Title: **Purchasing Orchestration Practices – Introducing A Purchasing-Innovation Framework**

Keywords: Purchasing-Enabled Innovation; Purchasing Capabilities; Purchasing as Boundary Spanner; Resource Orchestration; Open Innovation

Authors: Ulrich Schmelzle, Ph.D.
Michigan Technological University

Wendy L. Tate, Ph.D.
The University of Tennessee

Acknowledgment:
The authors would like to thank the editorial team, notably the editor Prof. Knight and the guest editor Prof. Johnsen, and three anonymous reviewers for their thoughtful comments and feedback that helped to improve the paper significantly.

Cite:
Schmelzle, U. and Tate, W.L., 2022. Purchasing orchestration practices–Introducing a purchasing-innovation framework. *Journal of Purchasing and Supply Management*, 28(2), p.100756.

DOI:
https://doi.org/10.1016/j.pursup.2022.100756

Download:
https://authors.elsevier.com/a/1evHC5G9huWetp

Purchasing Orchestration Practices – Introducing A Purchasing-Innovation Framework

Abstract

This research investigates the purchasing role in enhancing an organization's innovation performance. Taking a purchasing perspective, this research introduces a new purchasing-innovation framework and specific purchasing orchestration (PO) practices related to the acquisition, integration, re-configuration, and commercialization of critical resources to enhance innovation performance. A theory elaboration methodology is applied to broaden the scope of resource orchestration theory (ROT) and introduce PO practices as an essential enabler of innovation. Qualitative interviews with managers from different industries enrich the theory elaboration process. This research contributes to theory by developing the concept of PO and enhancing the theoretical understanding of its meaning. Based on theory and empirical data, this research elucidates the PO practices of resource structuring, bundling, and leveraging support. The purchasing innovation framework explains how open-mindedness and technological uncertainty influence purchasing orchestration practices and innovation performance. Purchasing managers benefit from this research by learning to identify and address potential PO capability gaps and take a holistic perspective on resource management, looking both upstream and downstream in the supply chain.

Keywords: Purchasing-Enabled Innovation; Purchasing Capabilities; Purchasing as Boundary Spanner; Resource Orchestration; Open Innovation

1. Introduction

The purchasing function plays a vital role in increasing sales revenues as it can facilitate the continuous innovation of products and services based on supplier input (van Echtelt, 2008; Bals et al., 2019; Lorentz et al., 2019; Picaud-Bello et al., 2019; Constant et al., 2020; Suurmond et al., 2020). Innovation refers to developing new processes, products, and services to create customer value and enable additional revenue (Kavin and Narasimhan, 2018). Suppliers have become critical contributors to innovation processes (Luzzini et al., 2015; Sjoerdsma and van Weele, 2015; Calvi et al., 2018; Lintukangas et al., 2019).

This research introduces the concept of purchasing orchestration (PO), which describes the relevant purchasing activities of managing or supporting the acquisition, integration, and re-configuration of resources to shape new capabilities and the subsequent commercialization of such capabilities (Das et al., 2006; Sirmon et al., 2011; Hitt et al., 2016). Resources can be tangible or intangible and refer to critical ideas, knowledge, solutions, and capabilities required by an organization to function effectively (Madhavaram and Hunt, 2008).

The PO-related literature is fragmented and does not sufficiently address the interdependencies among essential PO practices (Calvi et al., 2018), and purchasing orchestration research still appears relatively nascent. Prior research has investigated important PO subprocesses but has not adequately addressed the overarching PO mechanism interacting with technological uncertainty and cultural contingencies in NPD projects. In addition, previous research has not investigated the leveraging support role for non-customer-facing purchasing and whether cultural factors substantially affect the essential PO practices.

Scholars have called for more research on how purchasing can facilitate effective integration and commercialization of external resources to support innovation (Baert et al., 2016;

Picaud-Bello et al., 2019). A deeper understanding is needed to explain the dependencies of relevant PO practices, potential moderating effects, and the related performance implications. The PO mechanism is not satisfactorily theorized regarding (1) key constructs, (2) theoretical domain, (3) critical relationships and interdependencies among constructs, and (4) theoretical predictions (Wacker, 1998). Research has focused primarily on the purchasing role in resource structuring and bundling but noticeably less on leveraging support and the interdependence of PO practices. To address this theoretical gap, this research introduces a purchasing-innovation framework.

This research synthesizes the relevant literature into a new purchasing-innovation framework linking purchasing orchestration practices and innovation performance. It describes the critical practices of resource acquisition, integration, re-configuration, and the subsequent capability leveraging in the marketplace (Narasimhan and Narayanan, 2013). The study contributes by showing how a culture of open-mindedness might influence purchasing orchestration.

The purchasing management literature is extended by providing deeper insights into the interrelatedness of critical PO practices and the influence of contextual factors. This research offers a new systematic framework of purchasing orchestration impacting innovation. This paper describes purchasing's extended role as boundary-spanning "innovation facilitator" supporting the internal customer-facing function(s) and the influence of culture and technological uncertainty on innovation projects. The purpose of this manuscript is to investigate the performance implications of PO as an essential purchasing capability and to conceptualize the PO-Innovation relationship. This leads to the following research questions:

- How are the PO practices of structuring, bundling, and leveraging support defined and connected to innovation performance?
- How does environmental uncertainty influence innovation performance?

- How are cultural factors influencing the critical PO subprocesses?

A theory elaboration method (Ketokivi and Choi, 2014) is applied to investigate the PO mechanism impacting innovation performance. This research uses qualitative interviews from five cases as supporting evidence for the theory elaboration.

2. Theoretical Foundation

This section discusses the relevant resource orchestration, purchasing ambidexterity, and supplier involvement in innovation literature to inform the PO conceptualization. First, it describes the theoretical foundation of resource orchestration.

2.1. Resource Orchestration and Purchasing

Resource-based theory (RBT) explains why organizations differ in performance (Crook and Esper, 2014). Resource orchestration theory (ROT) extends RBT and emphasizes the critical role of resource orchestration in enhancing competitiveness (Koufteros et al., 2014). ROT focuses on the managerial practices of *structuring* the firm's resource portfolio, *bundling* resources into capabilities, and *leveraging* the capabilities to create organizational value (Gong et al., 2018). Even with abundant resources available, a competitive advantage can only be achieved when implementing effective managerial practices to effectively utilize those resources (Ketchen et al., 2014). The possession of resources alone does not guarantee competitiveness (Baert et al., 2016). Thus, purchasing needs to implement and support effective resource management practices that lead to new competitive capabilities (Picaud-Bello et al., 2019).

2.2 Purchasing Ambidexterity and Absorptive Capacity

Purchasing ambidexterity refers to simultaneously achieving short-term (exploitation) and long-term (exploration) objectives when interacting with suppliers (Aoki and Wilhelm, 2017; Lorentz et al., 2019). While the purchasing function has traditionally focused on resource exploitation (cost-cutting), the new role encompasses both exploitation and exploration (Mikkelsen and Johnsen, 2019; Andersen et al., 2020). Researchers emphasized that the purchasing function needs to balance exploitation and exploration activities, particularly when coping with environmental uncertainty (Mikkelsen and Johnsen, 2019; Legenvre et al., 2020). Exploitation activities, including *automated billing, report preparation, or inventory management*, focuses primarily on utilizing existing processes efficiently (Kristal et al., 2010; Gualandris et al., 2018). In contrast, exploration concerns substantial process enhancements by experimenting and testing new ideas (Burin et al., 2020). Resource exploration examples encompass *supplier innovation workshop*s or *market scanning* (Kristal et al., 2010; Gualandris et al., 2018; Burin et al., 2020).

In the NPD context, exploring external knowledge is complementary to utilizing internal expertise; both activities need to be conducted concurrently (Cassiman and Veugelers, 2006). Within the exploration-exploitation duality phenomenon, essential purchasing practices have been identified, but critical aspects such as the interdependence and interconnectedness of the practices require more research. An organization's ability to assimilate and apply new external knowledge determines its absorptive capacity (Cohen and Levinthal, 1990). High absorptive capacity can lead to better NPD performance, including speed (time to market) and process effectiveness (Volberda et al., 2010; Wagner, 2012). Absorptive capacity can play a significant role in PO, notably in

structuring and bundling, and opens up opportunities for future research in conceptualizing the relationships between purchasing ambidexterity, absorptive capacity, and PO.

2.3. Supplier Involvement in Innovation Projects

The supplier involvement and development literature provides essential insights into the PO phenomenon in the context of NPD projects (Luzzini et al., 2015). Supplier development refers to the buying organization's activities to enhance its suppliers' performance (Carr and Pearson, 1999). It encompasses the two PO subprocesses of trust-building with the suppliers and interface development, whose intensity varies depending on different performance objectives (Krause et al., 2007). The interface needs ongoing adjustments based on continuous learning and contextual changes (Andersen and Gadde, 2019). Essential PO-related tasks include managing information sharing, supplier evaluation, and 'direct involvement' development activities, including the relatively rich exchange of tacit knowledge (Krause et al., 2007). Sample practices include co-location of crucial employees, joint training programs, and site visits to achieve a shared understanding of essential values, processes, and innovation objectives.

Supplier involvement refers to managing the focal organization's relationships with suppliers, focusing on collaboration, and striving for long-term objectives (Song and Di Benedetto, 2008; Wagner, 2012). Effective collaboration between the focal firm and its supplier(s) in the innovation process is based on open communication, mutual trust between the two organizations, and a relatively long-term focus and partnering (instead of arm's length) relationship characteristics (Wagner, 2012). Furthermore, as suppliers are critical knowledge contributors (Schiele, 2010), purchasing should facilitate the inflow of external knowledge when managing the

buyer-supplier relationship (Luzzini et al., 2015) in a boundary-spanning role (Tchokogué and Merminod, 2021).

Purchasing involvement in NPD goes beyond managing the supplier input in NPD projects: In addition to project management, purchasing activities encompass product and supplier interface as well as development management (Wynstra et al., 1999). Purchasing's involvement early in the innovation process enhances the influx of innovative supplier resources. Differentiating between advanced sourcing for innovative technology and life-cycle sourcing for routine products, Schiele (2010) concluded that organizations need to adapt their organizational structure and foster intra- and inter-organizational collaboration to enhance the NPD processes. The traditional NPD project organization can jeopardize long-term product life cycle goals because such structure fosters a relatively narrow "*perspective to this single task"* (Schiele, 2010, p. 149).

Supplier involvement and integration activities are important facilitating aspects of the structuring practices and help build trust between both organizations in joint NPD projects (Wagner, 2012). In particular, purchasing facilitates an open and rich knowledge exchange with the key suppliers (Tchokogué and Merminod, 2021). Finally, supply management alignment practices include capturing internal needs and communicating them to suppliers, clarifying expectations, and aligning supply objectives accordingly (Handfield et al., 2015). A review of the PO-related literature shows that researchers have investigated structuring and bundling practices in more depth than leveraging support practices. Therefore, a synthesis of the relevant PO literature is needed. Table 1 summarizes the definitions of constructs pertinent to the PO phenomenon.

Table 1

Definitions of Purchasing Orchestration and Related Constructs.

PO Constructs	Definitions
Purchasing Orchestration	The resource structuring, bundling, and leveraging support processes that include the acquisition, integration, and re-configuration of resources to shape new capabilities and the commercialization of such capabilities (Das et al., 2006; Sirmon et al., 2011).
Structuring	Acquiring resources from the supply chain to establish an updated resource portfolio (Hitt et al., 2016).
Bundling	Integrating external resources and blending them with in-house resources to create new, competitive capabilities for the organization (Sirmon et al., 2011).
Leveraging Support	Purchasing practices supporting the commercialization processes to create customer value (Rogers et al., 2004).
Culture	A system of shared and strongly held values and beliefs (Schiele, 2010; Ireland et al., 2003).
Technological Uncertainty	The risks involving unexpected technological changes in the market (Mikkelsen and Johnsen, 2019).
Innovation Performance	Market, product, and financial performance of new products introduced, and the process performance of the NPD project (Schmelzle and Tate, 2017).
Supplier Development	Any effort by the buying firm to increase its supplier's performance to meet the buying firm's objectives (Carr and Pearson, 1999).
Supplier Involvement	The collaboration of a focal firm with a supplier in the NPD process characterized by a long-term and partnership-like relationship between the firms, high levels of trust and commitment, and openness of communication (Wagner, 2012).
	The integration of the resources contributed by suppliers plus activities performed and responsibilities assumed for the buying organization's NPD process (Johnsen, 2009; van Echtelt, 2008).
Purchasing Involvement	Purchasing's managerial practices related to NPD activities in terms of development, supplier interface, project, and product management (Wynstra et al., 1999).
Absorptive Capacity	Internal knowledge to effectively scan, screen, and absorb external know-how (Cassiman and Veugeleers, 2006).
Ambidexterity	The ability to manage the tradeoff between exploration and exploitation to excel at both simultaneously (Aoki and Wilhelm, 2017).
Resources	Capabilities, information, knowledge, ideas, and solutions (van Echtelt, 2008; Madhavaram and Hunt, 2008).

