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# Supply chain innovation: a framework of public procurement as a demand-side innovation driver

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## Abstract

**Purpose** – Much of the supply chain innovation (SCI) literature has focused on innovation as driven by supply-side factors that often lead to incremental product changes. Such marginal innovation outcomes make suppliers less responsive to government buyers' innovation needs for addressing societal challenges. Building on this observation, this article conceptualises how a demand-side innovation driver, namely public procurement, influences SCI radically and incrementally from downstream.

**Design/methodology/approach** – Employing the conceptual research approach and following established guidelines for building theory and conceptual development in management and supply chain research, we re-examine the SCI literature for existing assumptions about government innovation procurement and explain how public procurement may spur radical and incremental innovation across a supply chain. The article draws on network theory lenses to propose a framework that enhances government's innovation-oriented procurement role in SCI.

**Findings** – Our supply chain innovation-oriented procurement (SCIP) framework explains that government buyers, through demand articulation (i.e. precise, or outcome-based), may stimulate focal suppliers' responsiveness to generate their desired innovation – incremental or radical. While precise demand articulation often leads to incremental innovation, clear outcome-based demands favour radical innovation more as they allow for creative and alternative solutions. Radical and incremental innovation are not mutually exclusive and automatic. Their relationship with demand articulation is mediated by suppliers' responsiveness (i.e. supply size and absorptive capacity), whose effect on innovation outcome is further moderated by network complexities.



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*Erratum:* It has come to the attention of the publisher that the article Adjei-Bamfo, P., Djajadikerta, H. G., Jie, F., Brown, K. and Kiani Mavi, R. (2025), "Supply chain innovation: a framework of public procurement as a demand-side innovation driver", *International Journal of Physical Distribution & Logistics Management*, Vol. 55 No. 11, pp. 118-143. https://doi.org/10.1108/IJPDLM-06-2024-0237 included incorrect affiliation details for the second author Hadrian Geri Djajadikerta. The affiliation has been updated to "School of Accounting, Economics and Finance, Curtin University, Perth, Australia" in the online version of the article.

This error was introduced during the article publication process, for which the publisher apologises.

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**Practical implications** – Purchasing managers may use the proposed SCIP framework to determine the relevant demand articulation for their innovation procurements based on the nature and degree of innovation desired. Buyers will understand the crucial role of high absorptive capacity for supplier responsiveness and radical innovation even in complex supply networks. Also, buyers may better manage suppliers' tendency to avoid innovation risks and costs associated with innovation-oriented contracts by facilitating their access to complementary innovation resources.

**Originality/value** – The article addresses a gap in the SCI literature with new insight into how innovation procurement as a demand-side innovation driver influences SCI in the context of the downstream supply chain in addressing societal problems. We also propose a SCIP framework that helps manage SCI efforts in innovation procurement.

**Keywords** Supply chain innovation, Innovation procurement, Supply network, Public procurement

**Paper type** Conceptual paper

## 1. Introduction

Governments have employed various strategies and initiatives to support innovation capacity in supply chains to address grand societal challenges such as climate change, environmental damage, global pandemics, and social inequities (Wesseling and Edquist, 2018). These problems often transcend regional and national borders, potentially negatively affecting larger populations and communities (Voegtlin *et al.*, 2022). Prior research (Chang and Andreoni, 2020; Luomaranta and Martinsuo, 2020; Kabadurmus, 2020) suggests that a concerted effort by government and nonstate actors, including firms, is needed to explore innovative supply chain solutions to address these challenges by creating value for stakeholders. Public procurement, which stood at US$11 trillion of global GDP in 2018 (World Bank, 2018), presents a powerful incentive for policymakers to stimulate innovation among supply firms and towards achieving Sustainable Development Goal 12.7.

Existing research (Luomaranta and Martinsuo, 2020; Kabadurmus, 2020) advances that supply chain innovation (SCI) (i.e. changes to products and processes across the supply chain) occurs through technology advancement, supplier partnerships, response to uncertainties, changes in customer taste and changes in business processes. We focus on the responsiveness of the supply chain in meeting customers' new demands and responding to dynamic market conditions. Supplier responsiveness encompasses both operational agility and relational dynamics, and is crucial to enable suppliers to meet buyer needs effectively (Bellamy *et al.*, 2014; Choi and Krause, 2006; Gulati *et al.*, 2011). Through industry policies like patent laws, tax rebates and fiscal injections, governments support supply firms' capacity to find innovative ways to address public challenges (Chang and Andreoni, 2020). In this article, we refer to such strategies as supply-side innovation drivers, as they are characterised by firms' internal efforts and lobbied government support to innovate.

Although these supply-side innovation drivers could be effective (Kabadurmus, 2020; Jia *et al.*, 2019; Guan and Yam, 2015), they are often inadequate in making the supply chains more promptly and accurately responsive to governments' innovation needs. For example, Jia *et al.* (2019) examined the effect of incentive systems to promote indigenous innovation and found that the fiscal support extended to supply firms only led to a high quantity of patents with high product similarity. Such supply-side innovation initiatives created marginal and incremental changes in products, and they rarely resulted in radical innovation to the supply chains, making focal suppliers (i.e. representatives of the supply network who interact directly with buyers and coordinate their network along its supply chain towards buyers' needs) less responsive (Uyarra *et al.*, 2020; Shin and Lee, 2022; Voegtlin *et al.*, 2022).

Incremental innovation involves steady, small improvements to products/processes. Over time, these changes help boost efficiency, cut costs, support learning and growth within the organisation, and make it easier to adapt to change without causing major disruptions (Chapman *et al.*, 2003). While it is useful, combining it with radical innovation helps firms exploit current capabilities while also exploring new opportunities, enabling sustainable solutions and responsiveness to addressing societal challenges. Radical innovation involves transformative changes that fundamentally alter supply chain structures and processes (Wagner and Sutter, 2012). Focal suppliers often overlook transformative and radical changes in supply chains as they are mostly preoccupied with controlling and coordinating the complexity of their diverse networks. Network complexity refers to the differences among members of a supply network and their intricate interactions. While network complexity introduces challenges in coordination and risk management, it also presents opportunities for greater resilience and responsiveness if strategically managed (Choi and Krause, 2006; Sharma *et al.*, 2020).

Analogous studies (Kusi-Sarpong *et al.*, 2019; Uyarra *et al.*, 2020; Viale *et al.*, 2022) have suggested that new requirements in public procurement and effective coordination of supplier relations may promote transformative innovation outcomes in supply chains. Public procurement refers to how government agencies acquire goods (e.g. office supplies and defence hardware) through buying, leasing, and renting, engaging service providers in providing citizens with public goods, essential services and works such as buildings, roads and bridges (Uyarra *et al.*, 2020). Traditional public procurement promotes transparency, accountability and fair competition among tenderers in the evaluation and selection processes (Quiroga *et al.*, 2021; Brown *et al.*, 2012). While these principles help prevent potential bid-rigging and collusion and ensure fairness in the supplier selection process (Bawole and Adjei-Bamfo, 2019; Lember *et al.*, 2011), they often hinder innovation outcomes as they impede supplier collaborations essential for information and knowledge sharing.

The innovation procurement literature (Edquist *et al.*, 2015; Foss and Bonacelli, 2023; Aschhoff and Sofka, 2009; Edler and Georghiou, 2007) repositions public procurement as an innovation policy instrument to demand new or improved technologies and products (including services hereafter) from suppliers. It is increasingly recognised as a powerful demand-side innovation policy tool, where governments influence innovation not by directly funding research and development (R&D) but by acting as sophisticated buyers of innovative goods and services through demand articulation (Edquist and Zabala-Iturriagagoitia, 2012). Demand articulation in procurement involves how buyers' needs and requirements are defined, and markets are identified. For instance, while Uyarra *et al.* (2020) discuss various scenarios where public procurement is adopted in innovation policy to advance economic diversification, Kusi-Sarpong *et al.* (2019) observe that government demands for new standards in procurement may engender the production of new products and processes that are environmentally and socially friendly.

Despite existing research on public procurement and innovation (Uyarra *et al.*, 2014, 2020; Adjei-Bamfo *et al.*, 2023), there is still scant knowledge about how public procurement influences supply chains to be more responsive to governments' urgent and unique product needs. Therefore, this article attempts to answer the question: *how can public procurement influence supply chain response to government innovation needs in urgent and unique product situations?* Our research examines the role of government procurement in driving SCI from the downstream supply chain context and making supply chains responsive to public buyers' innovation needs. In this article, we draw on network theory lenses to propose a supply chain innovation-oriented procurement (SCIP) framework that explains how demand articulation in public procurement could influence supplier responsiveness and consequently lead to radical (and not just incremental) innovation from supply chains.

Our article makes three important contributions to theory. First, this article contributes to the SCI literature by advancing procurement as a demand-side innovation driver to complement existing supply-side innovation initiatives. Existing research on supply-driven SCI (Kabadurmus, 2020; Luomaranta and Martinsuo, 2020) has discussed how technological advancement, strategic alliances among firms, and change in business processes as factors underpinning innovation outcomes within the upstream supply chain. However, these studies do not consider the effect of industry and macro conditions, supply network complexities and the role of unique customer demands in SCI (Wang *et al.*, 2023; Jia *et al.*, 2019) – resulting in marginal and less transformative outcomes. The article explains the dynamics of how communicating innovation needs may generate either incremental or radical innovation, depending on the focal supplier's responsiveness and ability to manage complexities in their supply networks.

Second, this article further explores the resource-based competitive advantage of firm alliances on innovation (Lavie, 2006). Innovation is considered a product of a social network shaped by the interconnectedness of firms both upstream and downstream of the supply chain (Muller and Peres, 2019). With this observation, our research provides insight into government efforts to facilitate alliance formation among suppliers toward mobilising innovation resources through procurement. We critique the mainstream public procurement practices that are characterised by strict supplier competition and discourage alliance formation and information sharing among suppliers to control potential collusion and bid-rigging (Brown *et al.*, 2012). New procurement approaches that promote knowledge exchange and supplier interactions and allow for creative solutions essential for radical innovation are encouraged (Choi and Krause, 2006).

Thirdly, this article offers a conceptual framework to guide managers responsible for buyer-supplier relationships to navigate the different responsiveness factors and network complexities influencing suppliers' willingness and capacity to bid and fulfil buyers' innovation needs. Compared to other innovation mechanisms, such as private sector R&D investment or industry consortia, public procurement stands out in its dual capacity to address public policy goals and catalyse innovation markets (Georghiou *et al.*, 2014).

The remainder of this article is structured as follows. Section 2 outlines the research approach. Sections 3 describe the key constructs of our SCIP conceptual framework, while Section 4 explains the logical relationship between the constructs of our framework. Section 5 discusses the framework, implications for theory and practice and avenues for future research. Finally, Section 6 provides our concluding thoughts.

