Title: **Integrating External Knowledge: Building a Conceptual Framework of Innovation Sourcing**

Keywords: Innovation sourcing; systematic literature review; knowledge acquisition; open innovation; knowledge integration

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

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

DOI:

https://doi.org/10.5325/transportationj.56.4.0477

Stable URL:

https://www.jstor.org/stable/10.5325/transportationj.56.4.0477

Cite:

Schmelzle, U. and Tate, W.L., 2017. Integrating external knowledge: building a conceptual framework of innovation sourcing. *Transportation Journal*, *56*(4), pp.477-512.

Integrating External Knowledge: Building a Conceptual Framework of Innovation Sourcing

Abstract

Innovation sourcing is the acquisition and integration, rather than internal development, of critical knowledge from external providers. This key strategy has emerged as a necessity for survival in many markets. Consequently, sourcing processes are applied to complement internal design capabilities with external knowledge and ultimately improve innovation performance. Firms use external knowledge to enhance products and services, gain market share, and improve profits. The literature regarding the phenomenon of innovation sourcing is largely fragmented, limiting the theoretical advancement in the field. This article presents a systematic literature review that synthesizes the body of knowledge regarding innovation sourcing and derives a conceptualization of how innovation sourcing and its main dimensions are linked to innovation performance. A conceptual model, key dimensions, and an agenda for future research are significant results of this research.

Keywords

Innovation sourcing; systematic literature review; knowledge acquisition; open innovation; knowledge integration

Introduction

In today's competitive environment, continuous innovation has become a strategic imperative (Heidenreich and Kraemer 2016; Wowak et al. 2016). Quinn (2000) aptly labeled this as "innovate or die." In many industries, more than half of current revenues are derived from newly developed products or services (Schilling and Hill 1998), making innovation a strategic driver of growth (Calantone and Di Benedetto 2012). Organizations seek innovation, meaning new or refined methods, products, or practices that lead to higher performance (Flint 2006; Gatignon and Xuereb 1997). The outcome from successful innovation efforts is enhanced products and services that help the organization gain market share and improve profits (Luca and Atuahene-Gima 2007).

Innovation is increasingly the result of joint development within supply chains (Stock and Tatikonda 2008), involving a number of external development partners such as suppliers (Rothaermel and Alexandre 2009). Companies are challenged in developing new products or services completely on their own at a speed that the competitive market demands (Rosell and Lakemond 2012). Consequently, they rely on external entities for support (Kostopoulos et al. 2011). In Europe, for example, external research and development (R&D) spending is more than 50 percent of the total in-house R&D budget for some organizations (Gassmann 2006). A similar trend has been observed in the United States (Slowinski et al. 2009), so that half of the innovation "value" is sourced from or jointly developed with external organizations. This phenomenon is termed *innovation sourcing*. Organizations attempt to acquire critical knowledge from external partners and incorporate that knowledge into their product or service development to meet customer value expectations and improve firm performance. The goal of innovation sourcing is to acquire and incorporate innovative knowledge from external constituents to enhance the product and service portfolio; ultimately the goal is to gain market share and improve profits. In the event

that innovation is a long-term goal of the organization (Ogden, Rosetti, and Hendrick 2007), innovation sourcing is a subset of the strategic sourcing concept. However, while the former is more narrowly focused on the sourcing of innovative knowledge, the latter is much broader and not limited to specific innovation objectives.

Research on innovation sourcing is fragmented. Scholars do not sufficiently relate to prior findings and disagree about essential definitions. The divide is indicated by the divergent terminology used, including innovation sourcing (Linder, Jarvenpaa, and Davenport 2003), technology sourcing (Allred and Swan 2014; Sabidussi et al. 2014), knowledge sourcing (Kang and Kang 2009; Leiponen and Helfat 2010), knowledge transfer and application (Bierly, Damanpour, and Santoro 2009), knowledge integration (Revilla and Villena 2012), or knowledge acquisition (Cassiman and Veugelers 2006). This article develops a holistic term for innovation sourcing to streamline the fragmented literature. In this article, *innovation sourcing* is defined as the acquisition and integration of beneficial knowledge from the supply base to enhance the organization's innovation performance. Innovation sourcing enhances innovation efforts within a firm by seeking knowledge (beneficial ideas and solutions) from upstream external providers that can be applied to products, services, and processes. But the influence of innovation sourcing on innovation performance has not yet been sufficiently addressed so that the understanding of this complex phenomenon remains limited.

Open innovation is a related concept to innovation sourcing and refers to the inflow and outflow, use, and commercialization of ideas and technologies for organizations (Chesbrough 2003). Open innovation is broader in scope than innovation sourcing. The latter term refers to specific practices, including the active search for applicable external knowledge and its subsequent integration, combining internal and external information to create new, innovative solutions for

product, service, or process enhancement (Linder, Jarvenpaa, and Davenport 2003). Innovation sourcing focuses specifically on the upstream acquisition of knowledge whereas the emphasis of open innovation literature has been on joint development with downstream constituents, the co-creation and codevelopment activities with external market participants, such as customers and/or end-users (Gassmann, Enkel, and Chesbrough 2010). There have been calls for research on how supply chain management (SCM) can support innovation efforts (Brattström and Richtnér 2014; Clausen 2013). This research responds to those calls by focusing on the domain of the innovation sourcing concept, which encompasses the knowledge inflow from the upstream supply chain and its effective integration. By clarifying the key dimensions of innovation sourcing and relating the construct to innovation performance, this research fills a noticeable gap in the literature.