2.4. Technological Uncertainty

Environmental uncertainty describes changing contextual conditions that are difficult to predict (Buvik and Grønhaug, 2000; Germain et al., 2008). Uncertainty influences the PO process due to incomplete information about pricing, product availability, and unforeseeable or risky technological advancements (Ragatz et al., 2002; Knight et al., 2015; Johnsen, 2009; Cousins et al., 2011). A higher degree of newness or technological complexity in NPD projects leads to higher technological uncertainty levels. It requires purchasing to adapt the resource acquisition and integration processes (Noke et al., 2008). High environmental uncertainty can negatively affect innovation processes because relevant information is unavailable when needed or changes unexpectedly, possibly making prior decisions obsolete.

Specifically, technological uncertainty (TU) refers to the level of familiarity with the technology or the rate of technological change (Mikkelsen and Johnsen, 2019). TU affects the assessment of impact, applicability, and availability of evolving technology for NPD projects. In the context of high TU, purchasing needs to adapt its role and responsibility as the focus of resource acquisition shifts from existing to new, unknown suppliers (Phillips et al., 2006; Mikkelsen and Johnsen, 2019).

PO practices might need adaptation in different contexts, especially in high TU (Johnsen, 2009). High TU refers to new products, processes, or business models departing *drastically* and *fundamentally* from the industry's current state of the art (Song and Di Benedetto, 2008). The "rules of the game" change with high TU (Phillips et al. 2006, p. 452), destroying competitive capabilities due to a paradigm shift (Mikkelsen and Johnsen, 2019). Purchasing relies on weak ties to "broaden the radius of ideas and technological capabilities" for the focal organization (Noke et

al., 2008, p. 129) and draws complementary resources from outside the existing network (Phillips et al., 2006; Mikkelsen and Johnsen, 2019).

As innovative technology is transferred and adapted from a different context (Picaud-Bello et al., 2019), purchasing needs to enhance its practices and refine its capabilities to cope with new, TU-induced requirements (Cousins et al., 2011; Mikkelsen and Johnsen, 2019). Accordingly, the innovation type affects purchasing as deep relationships with current suppliers are more suitable to pursue incremental innovation (low TU) but less effective for a radical, breakthrough, or disruptive innovation (high TU) (Johnsen, 2009).

2.5. The Cultural Trait of Open-Mindedness in the PO Context

In this research, open-mindedness is understood as an essential cultural trait of an organization. It refers to one of the key dimensions of learning orientation (Kumar et al., 2020). Organizations that are receptive to new knowledge from internal and external sources are demonstrating an attitude of open-mindedness (Chesbrough, 2003). Braunscheidel and Suresh (2009) noted that open-mindedness includes a willingness to unlearn and question an organization's governance assumptions. This cultural trait helps organizations become aware of relevant new external resources, interact with suppliers effectively, and successfully integrate and assimilate such resources (Kumar et al., 2020). Open-minded organizations recognize the value of innovative ideas and understand the necessity to facilitate the inflow of new knowledge (Dobni, 2008). Being open-minded avoids the "not-invented-here" issue that has been a significant roadblock for innovation.

3. A Purchasing-Innovation Framework

Possessing strategic resources does not automatically lead to a competitive advantage. "What a firm does with its resources is at least as important as which resources it possesses" (Hansen et al., 2004, p. 1280). Resources must be orchestrated efficiently and effectively to achieve superior performance (Sirmon et al., 2011) as resources tend to be idiosyncratic and highly contextualized (Ireland et al., 2003). Thus, innovative organizations require an effective PO process to identify, acquire, integrate, re-configure, and commercialize the appropriate external resources and establish a competitive resource portfolio (Crook and Esper, 2014). Integrating external resources with internal capabilities is complex and requires a systematic approach to effective PO implementation (Schiele, 2010; Baert et al., 2016; Constant et al., 2020; Picaud-Bello et al., 2019). Uncertainty and technological change are specific factors driving the complexity of resource integration (Knight et al., 2015).

3.1. Construct Definitions

Resources are tangible and intangible assets and can be internal or external to the organization (Kozlenkova et al., 2014). They include ideas, knowledge, solutions, or organizational capabilities (Madhavaram and Hunt, 2008) and enable the organization to implement strategies that improve its efficiency and effectiveness (Barney, 1991). PO involves resource structuring, bundling, and leveraging support processes encompassing the acquisition, integration, re-configuration, and commercialization of internal and external resources/capabilities (Das et al., 2006; Hitt et al., 2016).

Structuring is defined as acquiring, accumulating, and divesting essential organizational resources (Hitt et al., 2016). Thus, the structuring construct extends beyond existing constructs in

the purchasing literature, such as external supply knowledge acquisition (Kipli et al., 2018), which focuses on the scanning, searching, and monitoring of a supply market.

Bundling relates to integrating external resources and blending them with in-house resources to create new capabilities. Bundling involves enriching organizational capabilities with complementary external resources and pioneering new capabilities.

Leveraging is defined as the commercialization of newly formed capabilities (Sirmon et al., 2011). Leveraging encompasses the capability deployment according to market needs (West and Bogers, 2014). *Leveraging support* refers to essential purchasing practices supporting the organization's leveraging activities.

Culture refers to a system of widely shared and firmly held values and beliefs that instigates behavioral patterns and norms (Schiele, 2010; Ireland et al., 2003). Such underlying values, norms, and principles support and justify an organization's management system and managerial practices (Braunscheidel and Suresh, 2009). Researchers have described culture as the "linchpin to innovation in organizations" (Dobni, 2008, p. 540). However, culture also encompasses a set of unwritten rules and hidden assumptions shared by corporate members. *Open-mindedness* refers to being willing to unlearn, accept and adopt new ideas (Braunscheidel and Suresh, 2009; Kumar et al., 2020).

Technological uncertainty encompasses the risks involved with unexpected technological changes. TU refers to the level of familiarity with the technology or the rate of technological change relative to an organization's products (Mikkelsen and Johnsen, 2019).

Innovation performance refers to the degree to which organizations are "satisfied with the achievements in their development and implementation of innovation activities" (Chen and Huang, 2009, p. 109), including both commercial success (effectiveness) of new products or services and

innovation process performance (efficiency) (Suurmond et al., 2020). Researchers have identified (product-related) innovation market performance (e.g., new product sales volume, sales growth, customer satisfaction ratings), product-related financial innovation performance (e.g., new product profitability, NPD project return on investment), NPD project-related innovation process performance (e.g., product development cycle time, NPD workflow effectiveness), and innovation product performance (e.g., new product characteristics such as functionality, quality, or technological advancement compared to targets or benchmarks) as key dimensions of the innovation performance construct (Schmelzle and Tate, 2017). The following Table 2 summarizes vital PO definitions and sample practices.

Table 2
PO definitions and sample practices.

PO Construct Definitions	Sample Practices
Structuring = Acquiring resources from the supply chain to establish an updated resource portfolio	- **Market Scanning**: Scanning, searching, and monitoring of supply markets for relevant (technological) developments (Wynstra et al., 2000; van Echtelt et al., 2008; Kipli et al., 2018); Establishing dedicated *technology offices* (Schiele, 2010), a *technology scout* role (Picaud-Bello et al., 2019), and a *reversed sourcing process*: Searching for new, unknown technologies; *Supplier pre-selection* for product development collaboration (Wynstra et al., 2000); - **Interface Development**: Designing the communication interface with suppliers (van Echtelt et al., 2008) to clarify requirements and expectations with suppliers (Handfield et al., 2015); Interface adjustments based on ongoing learning (Andersen and Gadde, 2019); Supplier pre-selection for future involvement in NPD collaboration (Wynstra et al., 2000; van Echtelt et al., 2008); Conducting innovation workshops with selected suppliers (Schiele, 2010; Kristal et al., 2010; Gualandris et al., 2018); - **Trust Building**: Motivating suppliers to develop specific knowledge or products (van Echtelt et al., 2008; Wynstra et al., 2000); Supplier relationship management: striving for *preferred customer status* to gain first access to supplier innovations (Luzzini et al., 2015; Tchokogué and Merminod, 2021); establishing purchasing as the supplier relationship facilitator to enhance supplier motivation and commitment (Wynstra et al., 1999; Mikkelsen and Johnsen, 2019); **Resource Portfolio Updating**: Establishing a systematic process to assess and monitor external resources' technological compatibility and readiness for subsequent integration with internal resources (Wynstra et al., 2000; Tchokogué and Merminod, 2021).
Bundling = Integrating external resources and blending them with in-house resources to create new, competitive capabilities for the organization	- **External Coordination:** Formulating policies and establishing systems and processes for supplier integration (Luzzini et al., 2015); Determining extent and moment of supplier involvement; Coordinating development activities with suppliers; Periodically evaluating guidelines and supplier base performance (van Echtelt et al., 2008); Organizing supplier participation in innovation projects (key suppliers provide input into NPD projects; suppliers are actively involved in NPD process; Design and development tasks of the NPD project are delegated to suppliers (Suurmond et al., 2020); - **Supplier Co-Location:** 'direct involvement' *supplier development* activities: exchange of tacit knowledge with co-location of crucial employees, joint training programs, or site visits (Krause et al., 2007); - **Internal alignment:** Cross-functional interaction and communication (information sharing), coordination and joint involvement across functions (Horn et al., 2014); Collaboration and cooperation of employees from different functions to conduct NPD tasks; Interface management: utilizing procurement engineers to improve the cross-functional integration (Mikkelsen and Johnsen, 2019); - **Resource Integration and Resource Re-configuration:** Knowledge integration, organizational learning activities, and resource reconfiguration (creating new configurations of internal and external resources) (van Echtelt et al., 2008); Innovation meetings: Facilitating exploration, communication, and integration of technical knowledge exchanges between the internal R&D department and suppliers (by creating a "learning atmosphere") (Picaud-Bello et al., 2019)
Leveraging Support = Purchasing practices supporting the commercialization processes to create customer value	- **Customer Need Capturing:** Capturing internal needs to discuss with suppliers (Handfield et al., 2015); - **Customer Interface Management:** Interface management in new platform development for product families (Sundgren, 1999);

3.2. Relationships Among Constructs and Predictions Within the PO Framework

This research demonstrates the theoretical consistency of the purchasing-innovation framework by addressing *how* and *why* constructs are related or unrelated (Wacker, 1998). How is innovation performance affected by structuring, bundling, and leveraging support PO practices, and how is the cultural trait of open-mindedness and the environmental factor of technological uncertainty influencing these relationships? Researchers have established that the effectively coordinated inflow of new ideas and capabilities can enhance innovativeness, innovation speed, and quality, leading to a competitive advantage (van Echtelt, 2008; Schiele, 2010). Such resource inflow enables an organization to adapt to environmental changes better due to an updated product, service, and process portfolio (Winter, 2003). Purchasing orchestration, encompassing the resource structuring, bundling, and leveraging support practices, enhances an organization's ability to control the resource in- and outflows (Buvik and Grønhaug, 2000). An organization can improve its competitiveness by effectively implementing PO practices, including structuring relevant resources into innovative resource portfolios and bundling them into new capabilities leveraged in the marketplace (Sirmon et al., 2011). Thus, effective PO practices can be a powerful competitive capability leading to increased innovation performance (Crook and Esper, 2014; Liu et al., 2016).

The PO framework addresses the relationships between resources, PO practices, organizational culture, technological uncertainty, and innovation performance. Following (Teece, 2007), PO practices can be understood as a competitive capability (Picaud-Bello et al., 2019), with a positive influence on innovation performance (Song and Di Benedetto, 2008). Furthermore, ROT would predict a positive direct effect of PO practices on innovation performance (Hitt et al., 2016). Besides, open-mindedness shows a positive effect on the level of PO implementation. Finally,

technological uncertainty negatively affects Innovation Performance (Schiele, 2010; Kilpi et al., 2018; Mikkelsen and Johnsen, 2019).

4. Methodology

Theory elaboration means "disciplined iteration between *general* theory and the empirical data" (Ketokivi and Choi, 2014, p. 236). The empirical data provides a complementary perspective and fleshes out the phenomenon from another perspective (Turkulainen et al., 2017). The theory elaboration approach contextualizes the logic of a general theory (Bals and Tate, 2018) and, based on case study empirical data, has been successfully applied to "provide initial analytical generalization" (Mikkelsen and Johnsen, 2019, p. 4) when investigating purchasing phenomena. The researchers interviewed purchasing managers and representatives of related supply chain functions involved in innovation and NPD projects to understand the capabilities needed to facilitate PO. Participants came from different innovation projects within various organizations because multiple cases yield more robust and generalizable findings than single cases (Eisenhardt and Graebner, 2007), enhancing theoretical precision (Yin, 2014).

Case studies are beneficial for developing theoretical insights when the research focuses on areas that literature has not yet fully addressed (Eisenhardt and Graebner, 2007). Due to its dual conceptual-empirical focus, the theory elaboration approach enables specification and structure of the resource orchestration framework's constructs and relationships to advance theory in the purchasing discipline. This research meets the duality criterion as (A) the literature review provides a "sense of generality" (Ketokivi and Choi, 2014, p. 234) to demonstrate a broad theoretical understanding of the PO phenomenon while (B) the empirical case data enables a solid situational grounding.