## 2. Methods

We used a two-step approach to gain knowledge to answer our research question: *how can public procurement influence supply chain response to government innovation needs in urgent and unique product situations?*

First, to avoid the common problem of lack of breadth with most theory papers (Cropanzano, 2009) and to determine which concepts should be considered (i.e. the what) in explaining the topic (Whetten, 1989), we searched and consolidated existing knowledge for theory extension on this topic. We followed a structured review drawn on Durach *et al.*'s (2017) and Seuring and Gold's (2012) guidelines.

Existing relevant literature was searched from Scopus and Web of Science (WoS) databases due to their broad geographic and disciplinary coverage as well as their extensive use in management research (Fahimnia *et al.*, 2015). Search strings used were "supply chain" AND "innovation"; "public procurement" AND "innovation"; "supply network" AND "innovation"; and "innovation" AND "public procurement policy", without set date ranges. A total of 2,688 first-hit article outputs were obtained from the search (i.e. 1,440 from Scopus and 1,248 from WoS). Based on our research question, the inclusion criteria in Table 1 were developed by the research team and used by two members of the team to screen the articles.

Thirty-six articles were finally selected and synthesised (see Figure 1). Articles that met these criteria were included irrespective of their methodology and publication year. Only studies that discuss/focus on SCI at an industry level with innovation procurement or customer demand as a driver were included as being within scope. These articles were published in leading journals, including the *Journal of Operations Management* and *Research Policy*, between 2006 and 2023, with a significant growth in attention only since 2014.

Second, we synthesised in Section 3 the different streams of knowledge to develop a SCIP conceptual framework to bridge theory and practice with examples and scenarios. Developing a SCIP conceptual framework was relevant due to two reasons: (1) the limited available research on public procurement's role as a demand driver for SCI, and (2) the topic is theory-light – the existing literature has few theory articles (Cropanzano, 2009), with a theory/data ratio of about only a third (with review articles dominating).

**Table 1.** Inclusion criteria for research

| Inclusion criteria | Rationale |
|---|---|
| Research published anytime | Allows a large knowledge and evidence pool from peer-reviewed sources required to answer our research question. Time limits in the search and selection may cause selection bias Durach *et al.* (2017) |
| Research in the English language | The English language is the common language of the research team and is largely used in the research topic field Seuring and Gold (2012) |
| Peer-reviewed studies published in a journal | Peer-reviewed articles published in journals are considered to be of high quality compared to articles that are not peer-reviewed. Hence, conference proceedings, books, book chapters, and editorials were excluded |
| SCI studies that are policy-oriented | To gather relevant evidence to explain how government buyers regulate and stimulate SCI Wang *et al.* (2023) |
| Public procurement and policy research that aims to drive market/SCI | To gather relevant evidence to explain the procurement policy dynamics for promoting innovation in markets and industries through demand. Focuses on SCI driven from the demand side and downstream oriented |
| SCI studies that discuss supply network elements as an enabler | Gather evidence to explain how government agencies may regulate supply network activities to drive SCI |
| Include articles irrespective of their methods, theory, context, etc. | Aims to minimise selection bias Durach *et al.* (2017) |

**Source(s):** Authors' construct and based on previous works Durach *et al.* (2017); Seuring and Gold (2012)

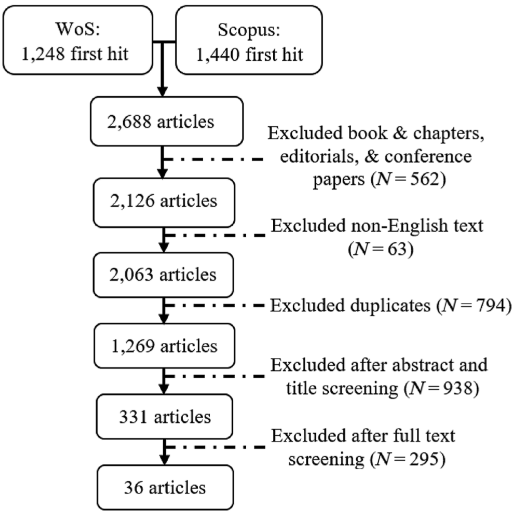


**Figure 1.** Selection process flowchart. Source: Authors' construct (based on article search and screening)

We adopted a conceptual review method following established guidelines for building theory and conceptual development in management (Cornelissen, 2017; Whetten, 1989; Alvesson and Sandberg, 2020), and particularly in supply chain management (SCM) studies (Wacker, 2004, 2008). While the framework explains how the concepts are related, we also formulate propositions that provide boundaries and conditions for these relationships (i.e. the how and why) to offer scientific and practical utility (Corley and Gioia, 2011).

## 3. Synthesis and development of the SCIP framework

We analysed the 36 selected articles, which include qualitative and quantitative studies, using an interpretive approach (Burrell and Morgan, 2019) to develop a new logic addressing how demand management in SCM enhances innovation. Drawing from diverse fields – purchasing and SCM, strategic and operations management, sociology, innovation policy and marketing – we synthesised existing insights and findings from the literature into our proposed SCIP framework (Patriotta, 2020). Incorporating social network theory's concept of synergistic resources (Kim, 2014) and recognising opportunism in public procurement, we explain how buyers and focal suppliers can reduce innovation risks and costs by leveraging innovative resources from network partners to boost supplier responsiveness.

Using the network theory to explain procurement's role in supply chain innovation offers a valuable contribution because it emphasises relational dynamics, knowledge exchange, and coordination mechanisms that are central to innovation in procurement settings (Choi and Krause, 2006; Sharma *et al.*, 2020). This framing was chosen over alternatives like transaction cost economics or resource-based views since it better accounts for collaboration, adaptability, and learning across diverse organisational boundaries, which are essential in public procurement's evolving innovation role (Uyarra *et al.*, 2014). The main constructs forming the components of our framework are summarised in Table 2.

### *3.1 Demand articulation*

Public procurement characterises an agency relationship between a buyer and supplier(s) (Jensen and Meckling, 1976; Adjei-Bamfo and Maloreh-Nyamekye, 2019). The process involves public buyers articulating a problem requiring innovative solutions that suppliers must address either in the form of a request-for-quotation, request-for-proposal or expression of interest (EOI) (Selviaridis *et al.*, 2023; Wesseling and Edquist, 2018). The relationship requires communication with potential suppliers and the supply chains about expectations to minimise goal conflicts in public procurement (Kauppi and Van Raaij, 2015).

**Table 2.** Key conceptual definitions

| Terminology | Adapted definition | Source(s) |
|---|---|---|
| Demand articulation | Buyer's degree of clarity in defining the innovation need or problem requiring innovative solutions from suppliers | Uyarra *et al.* (2014), Wesseling and Edquist (2018), Georghiou *et al.* (2014) |
| Supplier responsiveness | The swiftness and effectiveness with which suppliers use their creativity and/or manage their networks to meet buyers' innovation needs | Choi and Krause (2006), Gulati *et al.* (2011), Bellamy *et al.* (2014) |
| Networks | Two or more supply firms that are connected to share resources and create value for themselves throughout their supply chain | Lu *et al.* (2018), Kim (2014), Gulati *et al.* (2011), Carnovale and Yeniyurt (2015), Sharma *et al.* (2020), Cantu and Tunisini (2023), Bellamy *et al.* (2020) |
| Network complexity | Degree of differences between network members and their interactions in the network system | Sharma *et al.* (2020), Choi and Krause (2006) |
| Supply chain innovation | Incremental or radical changes in products or processes associated with members of a supply chain that create value for stakeholders | Kabadurmus (2020), Kusi-Sarpong *et al.* (2019), Luomaranta and Martinsuo (2020), Shete *et al.* (2020) |
| Innovation procurement | The use of procurement to demand new or improved products/services and to support or transform supply chains in critical industries | Kundu *et al.* (2020), Edquist *et al.* (2015), Adjei-Bamfo *et al.* (2023), Mazzucato and Robinson (2018), Foss and Bonacelli (2023), Jooriyan *et al.* (2023) |

**Source(s):** Adapted definition based on previous works in column three

Beyond knowing procurement policies and procedures, procurement managers also require technical knowledge about the problem, knowledge of the industry, and current innovation trends to ensure that the desired innovation addresses this need (Uyarra *et al.*, 2014). With this capacity, procurement managers define desirable standards that suppliers must meet. In this situation, the agency theory suggests that both the principal and agent are opportunistic and would not hesitate to optimise their self-interest (Wilhelm *et al.*, 2016; Holloway and Parmigiani, 2016). For example, while supply firms often aim to increase their profit margins and market share, government buyers seek improved products and innovative solutions worth their spending to address societal problems.

Communication gaps and goal incongruence in articulating buyers' needs may give rise to problems such as moral hazards and adverse selection (Eisenhardt, 1989). Adverse selection occurs when a supplier misrepresents their ability during the contracting process, knowing public buyers may not be able to verify the information fully and accurately. Alternatively, Eisenhardt (1989, p. 61) refers to moral hazard as a "lack of effort on the part of the agent". In this way, due to goal incongruence and communication gaps relating to how parties to a contract must behave, an advantaged party, mostly the agent (i.e. suppliers), shirks their responsibilities under an agreed contract to optimise their interest. This aspect poses a risk to the principal (i.e. public buyers).

In innovation procurement, buyers often employ either *precise specification demands* for standard products and desired incremental innovations or use *outcome-based demands* such as EOIs and request-for-proposals for nonstandard products to allow creative solutions that could lead to radical innovation. The buyer's clear and precise articulation of the technical specifications of their innovation need is critical to aligning their interests with those of the supplier firms (Kauppi and Van Raaij, 2015). However, precisely articulating demand may limit innovation to incremental outcomes and hinder radical innovation as it does not allow creativity in proposing unique and alternative solutions.

A recent empirical study (Kauppi and Van Raaij, 2015) has suggested that the principal (i.e. the buyer) may potentially also exercise opportunistic tendencies under honest incompetence – in Hendry's (2002) sense [1]. Honest incompetence occurs in demand articulation, where buyers have limited technical knowledge about their needs and cannot clearly communicate them to suppliers for their response. Supplier responsiveness to the buyer's articulated demands is discussed next.

### *3.2 Supplier responsiveness*

Supplier responsiveness refers to how promptly and accurately focal suppliers can respond to public buyers' articulated innovation demands (Choi and Krause, 2006). The buyer-supplier relationship is typically defined as linear or dyadic. In the context of innovation procurement, however, Selviaridis *et al.* (2023) suggest that institutional set-up for articulating demand underpins most of the challenges faced and recommend instituting structures that seek to support innovation procurement. Due to the increasing interdependence among these actors in order to fulfilment and value creation, a network perspective seems to provide richer insights into the multiple interactions and relationships occurring between supply firms and buyers (Choi and Krause, 2006).

Kim (2014) defines a network as "a broad set of firms that are motivated to accumulate tangible and intangible resources" (p. 220). The network offers supply firms the opportunity to build ideas and knowledge from interactions and relationships with both their internal and external partners. Besides knowledge, network firms also share various resources such as patent information and risk, giving them more of an urge to innovate (Burt and Burzynska, 2017). Networks increase both the capital flow and trust in the supply chain to enhance capabilities for SCI (Lu *et al.*, 2018). We, therefore, posit that *supply size* and *absorptive capacity* determine supplier responsiveness. These factors relate to how the buyer directs the innovation procurement process and identifies suitable suppliers.

