in relation-specific assets (Ellis et al., 2012) have been shown to enhance NPD performance. We highlight that behaviours outside of the formal NPD process are essential to the outcomes of formal NPD projects. This study focuses on organisational and relational factors, laying the groundwork for increased integration of suppliers into the NPD process. Laursen and Andersen (2016) found that setting roles and expectations enhances interactions and resource mobilisation. Our concept of alignment similarly includes setting role expectations, and we discovered that alignment reduces integration challenges and improves product outcomes in NPD projects. The empowerment of the PSM function essentially provides a supportive context for NPD projects. Therefore, the context within which NPD decisions are made – internally and

interorganisationally – is important to the success of NPD projects, and should not be ignored, as it often has been in previous research.

Another important result from this research is the dual effect of PSM empowerment on the success of NPD projects. First, internally, PSM contributes to staying on time and within budget. Second, PSM can affect product performance both directly and indirectly via supplier relationships. Although time and cost performance have been used as outcomes in NPD research, they are often grouped with product-related outcomes, with little distinction between the drivers of these different types of outcomes. Primo and Amundson (2002) previously identified time, cost, and product quality as the most common outcomes from previous NPD research, while Blindenbach-Driessen et al. (2010) found that operational and performance metrics were shown to be distinct outcomes. Our study similarly found these outcomes to be separate concepts.

This study identified time and cost outcomes as internal-facing metrics, while product performance was more complex. Empowerment appears to enable PSM to contribute to managing the time and budget for the project, while the indirect effects of PSM empowerment on the supplier relationship yielded no significant effect on time and cost performance. Conversely, product performance is enhanced both directly and indirectly via suppliers. This distinction among outcomes and paths to those outcomes is critical to the understanding of how firms can achieve superior NPD performance. It is possible that the lack of a distinction among the types of NPD outcomes may have hindered previous research while contributing to conflicting results.

The outcomes of this study go beyond the hypotheses and contribute to theory development. For example, information processing theory is a theoretical foundation for NPD when framing this study's constructs and posited relationships. The results of this study and our hypotheses confirm the importance of information processing, alignment, and indirect effects on performance. We also see support for resource dependence theory as firms engage with each other to acquire NPD resources and support for information processing theory in that the supply chain flow of information within firms is essential to NPD's success. Possible extensions to other related theories and future research can include assessing contingency theory, as the success of NPD projects may be contingent on internal and external contexts.

Finally, developing the constructs in this study and empirical testing of the relationships adds to researcher and practitioner knowledge regarding the NPD process and the evolution of the NPD paradigm. The insights from this study help decision makers in companies learn from the sample of firms in this study and provide several practices and relationships to think about to improve their operations and PSM function. The review of the literature and hypotheses paint a relatively complex picture of dynamic NPD practices. Understanding PSM empowerment, alignment opportunities, and challenges can inform researchers conducting field studies and further empirical work on this vital paradigm.

5 Conclusions and recommendations

Direct and indirect relationships to performance confirm the importance of PSM empowerment, alignment, and the management of challenges to integration. Our findings indicate that empowering the PSM function is important for delivering successful new products. PSM can and should play a prominent role in building relationships and

deriving benefits from suppliers' capabilities. However, as it is beneficial to integrate suppliers through design systems, technology development, and processes to achieve innovation, it is also necessary to manage operations internally to stay on time and within budget. When considering the benefits of PSM empowerment, decision makers should consider practices and policies that enable improvements in alignment involving technical performance metrics, business performance, along with clear expectations about intellectual property and overall performance. With increased alignment, companies should expect fewer integration challenges, i.e., compatible design systems, clear design responsibilities, and have processes to integrate supply chain partners. When anticipating these empowerment, alignment, and integration opportunities, practitioners can expect to get to increased product performance.

The methods, firms in this study, and overall research show that empowering the PSM function capabilities can advance internal capabilities, improve performance outcomes involving time and cost in NPD projects, and set a context for successful interactions with suppliers. The results of this study fill a void in the literature by contributing to a better understanding of the organisational side of buyer-supplier collaboration in the NPD process. Insights from this study also help inform practitioners and decision makers wanting to improve NPD practices within companies involved in similar NPD activities or contemplating why and how to improve PSM empowerment.

Limitations of this research include the generalisability of the results. Ideally, a longitudinal study across a greater variety of industries would help to determine if the findings are more broadly applicable or change over time. The survey-based research method also has limitations, particularly regarding a single respondent representing one side of a buyer-supplier relationship. Here, we see opportunities for future research to test these limitations while comparing and contrasting outcomes with field-based, qualitative studies.