The research context is the high technology equipment industry, in which purchasing contributes to the development of new products in innovation projects and manages the resource inflow from crucial suppliers. This setting was appropriate for several reasons. First, studying innovation teams from a relatively similar industrial context enables a more thorough comparison of purchasing practices, even when concerns regarding generalizability are acknowledged. Second, all five cases involve joint innovation projects with suppliers and demonstrate the necessary PO practices to investigate the phenomenon. Third, the research setting enables an in-depth depiction of the purchasing phenomenon in a natural environment. Fourth, the interviews yielded insightful data about how purchasing orchestrates internal and external resources in innovation projects. Finally, demographic diversity (e.g., size, budget, or project duration) enhanced the likelihood of observing different PO practices and allowed for a wide range of perspectives from the participants.

4.1. Data Collection

Different data sources were utilized: (1) interviews, (2) follow-up e-mails/phone calls for clarification, and (3) publicly available information and commercial databases (e.g., LexisNexis, Mergent Online). Using multiple sources provides a richer perspective, enables cross-verification of multi-source data (Cardador and Pratt, 2018), and enhances confidence in the validity of the theory elaboration findings. The researchers used interviews to verify the assumptions of the purchasing-innovation conceptualization and explore the details of the PO practices (refer to the interview guide Appendix Table A.1). Adopting a "systematic combining" process (van Echtelt et al., 2008, p. 181), the initial theoretical framework was iteratively refined while analyzing both the empirical case data and deepening the literature review. While the cases are drawn from five

different companies, the researchers focus their analysis on specific NPD/innovation projects within those companies. Participants were asked to think about a specific innovation project and reflect upon the learnings from that project. Consequently, the unit of analysis is the innovation project.

The interviews were conducted face-to-face, via Skype, or over the phone. Each semi-structured interview lasted 45–90 minutes and was recorded and transcribed verbatim. The participating managers were knowledgeable about joint innovation or NPD projects with suppliers. Participants selected the most recent collaborative innovation project, addressing the issue of potential recall bias (Hallen and Eisenhardt, 2012). Table 3 provides a brief overview of the cases, and Appendix Table A.2 describes each case in more detail.

Table 3
Case Overview.

Criteria	ALPHA	BETA	DELTA	ZETA	ETA
Interviews	8	4	5	4	5
Primary Functions of Participants	Purchasing Supply Chain Manufacturing R&D	Purchasing Strat. Purchasing Manufacturing	Purchasing Manufacturing R&D	Purchasing Supply Chain R&D	Purchasing Supply Chain Logistics
Industry	Technology	Technology	Logistics Equipment	Automotive / Specialty Equipment	Technological Equipment

A theoretical sampling approach was applied (Eisenhardt, 1989, 2021). The researchers selected the cases purposefully as "particularly suitable for illuminating and extending relationships and logic among constructs" and likely to offer substantial theoretical insights (Eisenhardt and Graebner, 2007, p. 27). Theoretical sampling is intentionally nonrandom (Eisenhardt, 2021). Each case was selected to provide a valuable perspective of the focal phenomenon. The key selection criterion was that the interview participant had relevant experience

with joint innovation projects with suppliers. The researchers requested the first interviewee at each organization to identify additional relevant potential participants in the organization.

4.2. Data Analysis

In total, 26 semi-structured interviews were recorded, transcribed, and coded. After the initial open coding step, important themes emerged, and more abstract categories were developed by comparing the coding results from different cases (Corbin and Strauss, 2008). The PO framework was improved and validated iteratively by comparing observed categories between cases (Eisenhardt, 1989) and linking the new data to the literature. Following the constant comparison approach during the analysis (Eisenhardt, 2021), the researchers refined the case categories by reviewing the literature in an iterative cycle of induction and deduction (Corbin and Strauss, 2008). The analysis progressed iteratively, moving back and forth between data and literature (Bals and Tate, 2018).

4.3. Validity and Reliability

The research design and specific post hoc steps after data collection ensured high study validity. The findings' accuracy was verified by employing recommended procedures (Creswell, 2014; Yin, 2014; Bals and Tate, 2018). For example, different types of information were analyzed (data triangulation) to enhance internal validity. The researchers conducted member checks with critical participants and peer debriefings with uninvolved scholars to verify the conclusions (Appendix Table A.6).

5. Case Analysis and Discussion

This case discussion describes essential PO categories (and sub-categories) and relevant environmental factors that emerged during the analysis, enriching the prior conceptual development. In addition, the case interviews revealed new details about the PO mechanism, the relationships between individual practices, and contingency effects.

5.1. Purchasing Orchestration Practices

PO is a multi-faceted concept of structuring, bundling, and leveraging support practices (Sirmon et al., 2011; Hitt, 2011). The interviewees described what PO-related practices were applied and emphasized during innovation projects.

5.1.1. Structuring

Recall that the structuring process includes managerial practices such as acquiring, accumulating, and divesting essential resources from external entities (Hitt et al., 2016), as detailed in Table 2. Structuring involves the continuous renewal of the resource portfolio with external input. When analyzing the cases in detail, striking patterns emerged, and four main structuring categories were identified: Market scanning, interface development, trust building, and resource portfolio updating. Opportunities in the supply network are easily overlooked, limiting innovation performance. Thus, purchasing needs to be attentive to new capabilities offered in the supply market (Kilpi et al., 2018). Some project groups continuously monitored market trends outside of their current supply base. Thereby, they became aware of new, potentially disruptive technologies and initiated an early assessment of how to commercialize those technologies appropriately.

"We do the best we can to scan and look for trends" (Hannah, BETA, Purchasing)

> "Scanning the world for solutions …, for example, we created an innovation department ... [*to become*] aware of disruptive technologies that would impact our business" (David, ETA, Logistics)

In cases with limited structuring processes, participants shared that they prioritized and focused on suppliers from their specific industry.

> "It was not possible so much to look really outside the world of *[our industry]* …" (Charles, ALPHA, Supply Chain)

> "I can't see like a structured process. … It depends on the individual, and the situation. … perhaps it would be [*a*] good idea to have a structured process" (Shawn, DELTA, R&D)

DELTA highlighted the need to establish a systematic process for market scanning. Effective structuring also entails building trust and nurturing the partnering relationship with suppliers. Treating suppliers fairly and consistently is a necessity for effective PO practices.

> "It's our job to ensure that we have a robust supply chain, and that doesn't just mean ensuring supply. It means that we're partnering with companies … where we can drive the greatest value." (Hannah, BETA, Purchasing)

Finally, the interviews uncovered two additional structuring-related aspects: updating the internal resource portfolio with new technology and interface development with suppliers.

> "… I have my engine supplier sitting down with my engine engineer. We sit down and look at the target. We look at all the process for getting there, how we can make this at this price." (Thomas, DELTA, Purchasing)

The analysis indicated that not all structuring practices were implemented to the same degree. Resource divesture, as mentioned in the ROT literature, was not the main concern for the managers, who prioritized resource acquisition over divesture. Many participants represented the supply management functions which could explain the emphasis on resource acquisition. Table 4 illustrates the primary structuring practices, including a within-case description.

Table 4

Structuring.

Case	Sample Quotes
ALPHA	**Market Scanning:** What counted was experience in *[our industry]*. So a supplier, yeah, that he has done something similar or something very close to that, what we wanted him to do. (Charles, Supply Chain) **Interface Development:** Even when the supplier is responsible for the design, we should provide with an interface point, and we will provide with a lot of different design rules, a lot. We impose a lot of design constraints (Benjamin, Supply Chain)
BETA	**Market Scanning:** We're constantly asking our suppliers for new ways to … increase value to our product. So those are the types of discussions I have with my suppliers. (Katie, Strategic Purchasing). We do the best we can to scan and look for trends. (Hannah, Purchasing) **Trust Building:** It's our job to ensure that we have a robust supply chain, and that doesn't just mean ensuring supply. It means that we're partnering with companies … where we can drive the greatest value. (Hannah, Purchasing) **Resource Portfolio Updating**: [*We*] had several meetings with our core team and our core strategy team and actually developed an alternative supply base of suppliers that we want to actually grow because they do have good quality. … They have robust R&D technology capabilities themselves." (Hannah, Purchasing)
DELTA	**Market Scanning:** There should be a specialized group that works on new product development, and they are scanning the industry for items, new technologies in order to be competitive, to meet mandates for business opportunities (Jan, Supply Chain) **Trust Building:** You sketch out the target across the functionalities, give them the vision so to speak, but the individual steps, the process, how to reach this target, that is up to the creativity of the supplier and their knowledge and understanding so that you don't micromanage their steps. (Thomas, Purchasing)
ZETA	**Interface Development:** We often have joint supplier meetings where I bring the supplier in and introduce them to the R&D team, and they might do a technical presentation (Tracy, Purchasing). **Trust Building:** Sharing of resources and redeployment of resources is probably the most effective way we have found (Brandon, Manufacturing)
ETA	**Market Scanning:** Scanning the world for solutions, … for example, we created an innovation department … [*to become*] aware of disruptive technologies that would impact our business. (David, Logistics) **Trust Building:** New viewpoint from a certain set of suppliers to be more partners, to be more collaborative, to understand how you're going to share intellectual property and manage a mutually beneficial type of a program. (David, Logistics)

Overall, the interviews revealed different structuring practices among the cases. Some were more proactive in their approach, taking clear initiative in structuring the resource portfolio. Others tended to be relatively passive and hesitant to engage in structuring activities. It appears that successful project teams better understand their external environment and adapt their constrained resource portfolio more quickly. For example, ALPHA and DELTA primarily looked within their industries, neglecting technological trends outside of their common domain. In contrast, BETA and ETA were scanning other sectors as well. Based on the interviews and the literature review, important characteristics of relatively low versus high-intensity levels of structuring emerged, as depicted in Appendix Table A.3.

5.1.2. Bundling

Bundling refers to integrating external resources to shape new, strategic capabilities. Bundling intends to match and combine internal resources with complementary external resources to build new capabilities and achieve a competitive edge. To build an effective combination (bundle) of internal and external resources, the participants described essential practices related to managing external coordination with suppliers, facilitating internal alignment and communication (speaking with one voice to the supplier), utilizing co-location opportunities, and fostering resource integration and reconfiguration. The interviews revealed some noticeable cross-case differences in terms of bundling implementation.

> "We really heavily rely on and communicate back with our core procurement team to make sure that we're aligned in the steps that we're taking" (Hannah, BETA, Purchasing)

In contrast, ZETA and ALPHA showed relatively little internal alignment. The interviews indicated a potential issue with functional silos.

> "Everybody looks for their own and is not looking left and right" (Kurt, ALPHA, Purchasing)
>
> "That's a problem. Sometimes I find that R&D has stepped down the road and done some work ahead of time [*without consulting other functions*]" (Thomas, DELTA, Purchasing)

Bundling also involves resource integration and reconfiguration practices, a process of enriching in-house capabilities with external knowledge.

> [*We*] "say, 'At this point, help us design it. What materials do we use? Do you have any more technologies that we're not aware of? How would you make this happen?' and in some cases, we pull in maybe more than one supplier." (Thomas, DELTA, Purchasing)
>
> "As they started to realize that there's a very effective supply base out there that can look at and use technology and knowledge that they have gained through their business and apply that … we started to do more effective supplier integration in the design process." (David, ETA, Logistics)

External coordination and internal alignment of NPD activities were essential for ALPHA and BETA.

> "We coordinate with the engineering team to understand and create a collaboration plan of what that new technology might look like and who the potential suppliers might be and then develop a list … and coordinate between the cores, the engineering, and our product development supply management group to align and integrate our strategy and establish and execute the agreement." (Katie, BETA, Strategic Purchasing).
>
> "We have to coordinate between our suppliers. I mean, a simple example is the interfaces, the physical interfaces of the [product] structure have to match later on. They have to fit. Of course, also the electronic and IT computer interface have to work. So, all that has to be harmonized." (Charles, ALPHA, Supply Chain)

The managers considered external coordination essential because critical upstream processes determine the performance in the marketplace. However, BETA noted supply chain coordination issues.

> "… We spent a huge amount of time and money doing production readiness and digging into our tier-one supply chain because, frankly, that's where we found most of our failures, was way way down in the supply chain. We're talking tier four, tier five. We had no clue

> that it was so deep, and so I would say that is an area that we're certainly more aware of, and we spend a lot of energy managing it." (Hannah, BETA, Purchasing)

Some participants noted formalized cross-functional and cross-organizational collaboration with their suppliers.

> "What we call a supplier day, we actually sell the project to the suppliers. So we take our preferred supply base. … We kind of tell them the whole story. … we explain what the benefits are, and we get their buy-in at that point." (Thomas, DELTA, Purchasing)

Likewise, ETA remarked on collaboration opportunities with suppliers.