*3.2.1 Supplier size.* Although a higher number of suppliers participating in a bidding process appears to translate into supplier responsiveness (Choi and Krause, 2006), the competitive pressure associated with a higher number of suppliers that engage with a buyer exposes suppliers to the risk of unsuccessful bids, denying them a chance of recovering invested innovation resources (Adjei-Bamfo *et al.*, 2023; Roumboutsos and Saussier, 2014). A high supplier number, therefore, affects suppliers' interest in bidding for government innovation procurement contracts and underscores the frequent use of preferred suppliers in a panel or framework agreement, restricted and single sourcing methods when unique or design changes are required (Kauppi and Van Raaij, 2015). A smaller supplier number engaging directly with a buyer, however, reduces innovation risk to focal suppliers, and buyers may potentially communicate their problem more effectively to fewer suppliers while making the innovation procurement process appear less competitive.



*3.2.2 Absorptive capacity.* Focal suppliers with innovation acumen also have a high response to market innovation demands (Bellamy *et al.*, 2014). Depending on the focal supplier's innovation orientation, they access additional diverse ideas and technologies from their external partners, interpret them, and translate this knowledge and information into innovation outcomes. This ability is known as *absorptive capacity* – the extent to which focal suppliers in the network can understand and utilise the network resources accessed to create new knowledge that can result in change (Bellamy *et al.*, 2014). Identifying suppliers with absorptive capacity in the innovation procurement process also moderates the relationship between the supplier's access to network resources and responsiveness to innovation needs.

### *3.3 Network complexity*

Suppliers form networks to draw on synergy resources and knowledge for innovation. Supply network members vary in various forms and relate differently among themselves, depending on the nature of their network structure. Sharma *et al.* (2020) and Choi and Krause (2006) define network complexity as the degree of differences between network members and their interactions in the network system. These differences give rise to network complexity, which Choi and Krause (2006) consider a critical issue that must be managed to achieve desired network outcomes. For example, members of a supply network may vary in terms of spatial complexity – their geographic spread (Sharma *et al.*, 2020), interconnectedness – either densely or sparsely (Bellamy *et al.*, 2014), accessibility to network resources (Gulati *et al.*, 2011; Burt, 1992; Burt and Burzynska, 2017), and vertical complexity – members' closeness to the focal supplier or downstream (Sharma *et al.*, 2020). For the purposes of parsimony of our conceptual framework, however, we focus on network interconnectedness and network resource accessibility.

*3.3.1 Network interconnectedness.* Network interconnectedness refers to the various potential sources from which supply network members can access innovation resources due to their association with other network members (Bellamy *et al.*, 2014). The connection of network members shows the extent to which the focal suppliers' network partners are directly connected to each other. Network members may be either densely or sparsely connected. A densely interconnected network implies that a large number of the focal supplier's network partners share direct links without intermediaries. Bellamy *et al.* (2014) suggest that for a network to be considered densely interconnected, there must be at least three direct links connecting the focal supplier's network partners. With sparsely interconnected networks, however, almost none of the focal suppliers' network partners share a direct link among themselves besides their links to the focal supplier, creating the need for brokerage through intermediaries (Burt, 1992; Burt and Burzynska, 2017).

Generally, it is assumed that dense interconnectedness positively influences innovation because interconnectedness presents network members and the focal supplier with multiple knowledge and other innovation resource sources from which they may tap. These interconnections also suggest congruent goals among network members, effective communications and clear translation of buyers' needs to network members in the supply chain. Public sector procurement regulations on anti-trust laws, mergers and acquisitions, and patent laws often limit such interconnection by controlling unfair supplier partnerships and associations, especially in bidding for public contracts. These regulations and related methods used may also hinder focal suppliers' access to vital innovation resources (Uyarra *et al.*, 2014).

*3.3.2 Network resources accessibility.* The capacity of suppliers to introduce product changes in response to buyers' articulated innovation demands largely depends on their ability to broker network resources. How effectively focal suppliers can access information and knowledge resources for innovation is critical. Although buyers often assume that network members have homogeneous characteristics with the same access to their network's resources, studies on network characteristics (Bellamy *et al.*, 2014; Muller and Peres, 2019; Gulati *et al.*, 2011) disagree with this assumption.

Gulati *et al.* (2011), for example, suggest that network members have different levels of capacity and position within the network structure that influence their access to network resources. The supplier's ability to leverage network resources to achieve innovation outcomes depends on the *reach*, *richness*, and *receptivity* of their network structure (Gulati *et al.*, 2011). *Reach* details the extent of a supplier's connection with network partners and how close a supplier is to its network members. This aspect implies that the closer a supplier is to other network members, the easier it is for the supplier to formally and informally access resources from network members and the network as a group. *Richness* describes how useful and unique a network resource is to the supplier (e.g. new technology, useful patent information, an investment pool, useful market information, or access to critical raw materials and skilled personnel) to facilitate a response to buyers' innovation needs. Lastly, *receptivity* refers to the extent to which suppliers can access and use network resources across the network boundaries – explained by Burt (1992) as network brokerage – for radical innovation.

### *3.4 Supply chain innovation: incremental vs. radical*

The SCI literature (Kabadurmus, 2020; Kusi-Sarpong *et al.*, 2019; Luomaranta and Martinsuo, 2020; Shete *et al.*, 2020) defines SCI as incremental and radical changes in products, processes, or technology that occur in the production activities of supply firms, among supply chain members, or in an industry that creates value for stakeholders. SCI features as an outcome of several strategic decisions that the management of focal suppliers and their supply chains implement (Goodale *et al.*, 2011). Goodale *et al.* (2011) advance eight innovation areas, which may be categorised into product and process innovation (see Prajogo, 2016). Product innovation is often, however, the primary interest of government innovation procurements (Wesseling and Edquist, 2018).

Innovation is driven by a supply firm's effort to adapt to the changing business environment such as increasing global concerns for environmental and social well-being in production and manufacturing (Kusi-Sarpong *et al.*, 2019). Supply firms may also invest in their research and development (R&D), upskill employees and improve entrepreneurial acumen to design new desirable products and industrial processes. Others also lobby for government support, like tax rebates and patent policies (Jia *et al.*, 2019). Supply firms form alliances to leverage synergistic resources to innovate (Carnovale and Yeniyurt, 2015).

While effective interaction with other firms upstream and downstream of the supply chain minimises innovation risk and enhances SCI, the information and knowledge resources shared by members of a supply network also contribute to enhancing product innovation and operational efficiency (Kusi-Sarpong *et al.*, 2019), competitiveness (Kabadurmus, 2020; Wang *et al.*, 2023), and profitability of their supply chain (Luomaranta and Martinsuo, 2020). The innovation literature advances two main streams of innovation drivers: demand-driven (Uyarra *et al.*, 2014; Edquist *et al.*, 2015) and supply-driven (Hottenrott and Lopes-Bento, 2016; Guan and Yam, 2015). We consider the above initiatives as supply-side innovation as they are driven by suppliers' own efforts.

These supply-side SCI initiatives are inadequate for two key reasons. First, the available studies focus on firm-level and do not consider industry and macro conditions that affect SCI. Although the supply network literature (Sharma *et al.*, 2020; Cantu and Tunisini, 2023; Bellamy *et al.*, 2020) have established a positive effect on focal suppliers' innovation, the existing SCI studies do not account for the effect of complexities on supplier responsiveness and how these effects lead to radical or incremental innovation outcomes. Second, the role demand-driven initiatives, such as public procurement, play in SCI has not been explored yet. Knowledge of how customer demands (i.e. as part of the changes in the business environment) and how the nature of articulated demands influence SCI is also limited. Demand-driven innovation involves customer demand from buyers and pertains to innovation driven by new customer tastes and new product features (Uyarra *et al.*, 2014; Shin and Lee, 2022; Edquist *et al.*, 2015). Since supply-side SCI initiatives are often left within the whims and caprices of suppliers, they have often led to marginal and incremental innovation outcomes even with formal government support (Jia *et al.*, 2019).

Depending on the nature of buyers' innovation needs, focal suppliers diversify their existing products to respond, as innovation involves either incremental or radical change to a product (Uyarra *et al.*, 2020; Kabadurmus, 2020). Radical innovation relates to the creation of major disruptive changes to products or processes. Roumboutsos and Saussier (2014) suggest that radical innovation is mostly capital-intensive and involves sunk cost – irrecoverable investments. This potential sunk cost is generally a disincentive for most firms to pursue radical innovations with social interest exceeding their private returns (Wesseling and Edquist, 2018; Roumboutsos and Saussier, 2014). This situation leads to an excessive focus on incremental innovation by leveraging the positive externalities from their interactions with the few supply firms that bear the sunk cost and with whom they are connected within a network, either directly or through an intermediary (Roumboutsos and Saussier, 2014).

Incremental innovation involves a continuous and marginal advancement in a product or the process of change (Roumboutsos and Saussier, 2014). Small startup firms are considered risk-takers and with the capacity to introduce more creativity into various industries due to the unique ideas with the potential to create radical innovation. Alternatively, large incumbent firms are generally considered to be risk-averse, efficiency-oriented, less agile and resistant to change, and often end up exploiting positive innovation externalities towards incremental innovation (Roumboutsos and Saussier, 2014).

## 4. Formulation of propositions

From our synthesis and development of a SCIP conceptual framework, four main constructs are crucial for understanding and managing how public buyers may influence supply chains' response to innovation needs in urgent and unique situations. These constructs include demand articulation (Wesseling and Edquist, 2018; Uyarra *et al.*, 2014), supplier responsiveness (Selviaridis *et al.*, 2023; Choi and Krause, 2006; Bellamy *et al.*, 2014), network complexity (Sharma *et al.*, 2020; Choi and Krause, 2006) and the nature of innovation desired (i.e. incremental or radical) (Roumboutsos and Saussier, 2014; Wesseling and Edquist, 2018).

Our theory article follows a propositional style (Cornelissen, 2017) to define relationships between these constructs through clear, logically structured statements in the form of testable propositions. We propose a non-linear relationship between demand articulation and innovation (i.e. incremental and radical), as shown in Figure 2. These propositions are

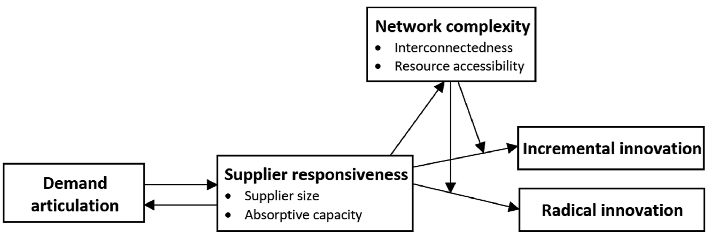


**Figure 2.** Conceptual framework: supply chain innovation-oriented procurement (SCIP). Source: Authors' construct

justified with existing theory or evidence, ensuring internal coherence and specifying the scope or boundary conditions of the theory. With this style, we provide our SCIP framework for empirical testing and to support cumulative knowledge development on the topic.