While we have some answers to our research questions, many other questions remain as opportunities for future research. With the growing importance of this paradigm, researchers will find many opportunities to address emerging issues. For example, manufacturers are shifting to servitisation in an era of technological advancement and uncertainty (Datta and Roy, 2011), and customer care and after market processes have gained in importance (Isoherranen and Majava, 2018). The process of developing services along with products is more complex than developing products alone. Future research can test whether the findings of this study are also relevant to service development. We also see opportunities for future research to look at alignment and overcoming integration challenges as constructs within a larger paradigm of integrated management (Sroufe, 2018) as we posit that more integrated firms will have more extensive impacts on firm performance. From an organisational standpoint, granting increasing decision-making authority to the PSM function requires capabilities to evaluate and integrate suppliers and be responsible for the outcomes of NPD projects. This research shows that the result is superior NPD performance when the PSM function is granted this power and these capabilities.

References

Amundsen, S. and Martinsen, Ø.L. (2014) 'Empowering leadership: construct clarification, conceptualization, and validation of a new scale', *The Leadership Quarterly*, Vol. 25, No. 3, pp.487–511.

Armstrong, J.S. and Overton, T.S. (1977) 'Estimating nonresponse bias in mail surveys', *Journal of Marketing Research*, Vol. 14, No. 3, pp.396–402.

Baghizadeh, K., Ebadi, N., Zimon, D. and Jum'a, L. (2022) 'Using four metaheuristic algorithms to reduce supplier disruption risk in a mathematical inventory model for supplying spare parts', *Mathematics*, Vol. 11, No. 1, p.42.

Bagozzi, R.P. (1980) *Causal Models in Marketing*, Wiley, New York.

Baines, T., Ziaee Bigdeli, A., Bustinza, O.F., Shi, V.G., Baldwin, J. and Ridgway, K. (2017) 'Servitization: revisiting the state-of-the-art and research priorities', *International Journal of Operations & Production Management*, Vol. 37, No. 2, pp.256–278.

Battles, B. (2005) 'Directing: accomplishing objectives through delegation and motivation', *Aircraft Maintenance Technology*, Vol. 16, No. 5, pp.38–41.

Bell, R.L. and Bodie, N.D., (2012) 'Delegation, authority and responsibility: removing the rhetorical obstructions in the way of an old paradigm', *Journal of Leadership, Accountability and Ethics*, Vol. 9, No. 2, pp.94–108.

Blindenbach-Driessen, F., Van Dalen, J. and Van Den Ende, J., (2010) 'Subjective performance assessment of innovation projects', *Journal of Product Innovation Management*, Vol. 27, No. 4, pp.572–592.

Brattström, A. and Richtnér, A. (2014) 'Good cop-bad cop: trust, control, and the lure of integration', *Journal of Product Innovation Management*, Vol. 31, No. 3, pp.584–598.

Byrne, B.M. (1994) *Structural Equation Modeling with EQS and EQS/Windows*, Sage Publications, Thousand Oaks, California.

Ceci, F. and Masini, A. (2011) 'Balancing specialized and generic capabilities in the provision of integrated solutions', *Industrial and Corporate Change*, Vol. 20, No. 1, pp.91–131.

Cooper, R.G., Edgett, S.J. and Kleinschmidt, E.J. (2004) 'Benchmarking best NPD practices-I', *Research Technology Management*, Vol. 47, No. 1, pp.31–43.

Cronbach, L.J. (1951) 'Coefficient Alpha and the Internal Structure of Tests', *Psychometrica*, Vol. 16, No. 1, pp.297–334.

Cruz-Gonzalez, J., Lopez-Saez, P. and Navas-López, J.E., (2015) 'Absorbing knowledge from supply-chain, industry and science: the distinct moderating role of formal liaison devices on new product development and novelty', *Industrial Marketing Management*, Vol. 47, pp.75–85.

Datta, P.P. and Roy, R. (2011) 'Operations strategy for the effective delivery of integrated industrial product-service offerings', *International Journal of Operations & Production Management*, Vol. 31, No. 5, pp.579–603.

Davis, F.D. (1989) 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *MIS Quarterly*, Vol. 13, No. 3, pp.319–340.

Dillman, D.A. (1978) *Mail and Telephone Surveys: The Total Design Method*, Wiley-Interscience, New York.

Eisenhardt, K. and Tabrizi, B.N., (1995) 'Accelerating adaptive processes: product innovation in the global computer industry', *Administrative Science Quarterly*, Vol. 40, No. 1, pp.84–110.