> "There's an opportunity to do more design collaboration activity so that suppliers could take over some of the core functions of the components that we're using and own that design, and we're just applying it to the product." (David, ETA, Logistics)

The interviews revealed challenges of internal alignment and cross-functional information-sharing practices.

> "… I think the communication exchange, … the communication stage has to cover all the different functions, whether it's the marketing information that's transmitted across volume and the calendarization of that volume just for seasonality to pricing and cost of raw materials. There needs to be some level of sharing." (Rodney, ZETA, R&D)

> "…We have a plan. We need to make sure it happens. … there's a formal process in which it gets closed out so that everybody understands and agrees." (Amy, ETA, Purchasing)

The participants highlighted effective resource integration as a critical success factor and emphasized the importance of both internal alignment and external coordination, which corresponds well to the literature (Hitt et al., 2016). Resource bundling plays an essential role in the PO mechanism that enhances innovation performance. By establishing effective bundling practices, managers enable internal functions to quickly access newly acquired external resources in a structured, coordinated process. Strong bundling practices result in superior resource utilization and new competitive capabilities. The bundling practices appear to provide the

necessary “glue” (Wales et al., 2013, p. 94) for connecting the relevant resources to achieve new innovative resource configurations and new strategic capabilities. Project groups with solid bundling practices can effectively convert newly acquired resources into meaningful competitive capabilities. Table 5 describes the bundling processes for all cases.

Table 5

Bundling.

Case	Sample Quotes
ALPHA	**Internal Alignment:** Everybody looks for their own and is not looking left and right, but we have those integration meetings, and then everybody has to come on the same level, and in the end, we have to put out a good product. (Kurt, Purchasing) **Resource Integration:** I think the only way of doing it is to work a lot closer with the suppliers but in the technical way, not in our commercial perspective, but the technical way. We really have face to face meetings all the time, continuously, so they can always see what issue could come up, but I know that they are basically doing that. (Jim, Purchasing) **Supplier Co-Location:** When you start having a supplier who doesn't know *[us]* at all, who needs to be explained each and every delivery, each and every procedure, then it's worth investing in the full time *[co-location]* of that supplier. … Some are onsite and then … *[they]* can stay on our premises. We give them an office, and then we discuss everything, and if they have questions, they can just come over to our office and we can discuss this in person. So I've experienced that a lot, and my personal point of view is that this is the best way to communicate. (Jim, Purchasing)
BETA	**Internal Alignment:** We coordinate with the engineering team to understand and create a collaboration plan of what that new technology might look like and who the potential suppliers might be and then develop a list and work through collaboration agreements with the suppliers, and then we coordinate with our core organizations, which are the ones responsible for doing the production programs right now. (Katie, Strategic Purchasing) **Resource Integration:** The only thing that I would identify is, from the product development, making sure that we're tying that with marketing and sales. I don't see a lot of that happening right now. Make sure that we're capturing the customer's perspective. (Katie, Strategic Purchasing) **Supplier Co-Location:** Whether it's colocation here or at their facility, at least in early-stage development, it's hugely beneficial. (Hannah, Purchasing)
DELTA	**External Coordination:** We're trying to pull; initially, we give them parameters. We're trying to make a product do this. We're trying to make it at this cost. Here's your piece of the pie, Mr. Supplier. How can you support that? What would you recommend we do? We may have some general specs, size, dimensions, packaging, but we don't have all that worked out. So what we do is try to bring the supplier in and say, "You're the best at doing this. We need your top people to look at this technology and be onsite in some cases for weeks to figure out how we design this. (Thomas, Purchasing) **Internal Alignment:** Keeping those people aligned, keeping all four of those people all the way through the process, is key. To me, it's all about information systems and communication. It's just all about talking and relying on each other to get to the next step. (Thomas, Purchasing)
ZETA	**External Coordination:** You don't need everyone involved from day one. So part of the secret is knowing when you need to bring in different parties so that they have adequate time to understand where we are, what the issues are, and can make an input that will impact decisions that they need to impact. (Brandon, Manufacturing) **Resource Integration:** Quite often, …, it's really not uncommon where you're developing a product, and you will use another company to help you enable that product. (Rodney, R&D)
ETA	**External Coordination:** There's an opportunity to do more design collaboration activity so that suppliers could take over some of the core functions of the components that we're using and own that design, and we're just applying it to the product. (David, Logistics) **Supplier Co-Location:** A joint definition phase, where typically we have the suppliers onsite all working together to ensure that we coordinate for a successful integration prior to a preliminary design review. (Greg, Supply Chain)

The cases differed in their internal vs. external focus. DELTA firmly focused on external coordination, while ZETA did not. One explanation might be that ZETA is in a Tier-1 position while the other cases represented the OEMs in their markets. Specifically, ZETA frequently deals with medium-sized Tier-2 suppliers who might lack sufficient resources for extensive collaboration with ZETA. Nonetheless, most project teams invested in external relationship building by co-locating supplier representatives who physically resided on their premises. Bundling practices are context-dependent and affected by the competitive situation, requiring the commitment of both parties. Appendix Table A.4 depicts the relatively low versus high-intensity levels of bundling practices for each case.

5.1.3. Leveraging Support

Leveraging implies that the innovation project is commercializing the newly formed capabilities to create customer value. Typically, purchasing managers have no direct relationship with external customers. Instead, purchasing provides leveraging support to its internal customer(s). Based on the case analysis, the two most crucial leveraging support practices were capturing customer needs and managing the internal customer interface. Compared to structuring and bundling, several cases demonstrated relatively poor leveraging support capabilities. However, while relatively weak in structuring and bundling, ALPHA and ZETA performed better in leveraging support. BETA emphasized that the external customers' requirements should drive the NPD activities. Consequently, customers' needs are at the center of managerial decision-making and trigger the PO practices.

> "We need to look at what the existing customer is experiencing with their equipment..., and then incorporate those activities back into the product development to see how we can make it better." (Katie, BETA, Strategic Purchasing)

Comparing the three PO practices, leveraging support shows unique characteristics. The cross-case analysis resulted in several interesting findings (Table 6). The cases ranged from a relatively strong focus on leveraging support to very little concern about the leveraging support processes; the latter cases emphasized the other two PO practices and were more engaged in identifying and integrating external resources (structuring and bundling).

Table 6

Leveraging Support.

Case	Sample Quotes
ALPHA	**Customer Need Capturing:** You have many customers. So you cannot listen to just one of them. It has to be a shared effect. … There is a balance to find; this is basically the job of our product development team, to find the right balance between the sexy, cheap, very technologically advanced *[product]* and robustness. (Benjamin, Supply Chain) **Customer Interface Management:** There was always one there, and what also happened there was that the customer was there. … maybe, in the beginning, there wasn't too much in the discussions, but when we knew this is probably the way we will go, then we will invite him [*the customer*] and explain to him, and then we want to see his reaction, and if he says this is a good idea to do that and continue in this direction. Of course, that's good for you to know that and it's very important to keep everyone in the picture. (Jim, Purchasing)
BETA	**Customer Need Capturing:** From the product development, making sure that we're tying that with marketing and sales. I don't see a lot of that happening right now. Make sure that we're capturing the customer's perspective. We're looking at it from a life cycle perspective, from the existing customer to the end customer. So we need to look at what the existing customer is experiencing with their [*product*], any concerns they have with the existing [*product*], and then incorporate those activities back into the product development to see how we can make it better. (Katie, Strategic Purchasing) **Customer Interface Management:** That's where some of the hard discussions are happening [*with the customer*]. We do have contractual mechanisms where if we work on projects together, we do have a sharing arrangement that's outlined. (Hannah, Purchasing)
DELTA	**Customer Need Capturing:** When there is an unmet need on the market. So our customers are looking for something, and usually, we develop it, where there's a gap. (Hunter, R&D) **Customer Interface Management:** This is all brand new because we haven't done this effectively in the past, but now what we do is start out with the project scope, and as soon as we figure out what the project scope is and that's basically what the cost of the equipment needs to be, what the timing for delivery is, what the innovation is, what the customer expects … we have somebody in those meetings that understands how that relates to a commercial item or how that impacts that supplier or customer. (Thomas, Purchasing)
ZETA	**Customer Need Capturing:** In a lot of cases, it's just simply sitting down with your customer and talking to them, knowing their application, and saying, "Hey, what are you looking for? (Brandon, Manufacturing) **Customer Interface Management:** The customers would be involved at the very beginning and toward the end, I guess. At the very beginning, they help define the product characteristics that you're looking for. … In terms of the level of involvement and our relationship with them, I think most of the customers that we have a good relationship with. It's just, I think, some of the customers are much more engineering-intensive than others. (Brandon, Manufacturing) The customer interface could be segmented … usually, it's a close relationship because you need to meet their specs, their requirements. You also have to pass their quality requirements in manufacturing. So that customer relationship is much more intimate. (Rodney, R&D)
ETA	**Customer Need Capturing:** The business guys are trying to think through, for this particular customer, what are the true requirements, what are things that haven't really been defined that we have true latitude on what we want to offer, are there certain strategic partnerships we ought to have even at the time of proposal and what are those going to be? (Amy, Purchasing) **Customer Interface Management:** It was a way for the customer to communicate to us, "Here are our issues that we're experiencing with you." When we get a [*corrective action report*], we have to put together a formal corrective action plan, … and we have to then carry that out, execute the plan, and then the customer has to come back and validate that we really have solved the problem. (Amy, Purchasing)

Leveraging support is a critical core element of PO practices. The new capabilities derived from effective structuring and bundling practices can only contribute to innovation performance when such capabilities are effectively leveraged with the appropriate strategies in the marketplace. All three PO practices must be balanced, which was not the case for ALPHA and ZETA. The cross-case analysis indicated an inconsistency between the fully synchronized orchestration practices described in the literature (Sirmon et al., 2011) and the actual PO implementation observed in practice. Appendix Table A.5 illustrates relatively low versus high levels of leveraging support.

According to literature and empirical case data, employing PO practices facilitates the inflow of innovative ideas and the (re-)combination of external with internal knowledge. Due to solid PO practices, project teams could identify and acquire precisely the missing external resources to complement internal capabilities (Crook and Esper, 2014). The effective integration of external input would result in higher innovation performance **(**van Echtelt, 2008; Luzzini et al., 2015; Schiele, 2010; Mikkelsen and Johnsen, 2019). Implementing effective and well-balanced PO practices should also lead to better innovation processes (Narasimhan and Narayanan, 2013). Rich information exchange (with personal interaction) is essential for achieving project goals concerning quality, delivery, flexibility, or innovativeness based on process and product innovations (Krause et al., 2007).

5.2. Purchasing Orchestration Impacting Innovation Performance

The interviews revealed that project teams with strong purchasing orchestration practices tend to be more alert and receptive to environmental changes because they continuously scan their external environment. They are aware of current trends regarding technology updates and

significant market shifts. Consequently, such a forward-looking attitude helps assess market developments relatively well, effectively utilize external and internal resources, and enhance innovativeness. Those project teams were also open to searching for external input to complement internal expertise and close existing capability gaps by orchestrating the resource inflow and reconfiguration process. However, the cases differed in their approach to implementing PO practices. As Katie from BETA explained, managers in a "firefighting" mode and weak structuring practices will not spend sufficient time analyzing or anticipating critical future developments, leading to ad-hoc responses to unexpected environmental changes. Hence, some managers will tend to neglect "early warning signals" and thus have less time for a thorough assessment and decision-making.

The purchasing orchestration practices describe a systematic approach in managing internal and external resources to enhance innovation performance. Thereby, PO embracing managers can actively develop a broader range of managerial decision options because they allocate more time for upfront analysis and decision-making than 'closed-minded' teams with a weak PO implementation. To conclude, innovation project teams that have effectively implemented PO practices will achieve a more agile response to relevant environmental changes and an NPD outcome based on a broader set of resources (internal plus external). Such teams are better prepared to take advantage of unexpected market shifts and changing technology to create novel products and service offerings. Overall, the analysis indicates a positive impact of PO practices on innovation performance. Consequently, the following is proposed:

> ***Proposition P1:*** *A higher level of purchasing orchestration practices is associated with a higher level of innovation performance.*

5.3. A Culture of Open-Mindedness and its Impact on PO

The case interviews mirror the literature about the influence of cultural traits on innovation. Researchers have shown the effect of cultural aspects on purchasing managers' innovation process or creative problem-solving capabilities (Schiele, 2010; Narasimhan and Narayanan, 2013; Kiratli et al., 2016). The interviewees described a culture of open-mindedness as particularly influential when innovating jointly with suppliers and integrating their critical input. An open mindset will help to engage with new suppliers more effectively, enhancing the performance consequences of PO practices by releasing positive energy and providing essential direction (Gualandris et al., 2018). In particular, open-minded innovation teams tend to accept more risks in exploring new external resources (Narasimhan and Narayanan, 2013). Such a mindset fosters the team members' willingness to actively and genuinely search for a fit of nascent external resources. For example, the teams might be willing to "experiment" with new suppliers and unknown technologies. Such groups will assess the usability without preconception, enabling a fair evaluation process to identify potential opportunities for incorporating the external input. Consequently, the teams will develop more effective PO practices.