*4.1 Demand articulation, supplier responsiveness and innovation*

Unclear technical specification hinders innovation procurement outcomes (Uyarra *et al.*, 2014; Kauppi and Van Raaij, 2015). Innovation procurement requires an effective framing of the problem to be solved by suppliers. Articulating demand clearly has proven essential in different government innovation procurement forms, such as competitive dialogue, pre-commercial procurement, innovation partnerships and public–private partnerships (Haugbølle *et al.*, 2015; Roumboutsos and Saussier, 2014). Besides clearly articulating to suppliers the problem requiring a unique solution, Wesseling and Edquist (2018) suggest that initial proposals from suppliers should also be translated into functional requirements. These requirements must be both narrow enough to direct the innovation process and broad enough to encourage technological variety and creativity to achieve radical innovation outcomes (Wesseling and Edquist, 2018). For example, competitive dialogue offers a two-stage process where public buyers discuss the problem and contract terms with suppliers and then gather technical details about the solution (Haugbølle *et al.*, 2015).

While precise specifications, such as request-for-quotations, are often used for standardised needs, other outcome-based demands are also used to communicate dynamic problems and urge suppliers to create unique solutions. The latter fosters an environment conducive to experimentation and radical innovation by shifting the focus from compliance to performance. For example, Bastianin *et al.* (2025) demonstrate how the European Organisation for Nuclear Research's (CERN) performance-based procurement facilitated breakthroughs in sensor design and material performance by encouraging suppliers to propose novel solutions under technological ambiguity. These contracts also generated spillovers into commercial markets. In the renewable energy sector, governments in the Netherlands, Denmark and the United Kingdom have also used outcome-based demands to stimulate radical innovation in the wind and solar infrastructure industry. Rather than mandating specific technologies, tenders emphasised energy efficiency metrics (OECD, 2024), spurring advances such as floating offshore wind farms and advanced blade technology. These initiatives contributed to a 70% cost reduction in offshore wind energy (OECD, 2024).

*P1a.* Precise specification demands generally enhance focal supplier responsiveness but predominantly lead to incremental innovation by limiting supplier creativity.

*P1b.* Outcome-based demands tend to facilitate radical innovation, especially within project-based sectors such as construction and energy, by allowing greater supplier flexibility and creativity.

Effective demand articulation is also necessary for supply chain relationship management (Lambert, 2008), and it helps focal suppliers manage, coordinate and align the activities of their network partners toward fulfilling the buyers' needs. Articulating demand via a close buyer-supplier interaction, buyers may gain insight into focal suppliers' absorptive capacity and network size, which demonstrates their potential responsiveness. Innovation procurement promotes collaboration and systematic coordination of innovation efforts among suppliers through industry consortia and innovation partnerships (Roumboutsos and Saussier, 2014), among others. However, the former often require intensive governance and may struggle to align diverse interests (Klerkx and Leeuwis, 2009), and suppliers' absorptive capacity may also differ. Thus, focal suppliers with high absorptive capacity exhibit high innovation acumen and can effectively understand buyers' needs, access relevant external innovation resources from their network partners and translate these resources into the desired innovation outcomes (Choi and Krause, 2006).

Suppliers with high absorptive capacity and clear demand articulation can help in aligning SCI with socially desirable directions (Georghiou *et al.*, 2014; Uyarra *et al.*, 2014; Wesseling and Edquist, 2018). Effectively communicating desired product specifications enhances focal suppliers' responsiveness to the innovation needs of buyers. However, where a focal supplier deals with a large number of diverse network members, complexity arises from this diversity, affecting the clarity and ease of translating the articulated innovation needs to elicit the desired innovation outcomes from the supply chain.

*P1c.* In networks characterised by low complexity and fewer intermediaries, precise specification demands may increase opportunities for radical innovation due to more effective communication and coordination.

*4.2 Supplier responsiveness, network complexity and innovation*

The decision to develop new products foremost depends on a supplier's *absorptive capacity* (Bellamy *et al.*, 2014). The more a firm diversifies to create disruptive products, the more it experiences escalating costs for controlling and coordinating additional experimentation and production processes associated with developing radical products (Ajay and Madhumathi, 2015). Therefore, radical change is considered more capital-intensive and occurs less frequently. This is also because producing unique products involves additional investment in new technology and skills toward new product segments (Monteforte and Staglianò, 2015). Some focal suppliers internally generate innovation resources from experimentation, simulations, and prototyping. Buyers may, therefore, invite proposed solutions from focal suppliers to assess their absorptive capacity. Without the innovation acumen and absorptive capacity to access and use innovation resources, new requirements in procurement will deter supplier firms from radical innovation – although it is a catalyst for technological invention and economic industrialisation (Uyarra *et al.*, 2020).

For example, in the Dutch water construction sector, Wesseling and Edquist (2018) analyse an innovation procurement effort in building a radically new flood barrier technology by adopting a developmental perspective, which identifies and selects supply firms with strong R&D capabilities. However, this approach tends to hinder SMEs who are mostly resource-constrained with limited R&D investments (Saastamoinen *et al.*, 2018). Exploring this innovation behaviour among SMEs in Finland, Saastamoinen *et al.* (2018) suggest partnerships among similar SMEs would help build their absorptive capacity by complementing their resources for innovation. Hence, there is a need for buyers to employ innovation procurement methods that both identify suppliers with high innovation orientation and allow alliance formation to access and effectively leverage additional external knowledge and information resources from partners.

*P2.1a.* High absorptive capacity increases a focal supplier's responsiveness to outcome-based buyers' articulated demands.

Besides absorptive capacity, a larger supplier size and network, although increase the focal supplier's access to wider sources for network resources, a large network size generally increases network complexity. An increase in network complexity reduces the focal suppliers' ability to control and coordinate their network's innovation effort, such as reducing information gaps in the network. Consequently, innovation procurement methods often maintain smaller supplier size and prefer simpler networks to reduce procurement risk and to enhance clearer communication of innovation requirements to participating focal suppliers (Uyarra *et al.*, 2014; Kalvet and Lember, 2010). Maintaining smaller supplier size and simpler networks through restricted tendering, preferred supplier lists, or single-sourcing methods also somewhat assures suppliers of recovering their invested innovation resources and reducing the risk of sunk costs (Adjei-Bamfo *et al.*, 2023).

*P2.1b.* High absorptive capacity may also enhance radical innovation in simpler networks.

It must be noted that using methods that allow too few suppliers, such as single-sourcing, may limit transparency and visibility in the buyer-supplier interaction. Swink *et al.* (2024) emphasise the importance of visibility of such inter-organisational relationships and is even more crucial where matters of public interest are involved. To avoid privileging a few potential suppliers, potentially breeding corruption and to promote visibility in the supply chain for the buyers in gathering market intelligence, Wesseling and Edquist (2018) recommend a two-step innovation procurement process where: (1) all interested suppliers are foremost invited to offer their diverse solutions and (2) those with desirable solutions are later selected to participate in actual tender. Therefore, buyers must attract and provide security for potential suppliers to offer intelligence about potential new solutions in the market and maintain and engage with a reasonable number of suppliers who have networks with minimal complexity. While a minimal supplier number enhances suppliers' interest in bidding for government innovation procurement contracts, a reasonable supply size reduces the focal supplier's burden of coordinating a complex and diverse supply network.

*P2.2a.* Large supply and network size negatively affect a focal supplier's responsiveness to the buyer's articulated demands.

*P2.2b.* The negative impact of large supply and network size leads to incremental innovation.

*P2.2c.* A densely interconnected network with reach and greater access to network resources may enhance a focal supplier's responsiveness, but it is insufficient to increase radical innovation under outcome-based specifications.

High responsiveness from a focal supplier with a simpler network and high absorptive capacity eventually results in incremental innovation in the long run. Thus, high supplier responsiveness exposes procurement managers to more technical knowledge about the problem and innovation trends within the industry in question (Uyarra *et al.*, 2014). Wang *et al.* (2023) suggest that when the technological capabilities of a supplier and a buyer are that high, SCI is negatively affected due to the tendency of buyers and network members becoming complacent and less motivated to amend existing practices. Public buyers whose ethos, among others, is to promote value for taxpayers' money through competitive procurement often leverage this technical knowledge to further design precise specifications in articulating future innovation demands, resulting in incremental innovation at the expense of radical innovation.

*P2.3.* Supplier responsiveness enhances buyer confidence and technical knowledge, which may lead to more precise demand articulation in future innovation procurements.

### *4.3 Network complexity and innovation*

Innovation procurement generally aims to promote responsive focal suppliers by encouraging supply networks and to accumulate synergy and external innovation resources (Saastamoinen *et al.*, 2018). Government interventions in the form of public procurement policy, either through direct innovation procurement (buyer as end-user), catalytic innovation procurement (buyer as innovation coordinator on behalf of end-users) or adaptive innovation procurement (Wesseling and Edquist, 2018) stimulate network formation and support focal suppliers to access technological capabilities and resources to innovate. Innovating products either incrementally or radically requires vital information and knowledge resources as well as financial investments to mitigate high transaction costs and supply risk (Choi and Krause, 2006).

Both literature on supply networks (Sharma *et al.*, 2020; Bellamy *et al.*, 2020) and SCI (Luomaranta and Martinsuo, 2020) suggest that forming alliances offers the supply chain opportunity to reinforce its absorptive capacity by drawing on external innovation resources from network members. Besides knowledge and information resources, supply networks also share innovation-related risks as network resources facilitate their capacity to mitigate the cost associated with innovation. Supply networks also provide focal suppliers access to members' technical personnel, technology, patent rights, marketing channels and manufacturing facilities (Kim, 2014; Lavie, 2006; Holloway and Parmigiani, 2016). External knowledge resources for innovation are often obtained through vicarious learning (i.e. modelled behaviour but not completely new) (Bellamy *et al.*, 2014). These are "resources belonging to or deployed by an organisation's diverse partners and are accessible to it due to its ties with those partners" (Gulati *et al.*, 2011, p. 211).

*P3a.* High network complexity might foster access to a diverse resource pool that supports radical innovation.

While some studies (Lu *et al.*, 2018; Kim, 2014) imply that firms within a common network have equal access to network resources, Gulati *et al.* (2011) argue in contrast. Different access to a network's resources by its members and their varied abilities to translate network resources into SCI are influenced by their power in the network structure, competency and superior market position of network members (Gulati *et al.*, 2011; Choi and Krause, 2006). Network members have heterogeneous characteristics, with different levels of capacity for accessing network resources and internalising them to innovate (Gulati *et al.*, 2011; Bellamy *et al.*, 2014). Also, while network members interact within their groups, network groups rarely interact among themselves due to their different foci and ideas (Burt, 1992; Burt and Burzynska, 2017). This situation creates a gap between groups called *structural holes* (Burt, 1992).