Ellis, S.C., Henke, J.W. and Kull, T.J. (2012) 'The effect of buyer behaviors on preferred customer status and access to supplier technological innovation: an empirical study of supplier perceptions', *Industrial Marketing Management*, Vol. 41, No. 8, pp.1259–1269.

Emden, Z., Calantone, R.J. and Droge, C. (2006) 'Collaborating for new product development: selecting the partner with maximum potential to create value', *Journal of Product Innovation Management*, Vol. 23, No. 4, pp.330–341.

Engelseth, P. and Jafari, H. (2018) 'Marketing complex product designs in the contemporary value chain', *International Journal of Value Chain Management*, Vol. 9, No. 4, pp.311–329.

Fisher, M.L. (1997) 'What is the right supply chain for your product?', *Harvard Business Review*, Vol. 75, No. 2, pp.105–117.

Galbraith, J. R. (1973) *Designing Complex Organizations*, Addison Wesley Pub. Co., Reading, MA.

Gattorna, J. (2016) *Dynamic Supply Chain Alignment: A New Business Model for Peak Performance in Enterprise Supply Chains across All Geographies*, CRC Press.

Gonzalez-Zapatero, C., Gonzalez-Benito, J. and Lannelongue, G. (2017) 'Understanding how the functional integration of purchasing and marketing accelerates new product development', *International Journal of Production Economics*, Vol. 193, pp.770–780.

Griffin, A. and Hauser, J.R. (1996) 'Integrating R&D and marketing: a review and analysis of the literature', *Journal of Product Innovation Management: An International Publication of the Product Development & Management Association*, Vol. 13, No. 3, pp.191–215.

Gualandris, J., Legenvre, H. and Kalchschmidt, M. (2018) 'Exploration and exploitation within supply networks: examining purchasing ambidexterity and its multiple performance implications', *International Journal of Operations & Production Management*, Vol. 38, No. 3, pp.667–689.

Hamman, J.R., Loewenstein, G. and Weber, R.A. (2010) 'Self-interest through delegation: an additional rationale for the principal-agent relationship', *American Economic Review*, Vol. 100, No. 4, pp.1826–1846.

Haselhuhn, M.P., Wong, E.M. and Ormiston, M.E. (2017) 'With great power comes shared responsibility: psychological power and the delegation of authority', *Personality and Individual Differences*, Vol. 108, pp.1–4.

Henke Jr, J.W. and Zhang, C. (2010) 'Increasing supplier-driven innovation', *MIT Sloan Management Review*, Vol. 51, No. 2, pp.41–46.

Isoherranen, V. and Majava, J. (2018) 'Customer care excellence in the new product development process: a case study', *International Journal of Value Chain Management*, Vol. 9, No. 1, pp.26–37.

Jayaram, J. (2008) 'Supplier involvement in new product development projects: dimensionality and contingency effects', *International Journal of Production Research*, Vol. 46, No. 13, pp.3717–3735.

Jeong, J.S. and Hong, P. (2007), Customer orientation and performance outcomes in supply chain management', *Journal of Enterprise Information Management*, Vol. 20, No. 5, pp.578–594.

Johnsen, T.E. (2009) 'Supplier involvement in new product development and innovation: Taking stock and looking to the future', *Journal of Purchasing and Supply Management*, Vol. 15, No. 3, pp.187–197.

Jöreskog, K.G. and Sörbom, D. (1982) 'Recent developments in structural equation modeling', *Journal of Marketing Research*, Vol. 19, No. 4, pp.404–416.

Jüttner, U., Peck, H. and Christopher, M. (2003) 'Supply chain risk management: outlining an agenda for future research', *International Journal of Logistics: Research and Applications*, Vol. 6, No. 4, pp.197–210.

Knight, L. and Harland, C. (2005) 'Managing supply networks: organizational roles in network management', *European Management Journal*, Vol. 23, No. 3, pp.281–292.

Laursen, L.N. and Andersen, P.H. (2016) 'Supplier involvement in NPD: a quasi-experiment at Unilever', *Industrial Marketing Management*, Vol. 58, No. 10, pp.162–171.

LeDain, M.A., Merminod, V. and Yager, M. (2020) 'Collaborative practices in new product development projects involving suppliers', *Production Planning & Control*, Vol. 31, No. 4, pp.308–321.

Lee, A., Willis, S. and Tian, A.W. (2017) 'Empowering leadership: a meta-analytic examination of incremental contribution, mediation, and moderation', *Journal of Organizational Behavior*, Vol. 39, No. 3, pp.306–325.