The interviewed managers criticized too much short-term thinking, limiting the necessary holistic approach and narrowing the decision-making options. At ZETA and ETA, managers noted internal resistance against adapting external ideas.

> "It's always the Not-Invented-Here issue. And then the organization … has a tendency to do what they always did. Because that's like, common knowledge and it's no risk and, there's a lot of pressure to keep everything on schedule and everything that is new and poses a change could compromise the schedule" (Ed, ZETA, R&D)

> "With resistance inside the organization … there's no real interest in changing [*processes*] too quickly." (Simon, ETA, Purchasing)

The project teams differed in their extent of embracing innovation. Some encouraged their members to challenge the established procedures while thinking more "outside of the box."

> [*It's critical*] "to think different, to challenge again the good old processes, for sure. I would say it is quite good in our culture. It is a key success factor." (Benjamin, ALPHA, Supply Chain)

ETA emphasized that open-mindedness plays a decisive role in developing supplier interfaces to enhance external coordination and integration.

> "As they started to realize that there's a very effective supply base out there that can look at and use technology and knowledge that they have gained through their business and apply that … we started to do more effective supplier integration in the design process. (David, ETA, Logistics)

In contrast, a lack of open-mindedness is limiting the integration efforts. Such project teams will face less internal buy-in to the use of supplier input and face strong resistance to integrating external resources. Thus, external coordination and information exchange will remain poor with such a mindset.

> "They have this narrow view, okay, I've run the process. I have to involve … , so I do it. But it's not that there's really an understanding what they can provide." (Simon, ETA, Purchasing)

Similarly, on the downstream supply chain, teams with high open-mindedness will find it easier to understand and capture changing customer needs. To summarize, a culture of open-mindedness positively influences the implementation and use of PO practices. Hence, the following is proposed:

> ***Proposition P2a:*** *A higher level of open-mindedness is associated with a higher level of structuring practices.*
> ***Proposition P2b:*** *A higher level of open-mindedness is associated with a higher level of bundling practices.*
> ***Proposition P2c:*** *A higher level of open-mindedness is associated with a higher level of leveraging support practices.*

5.4. The Influence of Technological Uncertainty

Technological uncertainty (TU) is a vital contextual factor impacting innovation performance outcomes due to continuously evolving technological developments (Mikkelsen and Johnsen, 2019). Such an environment requires high innovation speed and short product life cycles to stay competitive (Buvik and Grønhaug, 2000). Technological changes can make existing resources obsolete and delay managerial decision-making due to a lack of required (technical) information in an uncertain situation. When a relevant new technology emerges in the market, the innovation project teams need to assess the impact and decide how to proceed. A central decision relates to purchasing the latest technology versus developing it internally (if feasible).

The level of technological uncertainty influences the relationships with suppliers. When facing low technological uncertainty, teams can usually maintain relationships with existing suppliers whose essential procedures, values, and objectives are already established and harmonized. However, when dealing with substantial technological uncertainty, the innovation teams will frequently need to engage with new suppliers and jointly develop new processes, define the 'rules of engagement,' and agree on objectives and values. Such activities can (partly) be accounted for in the project planning but require substantial time and effort that can delay project deliverables.

A high TU context is characterized by the exchange of relatively ambiguous and uncertain information between buyer and supplier (Cousins et al., 2011). Critical data about product requirements and specifications, product costing, and production planning & scheduling, for instance, may change relatively rapidly due to technological risks. An effective and fast response to those changes requires successful collaboration between the project team and the supplier. But a lack of trust in the relatively 'unknown' supplier will limit the amount of flexibility and require

higher monitoring efforts when dealing with new suppliers of innovative technology. The team might decide to formalize the information exchange with the new suppliers to ensure proper technical premises and assumptions documentation. However, the formalization will reduce flexibility and agility in responding to technological changes. At ETA, process formalization was limiting the innovation process. For instance, David observed a lack of flexibility in his team, with relatively rigid structures constraining creativity and the flow of new ideas.

> [*We*] "need to be a little bit more free-flowing and create more of a brainstorming flexible type of an environment." (David, ETA, Logistics)

In an environment of high TU, the teams might have to concurrently deal with several potential technology suppliers plus in-house development activities without knowing what solution might eventually succeed. As a result, some concurrent advances taken in a relatively "foggy" environment might lead to a dead-end situation and wasted resources, delaying the final innovation project results.

The level of technological uncertainty can influence the type of innovation. On the one hand, a low TU environment might lead the project team toward incremental changes achievable by replacing old with new resources but leaving the remainder of the product untouched. On the other hand, a high TU context might lead to more disruptive changes and a focus on novel resource combinations. To create new capabilities when facing rapid technological changes, successful innovation teams might have to reconnect knowledge, building on combining internal and external expertise and accumulating knowledge rather than replacing it (Picaud-Bello et al., 2019). Thereby, high TU might trigger and initiate significant technological and market disruption. However, although technological uncertainty might substantially motivate the project teams to strive for highly innovative results and gain first-mover advantages, the lack of certainty in terms

of technology and market knowledge will constrain some essential innovation project processes, limiting innovation progress.

To conclude, an environment of high technological uncertainty is characterized by substantial albeit unanticipated changes in technology and a dynamic supply market of such technology (Buvik and Grønhaug, 2000). Consequently, high technological uncertainty can harm innovation performance because of unexpected market shifts, lack of visibility, or insufficient market information. Therefore, the following is proposed:

> ***Proposition P3:*** *A higher level of technological uncertainty is associated with a lower level of innovation performance.*

5.5.The Moderating Influence of PO Practices

Well-implemented PO practices will soften the negative performance implications of high technological uncertainty. Implementing PO practices will prepare teams to be more alert and open to significant technological evolutions in the market. Based on a higher level of awareness and proactivity, innovation teams will respond faster and more effectively to the environmental challenges of TU. Thus, teams with solid PO practices will better cope with the contextual uncertainty. Specifically, effective structuring and bundling practices can (partially) offset the detrimental performance consequences of high TU.

High TU can make resources from existing suppliers obsolete and require new suppliers. Consequently, the PO practices of developing an interface to the new suppliers and the external integration efforts become decisive. As new instead of existing suppliers are used in a context of high TU, the project collaboration with suppliers will be more difficult because critical technological factors might change relatively frequently, with little visibility of upcoming changes.

After all, inter-organizational processes and routines have not yet matured. In such a context of high TU, strong PO practices such as interface development and trust-building are more crucial. They help the innovation teams establish the necessary collaborative, trustful relationships with new suppliers and ensure a reliable inflow of new resources.

Echoing the supply management literature, BETA described active supply base and interface development as essential to enhancing innovation (Krause et al., 2007). Thus, PO practices such as structuring are critical to coping with the TU impact because they foster relationship building. Specifically, the structuring processes develop the supplier interface as a foundation of trust, encouraging the necessary flexibility and willingness to cooperate.

> [*We*] "actually developed an alternative supply base of suppliers that we want to grow because they do have good quality. They are cooperative, and they can provide other benefits." (Hannah, BETA, Purchasing)

Purchasing typically ensures reliable supplies by establishing proper controls and an adequate governance structure. However, establishing detailed control mechanisms such as supplier qualifications, audits, quality assurance procedures, supplier performance evaluations, etc., is more applicable for a low TU environment (Buvik and Grønhaug, 2000). In contrast, the formal controls might be less effective in high TU contexts with relatively unpredictable technology shifts and rapid product design changes. In particular, there might not be sufficient time available to complete and adapt the control setting process. However, the innovation teams risk that the new suppliers show opportunistic behavior and insufficient commitment toward joint objectives (Song and Di Benedetto, 2008). Hence, using the systematic PO practices might help project teams integrate the suppliers more effectively and ensure more reliable access to external technology even in a high TU environment where formal controls are less applicable.

When facing technological uncertainty, strong market scanning practices are essential to identify existing new technology utilized in another industry. Previously unknown or neglected resources might suddenly become helpful for the project team when adapted to fit in a new context (Picaud-Bello et al., 2019). Thus, the PO-related structuring processes, especially market scanning, are enhancing the innovation project in a high TU context. The teams need to assess unknown suppliers (weak ties) and intentionally abandon the traditional pathways to explore emerging breakthrough technologies. When utilizing strong structuring (e.g., market scanning, interface development) and bundling (e.g., external integration, resource re-configuration, and internal alignment) practices, the project teams will better cope with the inherent dynamism when entering unchartered territory in a high TU environment. Consequently, the final proposition states:

> ***Proposition P4:*** *The detrimental effect of high technological uncertainty on Innovation Performance is weaker when the level of purchasing orchestration is high.*

The interviews with the case participants enriched the understanding of purchasing orchestration practices and the influence of the culture of open-mindedness and technological uncertainty. Triangulating the data from literature and empirical case interviews substantiated the emergent conceptual PO framework and clarified its constructs, domain, relationships, and predictions (Ketokivi and Choi, 2014). Figure 1 depicts the new purchasing-innovation framework.

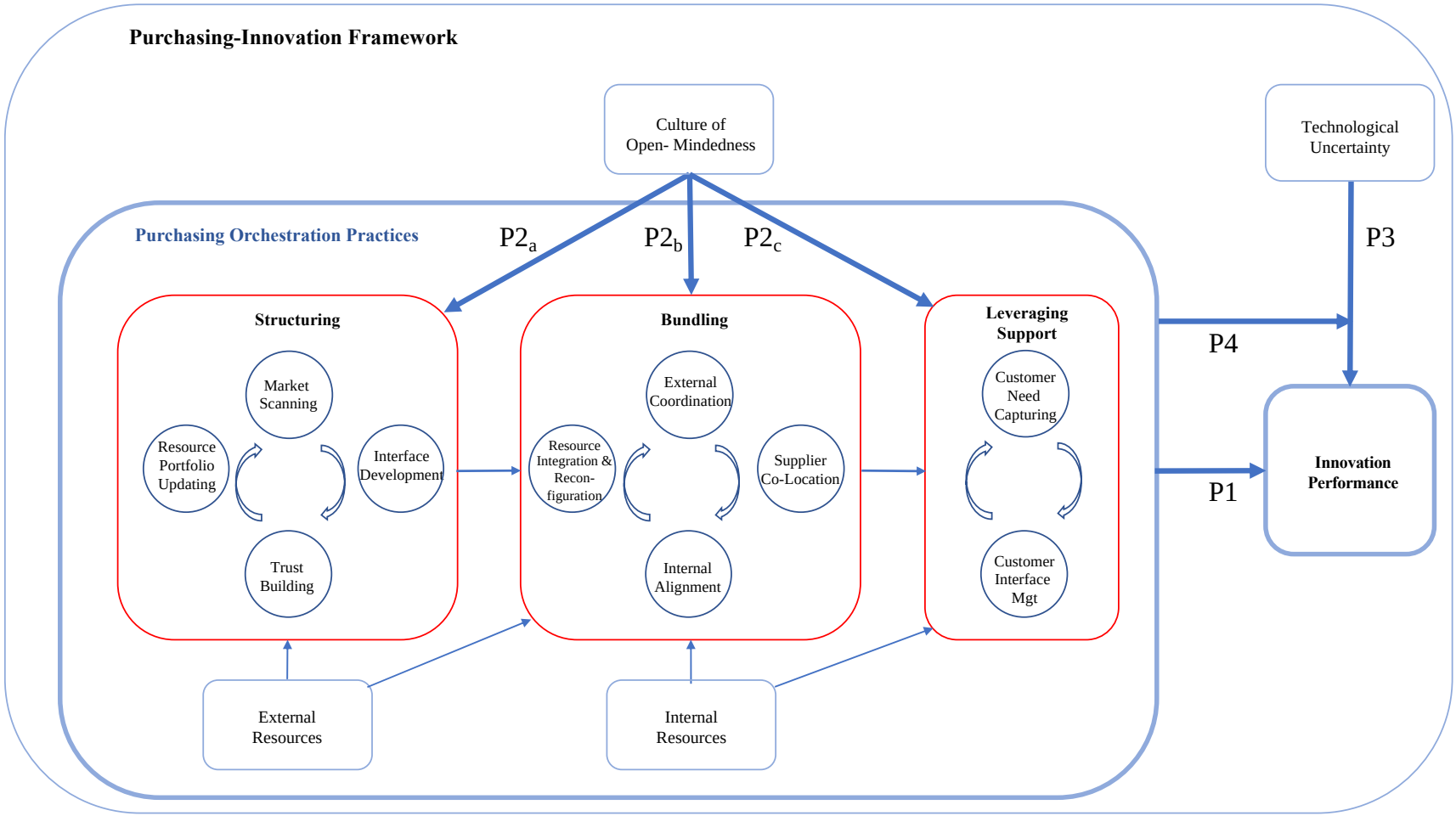

Figure 1: Purchasing-Innovation Framework

6. Implications and Conclusion

This research describes the PO phenomenon related to the purchasing practices of orchestrating key resources in innovation projects. It introduces a new Purchasing-Innovation framework and offers several theoretical and managerial contributions.