*P3b.* Coordination challenges in highly complex networks reduce supplier responsiveness to buyer innovation needs.

In the context of buyer-supplier interactions for stimulating process innovation, Wang *et al.* (2023) also refer to this gap as *technological capability asymmetry*. More powerful network members (network brokers) with strong technological capability and whose network spans across these structural holes and can interact with other network groups – beyond their immediate network structure – to access valuable information, ideas and best practices have a competitive advantage to generate radical innovation (Burt, 1992).

*P3c.* Suppliers with high absorptive capacity can effectively manage network complexity and broker resources for radical innovation, even when precise specifications are used.

Bellamy *et al.* (2014, p. 360) suggest that a supply network may also be densely interconnected or sparsely interconnected. In a dense interconnected supply network, a large number of the focal supplier's network members (at least three) are directly connected. A densely interconnected supply network is beneficial in two main ways: (1) offers the focal supplier a good opportunity to effectively communicate the buyer's needs to network partners as there are often fewer intermediaries (Uyarra *et al.*, 2017); and (2) provides them with reach and receptivity to network resources (Gulati *et al.*, 2011).

*P3.1a.* Dense networks enhance incremental innovation through improved communication and resource sharing.

While these benefits enhance innovation, their innovation outcomes are mostly incremental due to problems such as groupthink, complacency, resistance to change and lack of richness and uniqueness of the accessed network resources suitable for radical innovation. Again, this concurs with Wang *et al.*'s (2023) study of the effect of supply chain members' technological capability on innovation outcomes among Chinese manufacturing firms, which shows a higher buyer and supplier technological capabilities negatively affect SCI due to inertia from complacency and groupthink.

*P3.1b.* Groupthink and resistance to change in dense networks favour incremental innovation and hinder radical innovation in outcome-based demands.

Alternatively, a sparsely interconnected supply network involves a situation where a focal supplier has network members with very limited to no direct connection with each other, but with the focal supplier. This implies that the focal suppliers' network members are less receptive to accessing network resources from each other directly. We argue that focal suppliers, in these circumstances, are less responsive to buyers' needs as intermediaries and brokers are required to access vital innovation resources (Selviaridis *et al.*, 2023; Burt, 1992).

While a sparsely interconnected supply network suggests limited access to network resources, it minimises groupthink and increases the creativity of the network, which is positively associated with radical innovation. When there are differences between buyers and suppliers' technological capabilities, this facilitates SCI because capability gaps stimulate change and a need to improve (Wang *et al.*, 2023). This drives more powerful (and well-positioned) members of the network to take charge and coordinate the innovation by brokering the needed technological resources from across their existing network boundaries (Wang *et al.*, 2023; Burt, 1992).

*P3.2a.* Suppliers with high absorptive capacity and in sparse networks may broker complementary innovation resources for radical innovation where precise specifications are used, as the sunk cost is low.

*P3.2b.* Sparse networks, despite their limited access, may positively influence radical innovation under both precise and outcome-based demands, as groupthink is minimal.

## 5. Discussion

Drawing on the network theory literature (Lu *et al.*, 2018; Bellamy *et al.*, 2014; Muller and Peres, 2019), we offer a SCIP framework in Figure 3 to explain how public buyers may structure their innovation procurements to drive SCI in a manner that makes focal suppliers more responsive to both incremental and radical product innovation needs.

Our proposed SCIP framework in Figure 3 begins with the articulation of new product needs at the downstream supply chain by government buyers, to the point where supply firms tap into both their own and network resources to achieve innovative outcomes. We argue that the procurement strategy/method buyers use largely informs supplier responsiveness and the nature of innovation outcomes. For example, mainstream public procurement prioritises competitive tendering methods to promote principles such as competition and fairness in

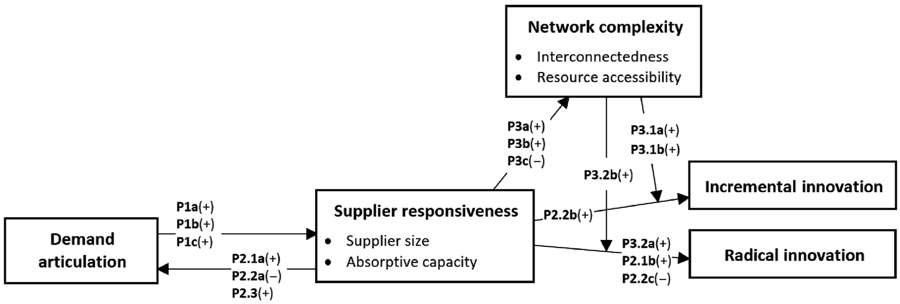


**Figure 3.** Conceptual relationship of the SCIP framework. Source: Authors' construct based on authors' own elaboration

public procurement to prevent collusion and bid-rigging in supplier selection (Bawole and Adjei-Bamfo, 2019). These mainstream methods involve minimal buyer-supplier interaction.

Although such mainstream procurement methods are associated with generating competitive pressure among suppliers (Choi and Krause, 2006), innovative-oriented procurements often attract limited supplier participation (Uyarra *et al.*, 2014). Thus, suppliers, including most SMEs and start-ups without competitive technological capabilities and ideas (see Saastamoinen *et al.*, 2018), face the risk of failing to recover their invested innovation resources due to unsuccessful bids. Our framework, therefore, suggests using innovative procurement methods that promote open and active communication through effective buyer-supplier interactions. Unclear framing and problem description hinder suppliers' ability to effectively respond to innovation procurement needs (Uyarra *et al.*, 2014; Kauppi and Van Raaij, 2015). Hence, an innovation procurement process that promotes outcome-based specifications allows public buyers to discuss the problem with suppliers and co-design the solution (Haugbølle *et al.*, 2015).

The innovation impact of public procurement is mediated by supply responsiveness factors (i.e. supply size and absorptive capacity), whose effect on innovation outcome is further moderated by network complexity factors. Firms with strong absorptive capacity can better integrate external knowledge to meet complex procurement demands (Cohen and Levinthal, 1990). In contrast, complex supply chains may require additional coordination efforts to realise innovation benefits, particularly when interdependencies span multiple tiers (Patrucco *et al.*, 2025).

Network complexity also conditions the nature of innovation outcomes. Dense, highly interconnected supply networks often reinforce incremental innovation through established routines and shared norms but may suppress more radical shifts due to conformity pressures (Sharma *et al.*, 2020). Alternatively, sparse networks, while less embedded, can support radical innovation if focal actors possess high absorptive capacity and connect disparate sources of knowledge (Tortoriello *et al.*, 2012). Procurement strategies that account for these relational dynamics – by aligning contract types with the innovation orientation of supplier networks – are more likely to generate transformative outcomes.

The size of suppliers directly participating in innovation procurement and supplier absorptive capacity also enhances supplier responsiveness. Suppliers accumulate and access external innovation resources such as patent information and new knowledge and share innovation-related risks and costs with their network partners (Bellamy *et al.*, 2014). The innovation resources gathered externally give them a competitive advantage (Lavie, 2006), which enhances their participation and responsiveness in innovative-oriented procurements. While high supplier size may imply responsiveness, this generates competitive pressure, which is a disincentive for suppliers who often avoid sunk costs from radical innovation. However, fewer participating suppliers with high absorptive capacities and simpler networks have the potential to generate radical innovation outcomes.

The higher the supplier numbers in a network or a supplier chain, the more difficult it would be for the focal supplier to coordinate, as each supplier presents different values, goals, work norms and organisational culture (Choi and Krause, 2006). This inherent need and potential cost incurred by the focal supplier (with low absorptive capacity) to control and coordinate the innovation effort of more complex networks generally limit outcomes to incremental changes. Hence, buyers and focal suppliers working with a sizeable supply network that share, for example similar cultures, aligned goals, and are in close geographical proximity and have multiple sources from which they could access rich innovation resources are necessary to enhance supplier responsiveness to buyers' radical innovation needs.

While supply networks provide an avenue to access external synergistic resources, their ability to access or broker external resources and understand and translate them in response to buyers' articulated innovation demands is influenced by their absorptive capacity (Bellamy *et al.*, 2014). It is, therefore, the buyers' responsibility to identify suppliers with high absorptive capacity by employing relevant procurement methods.

This article advances the need for buyers to engage suppliers with access to relevant external network resources. Suppliers with high absorptive capacity are more responsive to buyers' radical (including incremental) innovation needs in both precise and outcome-based demands because they can access complementary innovation resources externally. Such suppliers are also more responsive because they have innovation acumen and can manage their network complexities through control and coordination as well as broker complementary resources for radical innovation (Burt and Burzynska, 2017).

While precise specifications are mostly used in the technology sector for hardware manufacturing and in the construction sector for designs and architectural plans, they limit creativity and often lead to mere incremental changes. More responsive suppliers with access to rich and unique innovation resources can broker and use network resources even across their network boundaries, have generated radical innovations like AI-enabled traffic management (Edquist and Zabala-Iturriagagoitia, 2012), flood barrier technology (Wesseling and Edquist, 2018) and AI-driven diagnostic tools for early strokes and blood clot detection (Patrucco *et al.*, 2025) through outcome-based specifications.

We, therefore, note that radical and incremental innovations are not mutually exclusive, but the specific network effects and how demand is articulated are more influential on one type than the other. Procurement can stimulate incremental innovation by encouraging continuous improvements in existing solutions while also enabling radical innovation through mission-oriented projects that seek transformative outcomes (Edquist and Zabala-Iturriagagoitia, 2012). By designing procurement processes that support both low-risk, short-term advancements and high-risk, long-term breakthroughs, governments can foster a dynamic innovation environment responsive to both evolving public needs and systemic challenges (Uyarra *et al.*, 2014).

### *5.1 Implications for policy, practice and supply chain managers*

This article offers innovation procurement practitioners and policymakers knowledge on how public procurement may serve as an industry policy to facilitate SCI. Through innovation procurement requirements (Song *et al.*, 2018), our article shows that buyers may design innovation procurement methods in a manner that identifies responsive focal suppliers and facilitates supply networks to adopt operationally efficient practices and enhance suppliers' responsiveness to unique procurement needs. Our article offers greater visibility and insight into how government agencies may harness the social capital of supply networks while managing the potential opportunism in buyer-supplier interaction during demand articulation and supplier response, as well as network complexities in innovation procurement.

Particularly, practitioners and policymakers must foremost assess the nature of their product or problem requiring a solution. Having a better understanding of the problem and the solution needed helps direct the public buyers towards particular supplier industries to gather market intelligence about what solutions exist and determine whether the desired product will require incremental or radical innovation from suppliers. This knowledge is what initially informs how the innovation demand should be articulated. Public procurement managers may then use this knowledge to employ either a developmental innovation procurement method (which supports radical innovation) or an adaptive innovation procurement method (if incremental innovation is desired) (Wesseling and Edquist, 2018). In both approaches, the buyer plays the role of coordinating and directing the innovation process.