Luzzini, D., Amann, M., Caniato, F., Essig, M. and Ronchi, S. (2015) 'The path of innovation: purchasing and supplier involvement into new product development', *Industrial Marketing Management*, Vol. 47, pp.109–120.

Lynch, P., O'Toole, T. and Biemans, W. (2014) 'From conflict to crisis in collaborative NPD', *Journal of Business Research*, Vol. 67, No. 6, pp.1145–1153.

Madhani, P. M. (2019) 'Strategic supply chain management for enhancing competitive advantages: developing business value added framework', *International Journal of Value Chain Management*, Vol. 10, No. 4, pp.316–338.

Melander, L. and Lakemond, N. (2018) 'Variation of purchasing's involvement: case studies of supplier collaborations in new product development', *International Journal of Procurement Management*, Vol. 7, No. 1, pp.103–118.

Melnyk, S.A., Stewart, D.M. and Swink, M. (2004) 'Metrics and performance measurement in operations management: dealing with the metrics maze', *Journal of Operations Management*, Vol. 22, No. 3, pp.209–218.

Merminod, V., Le Dain, M.A. and Frank, A.G. (2022) 'Managing glitches in collaborative product development with suppliers', *Supply Chain Management: An International Journal*, Vol. 27, No. 3, pp.348–368.

Mikkelsen, O.S. and Johnsen, T.E. (2019) 'Purchasing involvement in technologically uncertain new product development projects: Challenges and implications', *Journal of Purchasing and Supply Management*, Vol. 25, No. 3, pp.496–508.

Nunnally, J. (1978) *Psychometric Theory*, McGraw-Hill, New York.

Oliva, R. and Watson, N. (2011) 'Cross-functional alignment in supply chain planning: a case study of sales and operations planning', *Journal of Operations Management*, Vol. 29, No. 5, pp.434–448.

Pemartín, M., Rodríguez-Escudero, A.I. and Munuera-Alemán, J.L. (2018) 'Effects of collaborative communication on NPD collaboration results: two routes of influence', *Journal of Product Innovation Management*, Vol. 35, No. 2, pp.184–208.

Picaud-Bello, K., Johnsen, T., Calvi, R. and Giannakis, M. (2019) 'Exploring early purchasing involvement in discontinuous innovation: a dynamic capability perspective', *Journal of Purchasing and Supply Management*, Vol. 25, No. 4, pp.1–14.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N.P. (2003) 'Common method biases in behavioral research: a critical review of the literature and recommended remedies', *Journal of Applied Psychology*, Vol. 88, No. 5, pp.879–903.

Primo, M.A. and Amundson, S.D. (2002) 'An exploratory study of the effects of supplier relationships on new product development outcomes', *Journal of Operations Management*, Vol. 20, No. 1, pp.33–52.

Ragatz, G.L., Handfield, R.B. and Petersen, K.J. (2002) 'Benefits associated with supplier integration into new product development under conditions of technology uncertainty', *Journal of Business Research*, Vol. 55, No. 5, pp.389–400.

Ragatz, G.L., Handfield, R.B. and Scannell, T.V. (1997) 'Success factors for integrating suppliers into new product development', *The Journal of Product Innovation Management*, Vol. 14, No. 3, pp.190–202.

Sanders, N.R. (2005) 'IT alignment in supply chain relationships: a study of supplier benefits', *Journal of Supply Chain Management*, Vol. 41, No. 2, pp.4–13.

Schiele, H. (2010) 'Early supplier integration: the dual role of purchasing in new product development', *R&D Management*, Vol. 40, No. 2, pp.138–153.

Schoenherr, T. and Wagner, S.M. (2016) 'Supplier involvement in the fuzzy front end of new product development: an investigation of homophily, benevolence and market turbulence', *International Journal of Production Economics*, Vol. 180, No. C, pp.101–113.

Schoonhoven, C.B., Eisenhardt, K.M. and Lyman, K. (1990) 'Speeding product to market: waiting time to first product introductions in new firms', *Administrative Science Quarterly*, Vol. 35, No. 1, pp.177–207.

Shou, Y., Shan, X. and Li, L. (2023) 'The roles of JIT supply chain practices in new product ramp-up: the moderating effects of IT integration', *International Journal of Logistics Research and Applications*, Vol. 26, No. 9, pp.1–18.

Silva, L.F. and Moreira, A. C. (2021) 'Involving suppliers in collaborative new product development: comparing large and small firms', *International Journal of Value Chain Management*, Vol. 12, No. 1, pp.1–27.