6.1. Theoretical Contribution

Continuous innovation has become a strategic imperative (Lintukangas et al., 2019), and suppliers have been identified as critical contributors to innovation processes (Mikkelsen and Johnsen, 2019). The effective and efficient integration of external resources is a crucial enabler of innovation (Suurmond et al., 2020), and purchasing plays a vital role in orchestrating the resource inflow from suppliers (Lorentz et al., 2019). This research deepens the understanding of the PO phenomenon by investigating relevant purchasing practices, the innovation performance consequences, and the impact of technological uncertainty and culture on such relationships. As the main theoretical contribution, this paper synthesizes the extant literature on the theme of purchasing-enabled innovation. This synthesis results in a new conceptual framework that can instigate further research.

Specifically, this study introduces the new purchasing-innovation framework and highlights PO practices as a critical purchasing capability that helps improve innovation performance (Picaud-Bello et al., 2019). The new framework explains purchasing's vital contribution to the innovation process. This research discusses the resource orchestration mechanism and introduces PO as an essential purchasing capability in innovation projects. The findings contribute to the supplier involvement literature (Wynstra et al., 1999; Schiele, 2010; Mikkelsen and Johnsen, 2019; Picaud-Bello et al., 2019).

This research explains how purchasing managers can orchestrate and support the inflow, integration, and commercialization of essential external resources. Based on theory and empirical data, this study elucidates the PO practices of resource structuring, bundling, and leveraging support in detail. As a result, the research provides a better understanding of vital purchasing practices. Moreover, the qualitative interviews offer a new perspective about PO practices in a relevant empirical context of predominantly High-Tech innovation projects and the influence of cultural and uncertainty factors. Thereby, this study (partly) addresses calls for research on the link between purchasing practices and performance (Bals et al., 2019) and on purchasing facilitation practices when integrating external resources to support innovation activities (Baert et al., 2016; Picaud-Bello et al., 2019).

Another theoretical contribution is highlighting a refined purchasing role in the context of innovation projects. This research offers additional justification for an extended (and more strategic) scope and higher relevance of the purchasing function. Complementing the existing purchasing management literature, this study can reemphasize the importance of purchasing involvement in innovation (Calvi et al., 2018; Mikkelsen and Johnsen, 2019). The study contributes to an ongoing scholarly debate about the new role of purchasing (Ellram et al., 2020). Some scholars have called for a broader role (Mikkelsen and Johnsen, 2019; Calvi et al., 2018) or a ‘dual role’ (Schiele, 2010) for purchasing in NPD projects and discussed the strategic relevance of purchasing (Luzzini et al., 2015; Gonzalez-Zapatero et al., 2017; Lorentz et al., 2019). In the new boundary-spanning role, purchasing is a crucial facilitator between external and internal stakeholders (Calvi et al., 2018; Tchokogué and Merminod, 2021). This research also adds new insights to the emerging scholarly discussion about how the purchasing role might need to be

adapted when facing environmental uncertainty (Mikkelsen and Johnsen, 2019; Picaud-Bello et al., 2019).

Finally, applying the Wacker (1998) guidelines, this research extends the theoretical domain of resource orchestration theory (Sirmon et al., 2011) to address the PO phenomenon. ROT explains and predicts the achievement of a competitive advantage (Hitt et al., 2016). This research shows how ROT can explain and predict performance outcomes for the PO practices of structuring relevant resources into innovative resource portfolios and bundling them into new capabilities leveraged in the marketplace to enhance innovativeness and competitiveness.

6.2. Purchasing Managerial Implications

This research provides several managerial insights about the PO phenomenon in the context of innovation projects. First, the findings indicate that purchasing managers can contribute to innovation projects by effectively implementing and balancing PO practices. Examples from the case study illustrate purchasing's vital role in orchestrating external and internal resources in innovation projects. By implementing effective PO practices, managers can enhance the visibility and predictability of the resource inflow from the supply chain. For example, purchasing might utilize the existing supply structure for existing products or incremental innovations (e.g., derivatives of current products). However, this is not the case for breakthrough or disruptive innovations that rely mainly on new suppliers. For the latter, purchasing should initiate and drive the market scanning, interface development, and external integration practices, for instance.

In many innovation projects, unique specifications and new requirements necessitate that purchasing pursues new resource structuring practices to adapt to the new needs. Consequently, purchasing involvement in innovation projects matters to manage the appropriate resource inflow

with effective PO practices. As a crucial managerial implication, this research demonstrates that purchasing managers need to adapt their PO implementation to the organization's specific environment. Purchasing managers must develop and maintain appropriate relationships with suppliers. The case analysis provides some illustrative examples for managers. For instance, BETA appears to achieve a good fit of their PO practices with their environment. The findings suggest that managers carefully align their level of PO activities to the level of environmental uncertainty.

Second, as purchasing managers emphasize structuring and bundling practices, they should also assess the leveraging support practices. In this study, BETA, DELTA, and ETA appear out of balance in their approach, with a noticeably higher emphasis placed on the structuring and bundling processes. Managers should ensure sufficient synchronization with the other two PO practices. The potential product commercialization success is critical for purchasing managers to consider during the initial structuring and bundling steps. Better cross-functional integration with marketing/sales might help to overcome leveraging obstacles. Related purchasing literature has shown many potential inhibitors to successful innovation outcomes. Uncertainty can limit the successful market adoption of innovation, for example (Knight et al., 2015). Thus, cross-functional coordination and information sharing become important to balance all three PO practices.

Finally, the descriptions of relevant PO practices can guide managers in enhancing their PO implementation. Tables 4 – 6 plus the Appendix Tables A.3 – A.5 list the main structuring, bundling, and leveraging support categories. Those descriptions, along with the case discussion, can enhance practitioners' understanding of the PO phenomenon and the applicable PO practices. Purchasing managers can refine their PO practices according to their strategic objectives and environmental context (e.g., level of technological uncertainty). By scrutinizing their internal PO processes, managers might derive new competitive capabilities by improving their PO practices.

6.3. Limitations and Future Research

This research has several limitations, which might present opportunities for future studies. First, the conclusions might be limited in generalizability beyond the current research setting of innovation projects within relatively large corporations in a High-Tech equipment market environment. Thus, researchers could investigate innovation activities in small and medium-sized organizations to verify the PO framework in other contexts. Second, while ALPHA was confronted with a high level of technological uncertainty, the other project teams faced a relatively low to medium level of technological uncertainty. Third, most cases were dealing with incremental instead of disruptive innovation. We acknowledge the limitations of our findings concerning high uncertainty environments and disruptive innovation.

We have followed Eisenhardt (1989) and Corbin and Strauss (2008) for the case study setup, data collection, and analysis/coding. However, we acknowledge that using the process model approach (Langley et al., 2013) would have been a better methodological choice to analyze process-oriented research questions. We are grateful to our anonymous reviewers for pointing this out. Thus, a follow-up study could collect longitudinal data, apply the Langley method, and investigate dynamic changes of the purchasing-innovation framework over time.

Our study investigated the influence of one specific cultural factor, open-mindedness, on the overall PO mechanism. Another opportunity could be to examine the impact of additional cultural factors and employees' attitudes on specific PO practices in more detail. Cultural factors and behavioral biases can impact organizational performance (Kiratli et al., 2016; Golini et al., 2018). Analyzing a potential interdependency between PO implementation and culture could provide valuable new insights for scholars and practitioners (Kiratli et al., 2016; Lintukangas et al., 2019). Moreover, researchers could extend this study and advance the current propositions into

explicit research hypotheses for theory testing (Turkulainen et al., 2017). Future research might identify additional relevant purchasing capability dimensions to develop a complete summary of essential purchasing capabilities supporting innovation processes. More extensive and complex requirements on the purchasing function might be explored.

Scholars could analyze the appropriate balance (PO mix) of structuring, bundling, and leveraging support practices in more detail. They could examine the implications for purchasing managers and the purchasing function in general when deprioritizing the relatively purchasing-dominated *structuring* while emphasizing the cross-functionally-driven *bundling* and *leveraging support* practices. Scholars could also verify the PO conceptualization and the impact on financial performance. Future research could also investigate how PO capabilities affect the strategic role of purchasing, the purchasing maturity of organizations, and the effect on firm performance (Bals et al., 2019). Using the PO practices described in this study, researchers can deepen the understanding of purchasing capabilities and the evolving role of purchasing (Oke and Kach, 2012; Gonzalez-Zapatero et al., 2017; Bals et al., 2019; Lorentz et al., 2019; Burin et al., 2020).

6.4. Conclusion

Resource orchestration theory is applied to address the purchasing orchestration phenomenon. This research introduces a new purchasing-innovation framework. It offers a new conceptualization of PO practices as an essential purchasing capability to strengthen innovativeness. The case study enriched the PO understanding by adding the insightful views of managers from purchasing and NPD-related functions involved in innovation projects in different industries. The framework demonstrates the interplay between open-mindedness, technological uncertainty, and PO practices. Both literature and case study evidence suggest a significant

contribution of PO practices to the success of innovation projects. Overall, PO appears to be a promising emerging framework that could further develop the purchasing field and inspire future research.

References

Andersen, P.H., Ellegaard, C. and Kragh, H. (2020), "How purchasing departments facilitate organizational ambidexterity", *Production Planning & Control*, pp.1-16.

Andersen, P.H. and Gadde, L.E. (2019), "Organizational interfaces and innovation: the challenge of integrating supplier knowledge in LEGO systems", *Journal of Purchasing and Supply Management*, Vol. 25 No. 1, pp.18-29.

Aoki, K. and Wilhelm, M. (2017), "The role of ambidexterity in managing buyer–supplier relationships: The Toyota case", *Organization Science*, Vol. 28 No. 6, pp. 1080-1097.

Baert, C., Meuleman, M., Debruyne, M. and Wright, M. (2016), "Portfolio Entrepreneurship and Resource Orchestration", *Strategic Entrepreneurship Journal*, Vol. 10 No. 4, pp. 346–370.

Bals, L. and Tate, W.L. (2018), "Sustainable Supply Chain Design in Social Businesses: Advancing the Theory of Supply Chain", *Journal of Business Logistics*, Vol. 39 No. 1, pp. 57–79.

Bals, L., Schulze, H., Kelly, S. and Stek, K. (2019), "Purchasing and supply management (PSM) competencies: Current and future requirements", *Journal of Purchasing and Supply Management*, Vol. 25 No. 5, p. 100572.

Barney, J.B. (1991), "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99–120.

Braunscheidel, M.J. and Suresh, N.C. (2009), "The organizational antecedents of a firm's supply chain agility for risk mitigation and response", *Journal of Operations Management*, Vol. 27 No. 2, pp. 119-140.

Burin, A.R.G., Perez-Arostegui, M.N., Llorens-Montes, J. (2020), "Ambidexterity and IT competence can improve supply chain flexibility? A resource orchestration approach", *Journal of Purchasing and Supply Management*, Vol. 26, p. 100610.

Buvik, A. and Grønhaug, K. (2000), "Inter-firm dependence, environmental uncertainty and vertical co-ordination in industrial buyer–seller relationships", *Omega*, Vol. 28 No. 4, pp. 445-454.

Calvi, R., Johnsen, T. and Bello, K.P. (2018), "Purchasing involvement in discontinuous innovation: an emerging research agenda", In *Innovation and Supply Chain Management* (pp. 165-185), Springer, Cham.

Cardador, M.T. and Pratt, M.G. (2018), "Becoming Who We Serve: A Model Of Multi-Layered Employee–Customer Identification", *Academy of Management Journal*, Vol. 61 No. 6, pp. 2053–2080.

Carr, A.S. and Pearson, J.N. (1999), "Strategically managed buyer–supplier relationships and performance outcomes", *Journal of Operations Management*, Vol. 7 No. 5, pp. 497-519.

Cassiman, B. and Veugelers, R. (2006), "In search of complementarity in innovation strategy: Internal R&D and external knowledge acquisition", *Management Science*, Vol. 52 No. 1, pp. 68-82.

Chen, C.J. and Huang, J.W. (2009), "Strategic human resource practices and innovation performance—The mediating role of knowledge management capacity", *Journal of Business Research*, Vol. 62 No. 1, pp.104-114.

Chesbrough, H. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Publication Corp., Boston, MA.

Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: A new perspective on learning and innovation", *Administrative Science Quarterly*, pp. 128-152.

Constant, F., Calvi, R. and Johnsen, T.E. (2020), “Managing tensions between exploitative and exploratory innovation through purchasing function ambidexterity”, *Journal of Purchasing and Supply Management*, Vol. 26, p.100645.

Corbin, J.M. and Strauss, A.L. (2008), *Basics of Qualitative Research*, 3rd ed., Sage Publications, Thousand Oaks, CA.

Cousins, P.D., Lawson, B., Petersen, K.J. and Handfield, R.B. (2011), "Breakthrough scanning, supplier knowledge exchange, and new product development performance", *Journal of Product Innovation Management*, Vol. 28 No. 6, pp. 930-942.