As discussed earlier in this article, radical innovation requires more investment in innovation resources compared to incremental innovation. Since the innovation risk and potential sunk cost deter focal suppliers from participating in desired radical innovation, buyers may facilitate focal suppliers' R&D, create an enabling environment for R&D collaboration or stimulate network formation through the innovation procurement policy. This policy may also be designed into a sectoral industrial policy that targets relevant and specific sectors that government buyers wish to grow or promote innovation (Spring *et al.*, 2017). The role of directing the innovation process also requires that the buyer – through the innovation procurement method – design functional requirements of the desired innovation narrowly enough and broadly enough to stimulate the variety and creativity of solutions. Besides a few SMEs and start-ups that present unique ideas capable of generating radical innovation outcomes to the market and have limited reach to or may not require network resources, buyers should hone supply networks to generate synergistic innovative resources in the process (see Saastamoinen *et al.*, 2018). To effectively coordinate and direct the innovation process, the innovation procurement policy must gather information about network structure and complexities as part of its initial market intelligence.

The network conditions (i.e. supply/network size and absorptive capacity) discussed in this article may be used to evaluate suppliers and manage the complexities that affect focal suppliers' responsiveness to buyers' unique needs when radical innovation is desired. For example, buyers must maintain a reasonable balance between restricting tenders and competition in the selection: (1) to avoid privileging a few suppliers and (2) to allow new ideas. While these network conditions help buyers to minimise procurement risks, they also help reduce the complexities that focal suppliers deal with in the buyer-supplier relationship of innovation procurement. As discussed throughout this article, innovation procurement is also generally complex. Buyers must, therefore, have both operational expertise to manage the innovation procurement process and the technical expertise to define the problem and assess the feasibility of the solutions suppliers propose as well as the quality of the final solution focal suppliers provide.

Another key policy implication concerns the strategic tailoring of procurement contracts to align with different supply chain contexts, thereby enhancing the potential for leveraging innovation. For instance, performance-based contracts are especially effective in mature or vertically integrated supply chains, such as those in energy or construction, where suppliers possess the technical expertise and operational capacity to deliver complex outcomes. In such contexts, these contracts emphasise desired results, such as energy efficiency or emissions reductions, rather than prescriptive inputs. This shift encourages suppliers to incorporate innovative technologies and optimise lifecycle performance (OECD, 2024; Chiappinelli *et al.*, 2025).

On the other hand, innovation partnerships fit growing or fragmented supply chains, such as in biotechnology or digital health, where co-development between procurers and suppliers is essential. These partnerships facilitate iterative feedback, joint problem-solving and risk-sharing, fostering breakthrough innovations via long-term engagement (Edquist and Zabala-Iturriagagoitia, 2012; Patrucco *et al.*, 2025). In sectors that are fast-changing and uncertain, such as smart mobility or cybersecurity, where solutions are not well-established and multiple technological approaches are possible, framing procurement around a specific policy challenge encourages a broad range of actors, including start-ups and research consortia, to propose diverse and experimental approaches (Georghiou *et al*., 2014).

To effectively implement the SCIP framework in such contexts, buyers must prioritise early market engagement to assess supply chain preparedness and absorptive capacities. In mature industries, this can be achieved by incorporating performance metrics into tenders, while in emerging sectors, fostering pre-commercial procurement and co-design workshops is crucial. Buyers must also carefully balance cost efficiency with innovation incentives by adopting flexible procurement models that prioritise long-term value and performance over immediate cost savings (Grimbert *et al.*, 2024; Kattel and Mazzucato, 2018). By integrating outcome-based contracts and fostering early market engagement, buyers can ensure that innovation is incentivised without compromising fiscal responsibility (OECD, 2024).

*5.2 Theoretical implications and future research avenues*

This article contributes to the SCI and innovation procurement literature in three ways. First, it contributes to the SCI literature (Kabadurmus, 2020; Luomaranta and Martinsuo, 2020) by advancing procurement as a demand-side innovation driver. While existing research on SCI has examined various ways through which supply firms enhance their SCI: including advances in technology, supply network formation to create synergy innovation resources, and R&D investments among others, demand-related factors and how they influence innovation from the downstream were unknown.

We extend this existing knowledge on SCI by explaining how changes in customer taste and requirement through public procurement serve as a demand innovation driver from a macro level, influencing innovation from downstream supply chain. We explain that different levels of clarity in communicating a buyers' desired innovation needs could lead to different degrees of change in existing products. We, however, argue in our explanation that this effect is impacted by two supplier responsiveness factors (i.e. absorptive capacity and supplier size) and two types of network complexities (i.e. interconnectedness and resource accessibility).

While fewer suppliers (i.e. a good chance to recover invested innovation resources) and a high absorptive capacity enhance responsiveness, using both outcome-based and precise demands fosters more radical innovation when there is less complexity. A high network complexity, however, affects responsiveness to buyers' needs due to the additional control and coordination constraint that could result in incremental innovation. This insight complements existing SCI discussions and offers new alternative pathways on how public procurement may foster both incremental and radical innovation.

Second, this article also deepens our understanding of SCI with insight into how the dynamics and contextual elements in innovation procurement make suppliers more responsive to government's innovation needs. We contribute to the innovation procurement discourse with a framework that explains the responsiveness of suppliers to innovation procurement needs. Innovation studies (Jia *et al.*, 2019; Guan and Yam, 2015) note that supply-side innovation drivers have only resulted in marginal product changes (i.e. high product similarity), making them less responsive to governments' innovation-oriented procurements, which sometimes require urgent and/or radical product needs.

While existing supply-side innovation drivers (Jia *et al.*, 2019; Guan and Yam, 2015) often yield incremental product changes due to their inability to control and account for complexity and network structures, our SCIP framework advances public procurement as a demand-side innovation driver with the capacity and conditions necessary to yield radical product changes in a market. We discussed how absorptive capacity and the number of suppliers engaged in the innovation procurement could enhance supplier responsiveness to buyers' incremental and radical innovation needs.

Third, our framework also explains the effect of network complexities on supplier responsiveness, which has typically been studied in isolation in the SCI literature (Sharma *et al.*, 2020; Bellamy *et al.*, 2020; Choi and Krause, 2006). While we generally agree with Choi and Krause (2006) that the differentiation associated with complex networks is negatively related to supplier responsiveness, we learn from this article that this effect holds where available suppliers have low absorptive capacity, and buyers use outcome-based specifications. In these circumstances, focal suppliers struggle with significant information asymmetries and challenges of coordinating their network members (Wilhelm *et al.*, 2016).

The direction of the effect may change where suppliers have high absorptive capacity and precise specifications are used to articulate demands as there is clarity about desired needs and suppliers can broker rich and diverse innovation resources to respond to buyers' needs. Absorptive capacity is thus crucial in innovation procurement for determining supplier responsiveness, even in industries where supply networks are highly complex. However, supplier responsiveness to precise specifications rarely leads to radical innovation in highly complex network environments as precise specifications hinder creativity. Therefore, buyers may use relevant procurement methods to identify suppliers with high absorptive capacity and can manage their networks' complexity towards radical innovation outcomes.

A key point to highlight is that procurement mechanisms are not neutral instruments. They actively influence firm-level innovation and supply chain structures. To optimise innovation outcomes, they must align with firms' R&D capacities, supply chain readiness and sector/market-specific needs. Outcome-based and functional procurement, which focus on performance rather than detailed specifications, are particularly effective for firms with strong absorptive capacities (Cohen and Levinthal, 1990). These approaches also support smaller organisations when paired with tools like pre-commercial procurement or competitive dialogue (Edquist and Zabala-Iturriagagoitia, 2012; OECD, 2024). In sectors like energy and healthcare, they foster integrated supply chains and joint innovation. In contrast, rigid, price-driven models can stifle innovation and exclude smaller organisations (Georghiou *et al.*, 2014).

*5.3 Avenues for future research*

While our study offers important insight into SCI from the downstream supply chain in the form of public procurement, there are several opportunities for extending and further clarifying our understanding of the topic. The propositions developed in this article offer a foundation for generating testable hypotheses in future empirical research.

For example, future studies may explore measuring items for focal suppliers' ability to manage network complexity through their absorptive capacity. While prior studies have used R&D investment, map to external networks and patent data as proxies for absorptive capacity (Bellamy *et al.*, 2020), these measures do not clearly explain how suppliers leverage their absorptive capacity to manage (i.e. control and coordinate) their complex networks towards desired radical innovation outcomes in demand-driven SCI.

Future research may also employ empirical approaches from various industries to validate the conceptual framework offered in this article. Although we found extant studies examining supply networks and innovation (Sharma *et al.*, 2020; Cantu and Tunisini, 2023; Luomaranta and Martinsuo, 2020), they do not distinguish innovation types in terms of radical and incremental. Hence, the supply network's impact on these innovation types is unclear. Following our SCIP framework, future studies may empirically test the effect of precise specifications and outcome-based demands (as independent variables) on the two innovation types (as dependent variables). Also, what will be the mediator effect of supplier responsiveness and moderator effect of network complexity on this relationship when buying from various industries? Such studies would further advance knowledge of the multiple perspectives of SCI.

Finally, future studies may also examine the effect of other forms of network complexities on radical and incremental innovation. For example, prior studies have discussed the effect of a network's spatial, vertical and horizontal complexity on innovation performance (Sharma *et al.*, 2020). Are there any changes to these effects in terms of radical and incremental innovation, and why? How could focal suppliers manage these other complexity types by leveraging their absorptive capacity to generate radical innovation for public buyers? Knowledge and answers to these questions would be helpful to better inform buyers and managers of focal supply firms in their innovation procurement efforts.

## 6. Conclusion

This theory-based article offers a conceptual framework that explains how public procurement as a demand-side innovation driver influences the responsiveness of supply chains to government incremental and radical innovation needs. The framework in Figure 3 shows that an innovation procurement system that prioritises how demand is articulated (precisely or outcome-based) and urges effective buyer-supplier interaction helps to effectively frame buyers' needs to suppliers to elicit the desired innovation outcomes, whether radical or incremental.

Being able to effectively translate buyers' needs into a well-understood procurement specification reduces the risk of honest incompetence by suppliers (Kauppi and Van Raaij, 2015). Also, buyers' facilitation of network associations through innovation procurement and knowledge of power structures within supply networks is necessary for effectively stimulating innovation responses to buyers' unique needs.

Encouraging supplier associations allows suppliers to leverage their absorptive capacity for accessing external innovation resources, interpret and translate them into innovation solutions for the buyer. To manage and meet the innovation costs of controlling and coordinating complex networks, focal suppliers must also maintain a small number of suppliers with close geographic proximity, similar cultures and complementary resources in their network (Choi and Krause, 2006).

### Notes

1. Hendry, J. (2002) explains honest incompetency as the principal's limitation in understanding their precise interests, specifying them, and communicating them clearly to the agent, assuming the agent is honest and dutiful.