Sjoerdsma, M. and van Weele, A.J. (2015) 'Managing supplier relationships in a new product development context', *Journal of Purchasing and Supply Management*, Vol. 21, No. 3, pp.192–203.

Song, M. and DiBenedetto, C.A. (2008) 'Supplier's involvement and success of radical new product development in new ventures', *Journal of Operations Management*, Vol. 26, No. 1, pp.1–22.

Souza, G.C., Bayus, B.L. and Wagner, H.M. (2004) 'New-product strategy and industry clockspeed', *Management Science*, Vol. 50, No. 4, pp.537–549.

Srinivasan, R. and Swink, M. (2018) 'An investigation of visibility and flexibility as complements to supply chain analytics: An organizational information processing theory perspective', *Production and Operations Management*, Vol. 27, No. 10, pp.1849–1867.

Sroufe, R. (2018) *Integrated Management: How Sustainability Creates Value for Any Business*, Emerald Group Publishing, UK.

Suurmond, R., Wynstra, F. and Dul, J. (2020) 'Unraveling the dimensions of supplier involvement and their effects on NPD performance: a meta-analysis', *Journal of Supply Chain Management*, Vol. 56, No. 3, pp.26–46.

Tan, K.C., Kannan, V.R. and Handfield, R.B. (1998) 'Supply chain management: supplier performance and firm performance', *International Journal of Purchasing & Materials Management*, Vol. 34, No. 3.

Urbaniak, M., Zimon, D. and Madzík, P. (2023) 'Expectations of industrial enterprises towards suppliers related to management of quality, environment and occupational health and safety systems', *Archives of Transport*, Vol. 65, No. 1, pp.87–104.

Van Echtelt, F.E.A., Wynstra, F., van Weele, A.J. and Duysters, G. (2008) 'Managing supplier involvement in new product development: a multiple-case study', *The Journal of Product Innovation Management*, Vol. 25, No. 2, pp.180–201.

Veldhuizen, E., Hultink, E. J. and Griffin, A. (2006) 'Modeling market information processing in new product development: an empirical analysis', *Journal of Engineering and Technology Management*, Vol. 23, No. 4, pp.353–373.

Wagner III, J.A. (1994) 'Participation's effects on performance and satisfaction: a reconsideration of research evidence', *Academy of Management Review*, Vol. 19, No. 2, pp.312–330.

Wagner, S.M. (2012) 'Tapping supplier innovation', *Journal of Supply Chain Management*, Vol. 48, No. 2, pp.37–52.

Wehrle, M., Birkel, H., Heiko, A. and Hartmann, E. (2021) 'The impact of digitalization on the future of the PSM function managing purchasing and innovation in new product development – evidence from a Delphi study', *Journal of Purchasing and Supply Management*, Vol. 28, No. 2, pp.1–19.

Wong, C., Skipworth, H., Godsell, J. and Achimugu, N. (2012) 'Towards a theory of supply chain alignment enablers: a systematic literature review', *Supply Chain Management: An International Journal*, Vol. 17, No. 4, pp.419–437.

Wynstra, F. and Ten Pierick, E. (2000) 'Managing supplier involvement in new product development: a portfolio approach', *European Journal of Purchasing & Supply Management*, Vol. 6, No. 1, pp.49–57.

Wynstra, F., Axelsson, B. and Van Weele, A. (2000) 'Driving and enabling factors for purchasing involvement in product development', *European Journal of Purchasing & Supply Management*, Vol. 6, No. 2, pp.129–141.

Yan, T. and Dooley, K.J. (2013) 'Communication intensity, goal congruence, and uncertainty in buyer-supplier new product development', *Journal of Operations Management*, Vol. 31, Nos. 7–8, pp.523–542.

Yan, T. and Nair, A. (2016) 'Structuring supplier involvement in new product development: a China-US study', *Decision Sciences*, Vol. 47, No. 4, pp.589–627.

Yukl, G. (2012) 'Effective leadership behavior: what we know and what questions need more attention', *Academy of Management Perspectives*, Vol. 26, No. 4, pp.66–85.

Zhang, X. and Bartol, K.M. (2010) 'Linking empowering leadership and employee creativity: the influence of psychological empowerment, intrinsic motivation, and creative process engagement', *Academy of Management Journal*, Vol. 53, No. 1, pp.107–128.

Zhao, Y., Cavusgil, E. and Cavusgil, S.T. (2014) 'An investigation of the black-box supplier integration in new product development', *Journal of Business Research*, Vol. 67, No. 6, pp.1058–1064.