Creswell, J.W. (2014), *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th ed., Sage Publications, Thousand Oaks, CA.

Crook, T.R. and Esper, T.L. (2014), “Do Resources Aid in Supply Chain Functioning and Management? Yes, But More (and More Precise) Research is Needed”, *Journal of Supply Chain Management*, Vol. 50 No. 3, pp. 94–97.

Das, A., Narasimhan, R. and Talluri, S. (2006), “Supplier integration—Finding an optimal configuration”, *Journal of Operations Management*, Vol. 24 No. 5, pp. 563–582.

Dobni, C.B. (2008), "Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis", *European Journal of Innovation Management*, Vol. 11 No. 4, pp. 539-559.

Eisenhardt, K.M. (1989), “Building Theories from Case Study Research”, *Academy of Management Review*, Vol. 14 No. 4, pp. 532–550.

Eisenhardt, K.M. (2021), "What is the Eisenhardt Method, really?", *Strategic Organization*, Vol. 19 No. 1, pp. 147-160.

Eisenhardt, K.M. and Graebner, M.E. (2007), “Theory building from cases: Opportunities and challenges”, *Academy of Management Journal*, Vol. 50 No. 1, pp. 25–32.

Ellram, L. M., Harland, C. M., van Weele, A., Essig, M., Johnsen, T., Nassimbeni, G., Pagell, M., van Raaij, E., Rozemeijer, F., Tate, W. and Wynstra, F. (2020), “Purchasing and supply management: Crisis? What crisis,” *Journal of Purchasing and Supply Management*, Vol. 26 No. 1, p. 100583.

Germain, R., Claycomb, C. and Dröge, C. (2008), "Supply chain variability, organizational structure, and performance: The moderating effect of demand unpredictability", *Journal of Operations Management*, Vol. 26 No. 5, pp. 557-570.

Golini, R., Mazzoleni, A. and Kalchschmidt, M. (2018), “National Culture as an Antecedent for Information Sharing in Supply Chains: A Study of Manufacturing Companies in OECD Countries”, In *Innovation and Supply Chain Management* (pp. 187-211). Springer, Cham.

Gong, Y., Jia, F., Brown, S. and Koh, L. (2018) “Supply chain learning of sustainability in multi-tier supply chains: A resource orchestration perspective”, *International Journal of Operations and Production Management*, Vol. 38 No. 4, pp. 1061-1090.

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 No. August, pp. 770–780.

Gualandris, J., Legenvre, H. and Kalchschmidt, M. (2018), "Exploration and exploitation within supply networks", *International Journal of Operations & Production Management*, Vol. 38 No. 3, pp. 667-689.

Hallen, B.L. and Eisenhardt, K.M. (2012), “Catalyzing Strategies and Efficient Tie Formation: How Entrepreneurial Firms Obtain Investment Ties”, *Academy of Management Journal*, Vol.

55 No. 1, pp. 35–70.
Hansen, M.H., Perry, L.T. and Reese, C.S. (2004), “A bayesian operationalization of the resource-based view”, *Strategic Management Journal*, Vol. 25 No. 13, pp. 1279–1295.
Handfield, R.B., Cousins, P.D., Lawson, B. and Petersen, K.J. (2015) "How can supply management really improve performance? A knowledge-based model of alignment capabilities", *Journal of Supply Chain Management*, Vol. 51 No. 3, pp. 3-17.
Hitt, M.A. (2011), “Relevance of strategic management theory and research for supply chain management”, *Journal of Supply Chain Management*, Vol. 47 No. 1, pp. 9–13.
Hitt, M.A., Xu, K. and Matz, C. (2016), “Resource based theory in operations management research”, *Journal of Operations Management*, Vol. 41, pp. 77–94.
Horn, P., Scheffler, P. and Schiele, H. (2014), “Internal integration as a pre-condition for external integration in global sourcing: A social capital perspective”, *International Journal of Production Economics*, Vol. 153, pp. 54–65.
Ireland, R.D., Hitt, M.A. and Sirmon, D.G. (2003), “A Model of Strategic Entrepreneurship: The Construct and its Dimensions”, *Journal of Management*, Vol. 29 No. 6, pp. 963–989.
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.
Kavin, L. and Narasimhan, R. (2018), “An Investigation of Contextual Influences on Innovation in Complex Projects”, In *Innovation and Supply Chain Management* (pp. 51-77). Springer, Cham.
Ketchen, D.J., Wowak, K.D. and Craighead, C.W. (2014), “Resource Gaps and Resource Orchestration Shortfalls in Supply Chain Management: The Case of Product Recalls”, *Journal of Supply Chain Management*, Vol. 50 No. 3, pp. 6–15.
Ketokivi, M. and Choi, T.Y. (2014), “Renaissance of case research as a scientific method”, *Journal of Operations Management*, Elsevier B.V., Vol. 32 No. 5, pp. 232–240.
Kilpi, V., Lorentz, H., Solakivi, T. and Malmsten, J. (2018), "The effect of external supply knowledge acquisition, development activities and organizational status on the supply performance of SMEs," *Journal of Purchasing and Supply Management*, Vol. 24 No. 3, pp. 247-259.
Kiratli, N., Rozemeijer, F., Hilken, T., de Ruyter, K. and de Jong, A. (2016), “Climate setting in sourcing teams: Developing a measurement scale for team creativity climate”, *Journal of Purchasing and Supply Management*, Vol. 22 No. 3, pp. 196–204.
Knight, L., Pfeiffer, A. and Scott, J. (2015), “Supply market uncertainty: Exploring consequences and responses within sustainability transitions,” *Journal of Purchasing and Supply Management*, Vol. 21 No. 3, pp. 167-177.
Koufteros, X., Verghese, A. and Lucianetti, L. (2014), “The effect of performance measurement systems on firm performance: A cross-sectional and a longitudinal study”, *Journal of Operations Management*, Elsevier B.V., Vol. 32 No. 6, pp. 313–336.
Kozlenkova, I. V., Samaha, S.A. and Palmatier, R.W. (2014), “Resource-based theory in marketing”, *Journal of the Academy of Marketing Science*, Vol. 42 No. 1, pp. 1–21.
Krause, D.R., Handfield, R.B. and Tyler, B.B. (2007), "The relationships between supplier development, commitment, social capital accumulation and performance improvement", *Journal of Operations Management*, Vol. 25 No. 2, pp. 528-545.
Kristal, M.M., Huang, X. and Roth, A.V. (2010), "The effect of an ambidextrous supply chain strategy on combinative competitive capabilities and business performance", *Journal of*

Operations Management, Vol. 28 No. 5, pp. 415-429.
Kumar, V., Jabarzadeh, Y., Jeihouni, P. and Garza-Reyes, J.A. (2020), "Learning orientation and innovation performance: the mediating role of operations strategy and supply chain integration", *Supply Chain Management: An International Journal*, Vol. 25 No. 4, pp. 457-474.
Langley, A.N.N., Smallman, C., Tsoukas, H. and Van de Ven, A.H. (2013), "Process studies of change in organization and management: Unveiling temporality, activity, and flow", *Academy of Management Journal*, Vol. 56 No. 1, pp. 1-13.
Legenvre, H., Henke, M. and Ruile, H. (2020), "Making sense of the impact of the internet of things on Purchasing and Supply Management: A tension perspective", *Journal of Purchasing and Supply Management*, Vol. 26 No. 1, p. 100596.
Lintukangas, K., Kähkönen, A.K. and Hallikas, J. (2019), "The role of supply management innovativeness and supplier orientation in firms' sustainability performance. *Journal of Purchasing and Supply Management*", Vol. 25 No. 4, p.100558.
Liu, H., Wei, S., Ke, W., Kee, K. and Hua, Z. (2016), "The configuration between supply chain integration and information technology competency: A resource orchestration perspective", *Journal of Operations Management*, Elsevier Ltd, Vol. 44, pp. 13–29.
Lorentz, H., Laari, S., Engblom, J. and Tanskanen, K. (2019), "Attention-based view on achieving ambidexterity in purchasing and supply management", *Journal of Purchasing and Supply Management*, Vol. 25 No. 5, p.100560.
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.
Madhavaram, S. and Hunt, S.D. (2008), "The service-dominant logic and a hierarchy of operant resources: developing masterful operant resources and implications for marketing strategy", *Journal of the Academy of Marketing Science*, Vol. 36 No. 1, pp. 67–82.
Mikkelsen, O.S. and Johnsen, T.E. (2019), "Involvement in technologically uncertain new product development projects : Challenges and implications", *Journal of Purchasing and Supply Management Purchasing*, Vol. 25 No. 3, pp. 1–11.
Narasimhan, R. and Narayanan, S., (2013), "Perspectives on supply network–enabled innovations", *Journal of Supply Chain Management*, Vol. 49 No. 4, pp.27-42.
Newman, R.G. (1988), "Single source qualification", *Journal of Purchasing and Materials Management*, Vol. 24 No. 2, pp. 10-17.
Noke, H., Perrons, R.K. and Hughes, M. (2008), "Strategic dalliances as an enabler for discontinuous innovation in slow clockspeed industries: evidence from the oil and gas industry", *R&D Management*, Vol. 38 No. 2, pp. 129-139.
Oke, A. and Kach, A. (2012), "Linking sourcing and collaborative strategies to financial performance: The role of operational innovation", *Journal of Purchasing and Supply Management*, Vol. 18 No. 1, pp. 46–59.
Phillips, W., Lamming, R., Bessant, J. and Noke, H. (2006), "Discontinuous innovation and supply relationships: strategic dalliances", *R&D Management*, Vol. 36 No. 4, pp. 451-461.
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.
Rogers, D.S., Lambert, D.M. and Knemeyer, A.M. (2004), "The product development and commercialization process", *The International Journal of Logistics Management*, Vol. 15

No. 1, pp. 43-56.
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, p. 100555.
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.
Schmelzle, U. and Tate, W.L. (2017), "Integrating external knowledge: Building a conceptual framework of innovation sourcing", *Transportation Journal*, Vol. 56 No. 4, pp. 477-512.
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.
Sirmon, D.G., Hitt, M.A., Ireland, R.D. and Gilbert, B.A. (2011), “Resource Orchestration to Create Competitive Advantage : Breadth , Depth , and Life Cycle Effects”, *Journal of Management*, Vol. 37 No. 5, pp. 1390–1412.
Song, M. and Di Benedetto, 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.
Sundgren, N. (1999), "Introducing interface management in new product family development", *Journal of Product Innovation Management*, Vol. 16 No. 1, pp. 40-51.
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.
Teece, D.J. (2007), “Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance”, *Strategic Management Journal*, Vol. 28 No. 13, pp. 1319–1350.
Tchokogué, A. and Merminod, N. (2021), "The purchasing department's leadership role in developing and maintaining a preferred customer status", *Journal of Purchasing and Supply Management*, Vol. 27 No. 2, p. 100686.
Turkulainen, V., Roh, J., Whipple, J.M. and Swink, M. (2017), “Managing Internal Supply Chain Integration: Integration Mechanisms and Requirements”, *Journal of Business Logistics*, Vol. 38 No. 4, pp. 290–309.
Van Echtelt, F.E., Wynstra, F., Van Weele, A.J. and Duysters, G. (2008), "Managing supplier involvement in new product development: a multiple-case study", *Journal of Product Innovation Management*, Vol. 25 No. 2, pp. 180-201.
Volberda, H.W., Foss, N.J. and Lyles, M.A. (2010), "Perspective—Absorbing the concept of absorptive capacity: How to realize its potential in the organization field", *Organization Science*, Vol. *21 No. 4*, pp. 931-951.
Wacker, J.G. (1998), “A definition of theory: research guidelines for different theory-building research methods in operations management”, *Journal of Operations Management*, Vol. 16 No. 4, pp. 361–385.
Wagner, S.M. (2012), "Tapping supplier innovation", *Journal of Supply Chain Management*, Vol. 48 No. 2, pp. 37-52.
Wales, W.J., Patel, P.C., Parida, V. and Kreiser, P.M. (2013), “Nonlinear effects of entrepreneurial orientation on small firm performance: The moderating role of resource orchestration capabilities”, *Strategic Entrepreneurship Journal*, Vol. 7, pp. 93–121.
West, J. and Bogers, M. (2014), “Leveraging External Sources of Innovation: A Review of

Research on Open Innovation", *Journal of Product Innovation Management*, Vol. 31 No. 4, pp. 814–831.
Winter, S.G. (2003), "Understanding dynamic capabilities", *Strategic Management Journal*, Vol. 24 No. 10, pp. 991–995.
Wynstra, J.Y.F., Van Weele, A.J. and B. Axelsson (1999), "Purchasing involvement in product development: A framework", *European Journal of Purchasing and Supply Management*, Vol. 5 No. 3-4, pp. 129-141.
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.
Yin, R.K. (2014), *Case Study Research: Design and Methods*, 5th ed., Sage Publications, Thousand Oaks, CA.
Zimmermann, A., Raisch, S. and Birkinshaw, J. (2015), "How is ambidexterity initiated? The emergent charter definition process", *Organization Science*, Vol. 26 No. 4, pp.1119-1139.