### References

*Studies included in the synthesis*

Adjei-Bamfo, P., Djajadikerta, H.G., Jie, F., Brown, K. and Kiani Mavi, R. (2023), "Public procurement for innovation through supplier firms' sustainability lens: a systematic review and research agenda", *Business Strategy and the Environment*, Vol. 32 No. 1, pp. 387-407, doi: 10.1002/bse.3137.

Aschhoff, B. and Sofka, W. (2009), "Innovation on demand–Can public procurement drive market success of innovations?", *Research Policy*, Vol. 38 No. 8, pp. 1235-1247, doi: 10.1016/j.respol.2009.06.011.

Bellamy, M.A., Dhanorkar, S. and Subramanian, R. (2020), "Administrative environmental innovations, supply network structure, and environmental disclosure", *Journal of Operations Management*, Vol. 66 Nos 7-8, pp. 895-932, doi: 10.1002/joom.1114.

Bellamy, M.A., Ghosh, S. and Hora, M. (2014), "The influence of supply network structure on firm innovation", *Journal of Operations Management*, Vol. 32 No. 6, pp. 357-373, doi: 10.1016/j.jom.2014.06.004.

Burt, R.S. and Burzynska, K. (2017), "Chinese entrepreneurs, social networks, and guanxi", *Management and Organization Review*, Vol. 13 No. 2, pp. 221-260, doi: 10.1017/mor.2017.6.

Cantu, C.L. and Tunisini, A. (2023), "A circular innovation strategy in a supply network context: evidence from the packaging industry", *Journal of Business and Industrial Marketing*, Vol. 38 No. 13, pp. 220-238, doi: 10.1108/jbim-07-2021-0325.

Carnovale, S. and Yeniyurt, S. (2015), "The role of ego network structure in facilitating ego network innovations", *Journal of Supply Chain Management*, Vol. 51 No. 2, pp. 22-46, doi: 10.1111/jscm.12075.

Choi, T.Y. and Krause, D.R. (2006), "The supply base and its complexity: implications for transaction costs, risks, responsiveness, and innovation", *Journal of Operations Management*, Vol. 24 No. 5, pp. 637-652, doi: 10.1016/j.jom.2005.07.002.

Edler, J. and Georghiou, L. (2007), "Public procurement and innovation—resurrecting the demand side", *Research Policy*, Vol. 36 No. 7, pp. 949-963, doi: 10.1016/j.respol.2007.03.003.

Edquist, C. and Zabala-Iturriagagoitia, J.M. (2012), "Public Procurement for Innovation as mission-oriented innovation policy", *Research Policy*, Vol. 41 No. 10, pp. 1757-1769, doi: 10.1016/j.respol.2012.04.022.

Foss, M.C. and Bonacelli, M.B.M. (2023), "Analyzing the legal environment for public procurement as a demand-side innovation policy measure", *Journal of Public Procurement*, Vol. 23 No. 1, pp. 35-55, doi: 10.1108/jopp-07-2022-0036.

Georghiou, L., Edler, J., Uyarra, E. and Yeow, J. (2014), "Policy instruments for public procurement of innovation: choice, design and assessment", *Technological Forecasting and Social Change*, Vol. 86, pp. 1-12, doi: 10.1016/j.techfore.2013.09.018.

Jia, N., Huang, K.G. and Man Zhang, C. (2019), "Public governance, corporate governance, and firm innovation: an examination of state-owned enterprises", *Academy of Management Journal*, Vol. 62 No. 1, pp. 220-247, doi: 10.5465/amj.2016.0543.

Jooriyan, N., Noori, J., Bahrami, F. and Karimi, T. (2023), "Towards a successful implementation of public procurement for innovation: the case of Iran's oil industry", *Innovation and Development*, Vol. 14 No. 3, pp. 587-605, doi: 10.1080/2157930X.2023.2216988.

Kabadurmus, F.N.K. (2020), "Antecedents to supply chain innovation", *The International Journal of Logistics Management*, Vol. 31 No. 1, pp. 145-171, doi: 10.1108/ijlm-04-2019-0096.

Kalvet, T. and Lember, V. (2010), "Risk management in public procurement for innovation: the case of Nordic–Baltic Sea cities", *Innovation: The European Journal of Social Science Research*, Vol. 23 No. 3, pp. 241-262, doi: 10.1080/13511610.2011.553509.

Kim, D.Y. (2014), "Understanding supplier structural embeddedness: a social network perspective", *Journal of Operations Management*, Vol. 32 No. 5, pp. 219-231, doi: 10.1016/j.jom.2014.03.005.

Kundu, O., James, A.D. and Rigby, J. (2020), "Public procurement and innovation: a systematic literature review", *Science and Public Policy*, Vol. 2011, pp. 1-13, doi: 10.1093/scipol/scaa029.

Kusi-Sarpong, S., Gupta, H. and Sarkis, J. (2019), "A supply chain sustainability innovation framework and evaluation methodology", *International Journal of Production Research*, Vol. 57 No. 7, pp. 1990-2008, doi: 10.1080/00207543.2018.1518607.

Lember, V., Kalvet, T. and Kattel, R. (2011), "Urban competitiveness and public procurement for innovation", *Urban Studies*, Vol. 48 No. 7, pp. 1373-1395, doi: 10.1177/0042098010374512.

Lu, H.E., Potter, A., Sanchez Rodrigues, V. and Walker, H. (2018), "Exploring sustainable supply chain management: a social network perspective", *Supply Chain Management: an International Journal*, Vol. 23 No. 4, pp. 257-277, doi: 10.1108/SCM-11-2016-0408.

Luomaranta, T. and Martinsuo, M. (2020), "Supply chain innovations for additive manufacturing", *International Journal of Physical Distribution and Logistics Management*, Vol. 50 No. 1, pp. 54-79, doi: 10.1108/ijpdlm-10-2018-0337.

Mazzucato, M. and Robinson, D.K. (2018), "Co-creating and directing Innovation Ecosystems? NASA's changing approach to public-private partnerships in low-earth orbit", *Technological Forecasting and Social Change*, Vol. 136, pp. 166-177, doi: 10.1016/j.techfore.2017.03.034.

Roumboutsos, A. and Saussier, S. (2014), "Public-private partnerships and investments in innovation: the influence of the contractual arrangement", *Construction Management and Economics*, Vol. 32 No. 4, pp. 349-361, doi: 10.1080/01446193.2014.895849.

Saastamoinen, J., Reijonen, H. and Tammi, T. (2018), "Should SMEs pursue public procurement to improve innovative performance?", *Technovation*, Vol. 69 No. October 2017, pp. 2-14, doi: 10.1016/j.technovation.2017.10.003.

Selviaridis, K., Hughes, A. and Spring, M. (2023), "Facilitating public procurement of innovation in the UK defence and health sectors: innovation intermediaries as institutional entrepreneurs", *Research Policy*, Vol. 52 No. 2, 104673, doi: 10.1016/j.respol.2022.104673.

Sharma, A., Pathak, S., Borah, S.B. and Adhikary, A. (2020), "Is it too complex? The curious case of supply network complexity and focal firm innovation", *Journal of Operations Management*, Vol. 66 Nos 7-8, pp. 839-865, doi: 10.1002/joom.1067.

Shete, P.C., Ansari, Z.N. and Kant, R. (2020), "A Pythagorean fuzzy AHP approach and its application to evaluate the enablers of sustainable supply chain innovation", *Sustainable Production and Consumption*, Vol. 23, pp. 77-93, doi: 10.1016/j.spc.2020.05.001.

Shin, K. and Lee, J.D. (2022), "Impact of public procurement for innovation on firm productivity", *Applied Economics Letters*, Vol. 29 No. 11, pp. 1016-1021, doi: 10.1080/13504851.2021.1904106.

Song, M., Chen, M. and Wang, S. (2018), "Global supply chain integration, financing restrictions, and green innovation: analysis based on 222,773 samples", *International Journal of Logistics Management*, Vol. 29 No. 2, pp. 539-554, doi: 10.1108/ijlm-03-2017-0072.

Uyarra, E., Edler, J., Garcia-Estevez, J., Georghiou, L. and Yeow, J. (2014), "Barriers to innovation through public procurement: a supplier perspective", *Technovation*, Vol. 34 No. 10, pp. 631-645, doi: 10.1016/j.technovation.2014.04.003.

Uyarra, E., Flanagan, K., Magro, E. and Zabala-Iturriagagoitia, J.M. (2017), "Anchoring the innovation impacts of public procurement to place: the role of conversations", *Environment and Planning C: Politics and Space*, Vol. 35 No. 5, pp. 828-848, doi: 10.1177/2399654417694620.

Uyarra, E., Zabala-Iturriagagoitia, J.M., Flanagan, K. and Magro, E. (2020), "Public procurement, innovation and industrial policy: rationales, roles, capabilities and implementation", *Research Policy*, Vol. 49 No. 1, 103844, doi: 10.1016/j.respol.2019.103844.

Viale, L., Vacher, S. and Bessouat, J. (2022), "Eco-innovation in the upstream supply chain: re-thinking the involvement of purchasing managers", *Supply Chain Management: an International Journal*, Vol. 27 No. 2, pp. 250-264, doi: 10.1108/SCM-11-2020-0591.

Wang, L., Jin, J.L. and Zhou, K.Z. (2023), "Technological capability strength/asymmetry and supply chain process innovation: the contingent roles of institutional environments", *Research Policy*, Vol. 52 No. 4, 104724, doi: 10.1016/j.respol.2023.104724.

Wesseling, J.H. and Edquist, C. (2018), "Public procurement for innovation to help meet societal challenges: a review and case study", *Science and Public Policy*, Vol. 45 No. 4, pp. 493-502, doi: 10.1093/SCIPOL/SCY013.

*Other cited studies*

Adjei-Bamfo, P. and Maloreh-Nyamekye, T. (2019), "The 'baby steps' in mainstreaming sustainable public procurement in Ghana: a 'double-agency' perspective", *Journal of Public Affairs*, Vol. 19 No. 1, pp. 1-16, doi: 10.1002/pa.1902.

Ajay, R. and Madhumathi, R. (2015), "Do corporate diversification and earnings management practices affect capital structure?: an empirical analysis", *Journal of Indian Business Research*, Vol. 7 No. 4, pp. 360-378, doi: 10.1108/JIBR-01-2015-0008.

Alvesson, M. and Sandberg, J. (2020), "The problematizing review: a counterpoint to Elsbach and Van Knippenberg's argument for integrative reviews", *Journal of Management Studies*, Vol. 57 No. 6, pp. 1290-1304, doi: 10.1111/joms.12582.

Bastianin, A., Castelnovo, P. and Zirulia, L. (2025), "Overcoming the innovation threshold through innovative public procurement: evidence from CERN", *Industrial and Corporate Change*, dtaf004, doi: 10.1093/icc/dtaf004.

Bawole, J.N. and Adjei-Bamfo, P. (2019), "Public procurement and public financial management in africa: dynamics and influences", *Public Organization Review*, Vol. 20, February, pp. 301-318, doi: 10.1007/s11115-019-00443-7.

Brown, K., Furneaux, C. and Gudmundsson, A. (2012), "Infrastructure transitions towards sustainability: a complex adaptive systems perspective", *International Journal of Sustainable Development*, Vol. 15 Nos 1-2, pp. 54-71, doi: 10.1504/IJSD.2012.044034.

Burrell, G. and Morgan, G. (2019), *Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life*, Routledge, London.

Burt, R.S. (1992), *Structural Holes: the Social Structure of Competition*, Harvard University Press, Cambridge, MA.

Chang, H. and Andreoni, A. (2020), "Industrial policy in the 21st century", *Development and Change*, Vol. 51 No. 2, pp. 324-351, doi: 10.1111/dech.12570.

Chapman, P., Soosay, C. and Kandampully, J. (2003), "Innovation in logistics services and the new business model: a conceptual framework", *International Journal of Physical Distribution and Logistics Management*, Vol. 33 No. 7, pp. 630-650.

Chiappinelli, O., Giuffrida, L.M. and Spagnolo, G. (2025), "Public procurement as an innovation policy: where do we stand?", *International Journal of Industrial Organization*, Vol. 100, 103157, doi: 10.1016/j.ijindorg.2025.103157.

Cohen, W.M. and Levinthal, D.A. (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, Vol. 35 No. 1, pp. 128-152, doi: 10.2307/2393553.

Corley, K.G. and Gioia, D.A. (2011), "Building theory about theory building: what constitutes a theoretical contribution?", *Academy of Management Review*, Vol. 36 No. 1, pp. 12-32, doi: 10.5465/amr.2009.0486.

Cornelissen, J. (2017), "Developing propositions, a process model or typology? Addressing the challenges of writing theory without a boilerplate", *Academy of Management Review*, Vol. 42 No. 1, pp. 1-9, doi: 10.5465/amr.2016.0196.

Cropanzano, R. (2009), "Writing nonempirical articles for journal of management: general thoughts and suggestions", *Journal of Management*, Vol. 35 No. 6, pp. 1304-1311, doi: 10.1177/0149206309344118.

Durach, C.F., Kembro, J. and Wieland, A. (2017), "A new paradigm for systematic literature reviews in supply chain management", *Journal of Supply Chain Management*, Vol. 53 No. 4, pp. 67-85, doi: 10.1111/jscm.12145.

Edquist, C., Vonortas, N.S., Zabala-Iturriagagoitia, J.M. and Edler, J. (2015), *Public Procurement for Innovation*, Edward Elgar Publishing, available at: www.e-elgar.comwww.elgaronline.com

Eisenhardt, K.M. (1989), "Agency theory: an assessment and review", *Academy of Management Review*, Vol. 14 No. 1, pp. 57-74, doi: 10.5465/amr.1989.4279003.

Fahimnia, B., Sarkis, J. and Davarzani, H. (2015), "Green supply chain management: a review and bibliometric analysis", *International Journal of Production Economics*, Vol. 162, pp. 101-114, doi: 10.1016/j.ijpe.2015.01.003.

Goodale, J.C., Kuratko, D.F., Hornsby, J.S. and Covin, J.G. (2011), "Operations management and corporate entrepreneurship: the moderating effect of operations control on the antecedents of corporate entrepreneurial activity in relation to innovation performance", *Journal of Operations Management*, Vol. 29 Nos 1-2, pp. 116-127, doi: 10.1016/j.jom.2010.07.005.

Grimbert, S.F., Zabala-Iturriagagoitia, J.M. and Valovirta, V. (2024), "Transformative public procurement for innovation: ordinary, dynamic and functional capabilities", *Public Management Review*, pp. 1-24, doi: 10.1080/14719037.2024.2326079.

Guan, J.C. and Yam, R.C.M. (2015), "Effects of government financial incentives on firms' innovation performance in China: evidences from Beijing in the 1990s", *Research Policy*, Vol. 44 No. 1, pp. 273-282, doi: 10.1016/j.respol.2014.09.001.

Gulati, R., Lavie, D. and Madhavan, R. (2011), "How do networks matter? The performance effects of interorganizational networks", *Research in Organizational Behavior*, Vol. 31, pp. 207-224, doi: 10.1016/j.riob.2011.09.005.

Haugbølle, K., Pihl, D. and Gottlieb, S.C. (2015), "Competitive dialogue: driving innovation through procurement?", *Procedia Economics and Finance*, Vol. 21, pp. 555-562, doi: 10.1016/s2212-5671(15)00212-9.

Hendry, J. (2002), "The principal's other problems: honest incompetence and the specification of objectives", *Academy of Management Review*, Vol. 27 No. 1, pp. 98-113, doi: 10.5465/amr.2002.5922406.

Holloway, S.S. and Parmigiani, A. (2016), "Friends and profits don't mix: the performance implications of repeated partnerships", *Academy of Management Journal*, Vol. 59 No. 2, pp. 460-478, doi: 10.5465/amj.2013.0581.

Hottenrott, H. and Lopes-Bento, C. (2016), "R&D partnerships and innovation performance: can there be too much of a good thing?", *Journal of Product Innovation Management*, Vol. 33 No. 6, pp. 773-794, doi: 10.1111/jpim.12311.

Jensen, M.C. and Meckling, W.H. (1976), "Theory of the firm: managerial behavior, agency costs and ownership structure", *Journal of Financial Economics*, Vol. 3 No. 4, pp. 305-360, doi: 10.1016/0304-405X(76)90026-X.

Kauppi, K. and Van Raaij, E.M. (2015), "Opportunism and honest incompetence - seeking explanations for noncompliance in public procurement", *Journal of Public Administration Research and Theory*, Vol. 25 No. 3, pp. 953-979, doi: 10.1093/jopart/mut081.

Kattel, R. and Mazzucato, M. (2018), "Mission-oriented innovation policy and dynamic capabilities in the public sector", *Industrial and Corporate Change*, Vol. 27 No. 5, pp. 787-801, doi: 10.1093/icc/dty032.

Klerkx, L. and Leeuwis, C. (2009), "Establishment and embedding of innovation brokers at different innovation system levels: insights from the Dutch agricultural sector", *Technological Forecasting and Social Change*, Vol. 76 No. 6, pp. 849-860, doi: 10.1016/j.techfore.2008.10.001.

Lambert, D.M. (2008), *Supply Chain Management: Processes, Partnerships, Performance*, 3rd ed., Supply Chain Management Institute, Florida.

Lavie, D. (2006), "The competitive advantage of interconnected firms: an extension of the resource-based view", *Academy of Management Review*, Vol. 31 No. 3, pp. 638-658, doi: 10.5465/amr.2006.21318922.

Monteforte, D. and Staglianò, R. (2015), "Firm complexity and capital structure: evidence from Italian diversified firms", *Managerial and Decision Economics*, Vol. 36, August, pp. 205-220, doi: 10.1002/mde.2660.

Muller, E. and Peres, R. (2019), "The effect of social networks structure on innovation performance: a review and directions for research", *International Journal of Research in Marketing*, Vol. 36 No. 1, pp. 3-19, doi: 10.1016/j.ijresmar.2018.05.003.

OECD (2024), *Public Procurement for Public Sector Innovation*, OECD Publishing, available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/12/public-procurement-for-public-sector-innovation_93d920fc/9aad76b7-en.pdf

Patriotta, G. (2020), "Writing impactful review articles", *Journal of Management Studies*, Vol. 57 No. 6, pp. 1272-1276, doi: 10.1111/joms.12608.

Patrucco, A.S., Dimand, A.M., Agasisti, T., Benedetti, M., Gaeta, M. and Tangi, L. (2025), "Managing public sector innovation for a better society: the case of public procurement of innovation", *Production Planning and Control*, pp. 1-19, doi: 10.1080/09537287.2025.2475286.

Prajogo, D.I. (2016), "The strategic fit between innovation strategies and business environment in delivering business performance", *International Journal of Production Economics*, Vol. 171, pp. 241-249, doi: 10.1016/j.ijpe.2015.07.037.

Quiroga, B.F., Moritz, B.B. and Guide V.D.R, Jr. (2021), "The role of transparency in procurement: revealed versus concealed scoring rules in sealed bid A+ B auctions", *Journal of Operations Management*, Vol. 67 No. 1, pp. 71-81, doi: 10.1002/joom.1104.

Seuring, S. and Gold, S. (2012), "Conducting content-analysis based literature reviews in supply chain management", *Supply Chain Management: an International Journal*, Vol. 17 No. 5, pp. 544-555, doi: 10.1108/13598541211258609.

Spring, M., Hughes, A., Mason, K. and McCaffrey, P. (2017), "Creating the competitive edge: a new relationship between operations management and industrial policy", *Journal of Operations Management*, Vols 49-51 No. 1, pp. 6-19, doi: 10.1016/j.jom.2016.12.003.

Swink, M., Sant'Ana Gallo, I., Defee, C. and da Silva, A.L. (2024), "Supply chain visibility types and contextual characteristics: a literature-based synthesis", *Journal of Business Logistics*, Vol. 45 No. 1, e12366, doi: 10.1111/jbl.12366.

Tortoriello, M., Reagans, R. and McEvily, B. (2012), "Bridging the knowledge gap: the influence of strong ties, network cohesion, and network range on the transfer of knowledge between organizational units", *Organization Science*, Vol. 23 No. 4, pp. 1024-1039, doi: 10.1287/orsc.1110.0688.

Voegtlin, C., Scherer, A.G., Stahl, G.K. and Hawn, O. (2022), "Grand societal challenges and responsible innovation", *Journal of Management Studies*, Vol. 59 No. 1, pp. 1-28, doi: 10.1111/joms.12785.

Wacker, J.G. (2004), "A theory of formal conceptual definitions: developing theory-building measurement instruments", *Journal of Operations Management*, Vol. 22 No. 6, pp. 629-650, doi: 10.1016/j.jom.2004.08.002.

Wacker, J.G. (2008), "A conceptual understanding of requirements for theory-building research: guidelines for scientific theory building", *Journal of Supply Chain Management*, Vol. 44 No. 3, pp. 5-15, doi: 10.1111/j.1745-493X.2008.00062.x.

Wagner, S.M. and Sutter, R. (2012), "A qualitative investigation of innovation between third-party logistics providers and customers", *International Journal of Production Economics*, Vol. 140 No. 2, pp. 944-958, doi: 10.1016/j.ijpe.2012.07.018.

Whetten, D.A. (1989), "What constitutes a theoretical contribution?", *Academy of Management Review*, Vol. 14 No. 4, pp. 490-495, doi: 10.2307/258554.

Wilhelm, M.M., Blome, C., Bhakoo, V. and Paulraj, A. (2016), "Sustainability in multi-tier supply chains: understanding the double agency role of the first-tier supplier", *Journal of Operations Management*, Vol. 41 No. 1, pp. 42-60, doi: 10.1016/j.jom.2015.11.001.

World Bank (2018), "Global public procurement database", available at: https://www.globalpublicprocurementdata.org/gppd/

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