Appendix

Appendix Table A.1
Interview guide.

Sample questions
Please describe your work experience, current job responsibility, and how recently you have been involved in innovation/NPD projects.
For the next questions, we want you to focus on the last innovation/NPD project in which you were involved:
Please explain the innovation project and describe focus/topic, key participants (functions), duration, and targets o What exactly was your role in the innovation project? o Who was leading the project? o How were the internal and external members selected? By whom? o What changes occurred to the project structure? Why?
How was the information exchange organized between internal and external entities?
Can you please explain the decision-making process in your project?
Please describe the supplier's contribution. How was the supplier's contribution utilized? How does this relate to existing internal capabilities? How does this relate to commercialization opportunities?
What information was provided to the supplier team? Specifications? Targets?
Please describe the team spirit? How was the team supported by other parts of the company?
Can you please elaborate on the strengths and weaknesses of your innovation process? The innovation project overall? o What were key challenges? o What practices worked well? What didn't work, and why?
Please give an example of specific activities performed …Please describe the … process in detail.
How would you evaluate the project's innovation outcome when compared to targets or prior projects? o What was the project outcome? When was it achieved? o How was the project outcome perceived by top management?
How does your organization compare to your competition in terms of financial performance? Innovation performance? Quality? Agility or Responsiveness?
What would be your recommendations (lessons learned) for future projects? Why?
Is there anything else that you would like to add at this point?

Note: The interviews involved additional probing and follow-up questions depending on the situation.

Appendix Table A.2
Case Descriptions.

Case	Overview	Nature of Innovation	Environmental Uncertainty	Role of Purchasing	Driver of Innovation Project	Important Changes	Project Size, Relevance, Duration
ALPHA	ALPHA is an organization offering High-Tech equipment with a global supply chain. Headquartered in Europe, a very large percentage of their revenues is generated in Asia. Structured in multiple divisions, they offer a relatively broad range of products and services. Recovering from relatively mediocre financial performance in the past, ALPHA has shown tremendous growth in profits in recent years.	Adopting new technology: New development of a multi-million $ High-Tech product (not a derivative but new product category) using new technology (technology is not new to the world but new to ALPHA). Innovation Outcome: New product-service bundle including training, maintenance, and spare parts supply. However, the product category represents only a market niche and much lower projected sales than the main revenue-generating cash cow products.	High level of technological uncertainty due to the use of new materials and processes (high technological risks). Relatively high supply market uncertainty (only a few capable suppliers). Low level of customer market uncertainty (firm governmental contract).	Purchasing is supporting the program organization with PO practices such as managing supplier selection, involvement, and development; also facilitating the communication and collaboration with the suppliers.	A large program organization is driving several concurrent projects of different work packages.	No changes since the start of the innovation project/program.	Large multi-million $ development program encompassing several projects; large headcount involved. The program has a relatively low level of commercial importance in terms of revenue and profit potential. However, the program provides a strategic opportunity to adopt and learn a critical new technology on a large-scale project. The project duration is greater than five years.

Appendix Table A.2 (continued)

Case	Overview	Nature of Innovation	Environmental Uncertainty	Role of Purchasing	Driver of Innovation Project	Important Changes	Project Size, Relevance, Duration
BETA	BETA is significantly larger than ALPHA, but both companies are competing in many similar markets. However, in contrast to ALPHA, BETA is also an important "player" in other margin-strong market segments. BETA has experienced substantial growth in terms of revenue and profitability in recent years. As part of a strategic repositioning of the organization, BETA has introduced new business models including new services.	Incremental innovation with technology advancements: The product development project is a derivative (but with major advancement) of a highly successful, highly profitable main product line. The new product will be attractive to the existing customer base plus new market segments.	Medium level technological and customer market uncertainty, and low to medium level supply market uncertainty. Large customers have "pushed" for this new product development and have made initial orders to justify the program start. However, customers can still cancel their orders so BETA is facing a higher customer market uncertainty than ALPHA. New product benefits from very long product-use cycles.	Purchasing has established a specific internal group to manage the suppliers involved in product development and work closely with the product development engineering group. Purchasing maintains the commercial and legal aspects (including IP rights) and ensures that those are recognized while engineering is interacting with the suppliers. Purchasing is interfacing with many functions (plus external suppliers), is dependent on receiving key information, and stirs collaboration (emphasis on cross-functional and external integration).	Similar to ALPHA, a program organization is leading the project (responsible for project management and for coordinating the various project activities).	A recent change was to install internal co-location of the specific purchasing group with the corresponding engineering group to enhance internal collaboration.	Large multi-million $ development program encompassing several projects; large headcount involved. The program has a relatively high level of strategic importance for BETA. The project duration is greater than five years.

Appendix Table A.2 (continued)

Case	Overview	Nature of Innovation	Environmental Uncertainty	Role of Purchasing	Driver of Innovation Project	Important Changes	Project Size, Relevance, Duration
DELTA	DELTA is providing technologically-advanced logistics equipment across the world. Experiencing relatively low margins, DELTA is engaged in many heavily competitive market segments. They attempt to differentiate themselves through innovativeness to enhance profitability and to overcome their financial struggles. Nonetheless, they show a relative decline in revenue and profits in recent years.	Incremental innovation: The project relates to new product development (refinement of an existing product by adding new technical features) to meet new requirements / specifications from customers. Customers have expressed some interest in the new product. NPD outcome will serve a stable, slightly growing market segment (relatively low margins).	Relatively low technological and supply market uncertainty but medium level customer market uncertainty.	Purchasing is a core element of the new product development process and has responsibility for the product costs. A purchasing project manager collaborates with the NPD program manager. Purchasing is represented in a cross-functional team.	A cross-functional group made the strategic decisions to start the NPD project (project prioritization and budget allocation). A program manager is responsible for managing the cross-functional project (responsible for timeline and technology).	Purchasing has implemented a supplier day early-on and also increased co-location of critical suppliers on-site during the NPD project.	A relatively small project compared to ALPHA and BETA. Medium level importance for the organization. The project duration is about 1- 1.5 years.

Appendix Table A.2 (continued)

Case	Overview	Nature of Innovation	Environmental Uncertainty	Role of Purchasing	Driver of Innovation Project	Important Changes	Project Size, Relevance, Duration
ZETA	In the past, ZETA has been engaged mainly in the automotive supplier market and related industry segments. In recent years, they have successfully branched out to new, higher-margin markets. The new strategy appears to pay off for the company as reflected in strong revenue growth and an even more substantial increase in profits.	Incremental innovation: A new product is developed (based on an existing product) in close collaboration with specific customers to ensure meeting their requirements (but still high customer risk). Relatively modest margins and noticeable competition are expected for the new product.	Relatively low technological and supply market uncertainty but high level customer market uncertainty. High cost pressure and Customer risk: High customer uncertainty because customers have pulled out in the past (no guarantees that the end product will be purchased by the target customers); Technological uncertainty: Changes in raw materials require an investment in new equipment (however, the change is categorized with a relatively low level of technical complexity).	Purchasing conducts supplier selection and maintains relationships with suppliers (issues request for quotations/ proposals to suppliers for materials or components). Purchasing is a member of the cross-functional NPD team.	The marketing function is initiating the NPD efforts and triggering the NPD project. ZETA is utilizing a stage-gate process with gate reviews. A project manager is leading the NPD project with a cross-functional team.	The project manager is usually coming from the engineering organization. In the future, ZETA wants to establish a separate project management organization (PMO), separate from the engineering function, to lead the NPD projects.	The project is much smaller than the ALPHA and BETA projects and is rather routine. It has relatively low importance for the organization. High cost pressure. The project duration is about 1.5 years.

Appendix Table A.2 (continued)

Case	Overview	Nature of Innovation	Environmental Uncertainty	Role of Purchasing	Driver of Innovation Project	Important Changes	Project Size, Relevance, Duration
ETA	ETA offers very innovative products and appears to be driven by STEM topics. Based on a global supply chain, the company offers High-Tech equipment in a diverse set of markets. Some of these markets are relatively cyclical. Furthermore, large project milestones can substantially influence the financial results. Currently, ETA appears to be struggling and shows relatively poor financial performance.	Incremental innovation: The project refers to a product redesign adding major new technical features and new functionality for multi-million equipment (but still the derivative of an existing product). Innovation Outcome: New product-service bundle including service package (maintenance and spare parts supply).	Low to medium level technological and supply market uncertainty but high level customer market uncertainty (highly cyclical / relatively volatile markets) High cost pressure and very high customer risk: Product demand depends on local economies in developing and emerging customer markets.	Purchasing is involved early on in the NPD project. Nonetheless, ETA is working on improving the information flow to purchasing (see “Important Changes” column).	ETA is utilizing a stage-gate process with gate reviews (similar to ZETA). The NPD program manager is leading the project.	ETA is doing a transformation project to enhance the effectiveness of purchasing involvement (information exchange) in the NPD stage-gate process. They will implement a "pre-gate three" step to provide early part numbers and materials specifications for long-lead items from engineering to purchasing because gate three is too late for some parts.	The project is a little bit smaller than the ALPHA and BETA projects but much larger than the DELTA and ZETA projects. Headcount: relatively large number of people supporting the NPD team. Medium level importance for the organization. The project duration is about 3- 4 years.

Appendix Table A.3

Low and High Levels of Structuring.

Structuring Categories	Low Intensity	High Intensity
Market Scanning	• Little/No systematic scanning processes • Emphasis on the existing supply network	• Active scanning to detect new suppliers • Processes to monitor other industries
Interface Development	• Relatively unclear interfaces • Suppliers are "left alone" and suffer from insufficient data • Constraints and requirements are unclear to the supplier	• Clear specification of interfaces • A detailed exchange about requirements • The supplier has timely access to all relevant data • Established liaison process
Trust Building	• Arm's length relationships with suppliers • "Contractual spirit" • Only minimum interaction	• The project team provides development support • "Partnering spirit" with mutually shared objectives • Frequent interaction
Resource Portfolio Updating	• Little knowledge about supplier technological capabilities • Little/No awareness of recent developments of suppliers • No systematic process to utilize external technology	• Established a process to assess supplier capabilities • Systematic use of external expertise • Monitoring of technological readiness and compatibilities of the supply base

Appendix Table A.4

Low and High Levels of Bundling.

Bundling Categories	Low Intensity	High Intensity
External Coordination	• Little/ No coordination between the project team and suppliers' processes • No procedures to coordinate workflows/actions and schedules	• Strong coordination between the project team and suppliers' processes • Established procedures to coordinate workflows/actions and schedules • Synchronized activities between focal firm and suppliers
Internal Alignment	• Functional silos • Little internal communication among departments/functions • No central platform to share data internally (functions suffer from data inconsistencies or incomplete data)	• Internal data sharing (e.g. central information platform for other functions) • Cross-functional alignment and joint decision-making toward suppliers (one voice to the supplier) • Frequent communication
Resource Integration & Reconfiguration	• Little/No collaboration with suppliers on a technical level • Neglect of suppliers' knowledge • Little/No learning from suppliers	• Close in-depth collaboration with suppliers on a technical level • Processes to effectively utilize suppliers' knowledge • Systematic learning from suppliers
Supplier Co-Location	• No ongoing physical presence of suppliers' staff members • Use of only (temporary) business travel	• Suppliers send staff to focal firm (ongoing continuous presence) • Supplier's engineers are physically on-site and integrated into development teams

Appendix Table A.5

Low and High Levels of Leveraging.

Leveraging Support Categories	Low Intensity	High Intensity
Customer Need Capturing	• Little attention to customer needs and customer requirements • No systematic process to verify/ensure the customer requirements are met	• High attention to customer needs and customer requirements • A systematic process to verify/ensure the customer requirements are met • Informing customers continuously or bringing them onboard for milestones
Customer Interface Management	• Infrequent information exchange with customers • No process to obtain feedback from customers	• Regular information exchange with customers • Established process requesting feedback from customers

Appendix Table A.6
Validity and Reliability.

Criteria	Meaning	Application in this Research Study
Construct Validity	The research measures what it is intended to measure	Incorporating multiple sources of evidence (e.g., multiple informants, secondary data, empirical and conceptual literature) Verifying the initial findings with other scholars and practitioners
Internal Validity	Relationships among constructs are demonstrated and conclusions can be drawn	Triangulating data (interview data, secondary data, academic literature) and supplementing interview data with other data sources (publicly available information) Conducting member checks (review of findings by and discussion with practitioners) Reviewing study findings with uninvolved scholars
External Validity	The results can be applied to the population of interest. A domain is established in which the findings can be generalized	Using multiple respondents and multiple industrial contexts for the interviews Sampling purposeful and including organizations from different countries
Reliability	Repeatability is demonstrated	Applying an interview guide with common questions Using NVivo software for coding, annotating, and memo-writing Developing a case study repository with multiple data sources (interview data, secondary data, and literature)

Adapted from Yin (2014), Creswell (2014), Bals and Tate (2018)