As Gligor and Holcomb (2012) highlight, a comprehensive literature review is the appropriate method to establish an "initial or preliminary conceptualization" of an unexplored phenomenon (439). Therefore, the overarching objective of this article is to perform a systematic literature review that synthesizes the current and fragmented scholarly knowledge regarding innovation sourcing and the corresponding performance impact (Schmelze 2017). A critical necessity for the theoretical development of a field is to achieve a minimal degree of consensus regarding the main dimensions of the core constructs (Combs, Crook, and Shook 2005; Venkataraman and Grant 1986). Hence, this research focuses on the main underlying dimensions of innovation sourcing to derive a conceptual model and a foundation for future research. It is directed by three research questions:

RQ1: What are the key dimensions of innovation sourcing?
RQ2: How is innovation sourcing related to innovation performance?
RQ3: What future research issues should be addressed to enhance the understanding of the innovation sourcing phenomenon?

First, the essential literature on innovation sourcing and performance is summarized to establish a fundamental understanding of the phenomenon. A conceptual model of innovation sourcing is introduced, followed by a future research agenda.

Innovation Sourcing and Innovation Performance

Researchers have identified a number of (positive) performance consequences of innovation sourcing practices, which explains the trend toward utilizing external knowledge to support internal research and development (R&D) activities. In this section, some of the performance implications are explained. In many companies, innovation is primarily driven by internal activities, championed by the in-house R&D or commercialization departments. However, this internally focused "design-it-yourself" mentality is arduous and neglects external knowledge from the supply network, limiting competitiveness (Cantarello et al. 2011; Gassmann 2006). Similar to the global division of labor in manufacturing and logistics, R&D activities are increasingly shared cooperatively among supply network partners (Chesbrough 2006; Rigby and Zook 2002). Joint innovation collaboration has become essential because of increasing product, service, and process complexity (Chesbrough and Crowther 2006; Enkel, Gassmann, and Chesbrough 2009).

The innovation sourcing process involves constant scanning for new ideas in methods, products, or practices from upstream supply chain members. With innovation sourcing, organizations are acquiring relevant knowledge from a collaborative network of various suppliers supporting the focal organization (Chesbrough 2003; Gallego, Rubalcaba, and Suárez 2013; Powell, Koput, and Smith-Doerr 1996). An organization's formal boundaries are converted "into a more semi-permeable membrane that enables knowledge to move more easily between the external environment and the company's internal innovation process" (Gassmann and Enkel 2004,

2). The sourcing of external knowledge enables the organization to strategically share development risks and costs with other organizations (Chesbrough and Crowther 2006). Managing effective interorganizational innovation can result in improved innovation performance, such as substantially faster time to market (Di Benedetto 1999; Rothwell 1994), or lower costs (Chesbrough 2006). Innovation performance has been defined (table 1) and operationalized (table 2) in various ways in the literature, illustrating a tendency toward fragmentation and diversity within the innovation research domain. In particular, many diverse operationalizations of innovation performance have been applied (refer to table 2).

Table 1/Innovation Performance Definitions

Type	**Definitions of Innovation Performance and Related Constructs**	**Source**
MP, PSP	*New Product Performance*: The degree to which a product achieves goals originally established by the firm for the product, for example, in terms of customer satisfaction, technological advancement, and overall product performance	Nakata and Im 2010
PSP, PP	*Innovation Performance*: The extent to which firms are satisfied with the achievements in their development and implementation of innovation activities	Chen and Huang 2009
FP, PSP, PP	*New Product Performance*: Lower costs, higher quality, or speed to market either compared to the firm's own usual resource requirements, expectations, or the norm in the industry	Knudsen and Mortensen 2011
MP	*Innovation Performance*: A firms' turnover attributable to technologically improved or new products	Tsai and Wang 2009
MP, PSP	*Service Innovation Performance*: The introduction of new services that are created based on new knowledge or technology, are definitely different or greatly improve the existing services in terms of the technological aspects, customer relations, or other features	Kang and Kang 2014
MP, PSP	*Innovation Success*: The commercial performance of a new product, measured by perceived measures such as the degree to which the new product's objectives have been achieved, which are relative to competition and expectation within the industry	Gatignon and Xuereb 1997
FP, MP	*New Product Performance*: The new product's profitability, market share, and growth performance benefits from highly effective and efficient innovation project outcomes	Wagner 2010
PSP	*Innovation Effectiveness (Innovativeness)*: The degree of newness of an innovation with highly innovative products on one side of the continuum and low innovative products on the opposite side of the continuum	
FP	*Innovation Efficiency*: The resources in terms of time and cost required to complete the innovation project	

Source: (Schmelzle 2017)
MP = Market Performance (e.g., sales, sales growth, product introductions, customer satisfaction)
FP = Financial Performance (e.g., profitability, return on investment, return on assets)
PSP = Product and Service Performance (Characteristics) (e.g., functionality, quality, technology)
PP = Process Performance (e.g., development cycle time, effectiveness of workflows, routines, and practices)

Table 2/Innovation Performance Operationalization

Type	Operationalization of Innovation Performance (and Related Constructs)	Source
FP, PSP	Innovation Success (new product performance): Relative to other products of our firm, this one has a better return on investment; Relative to our competitors' products, this one has a better return on investment; This new product has succeeded in achieving its main objectives.	Gatignon and Xuereb 1997
MP	Incremental Innovation Performance: Percentage of total sales from incremental product introduced by your firm in the last three years; This firm frequently introduced incremental new products into new markets in the last three years; Compared to your major competitor, this firm introduced more incremental new products in the last three years.	Atuahene-Gima 2005
MP	Radical Innovation Performance: Percentage of total sales from radical product introduced by your firm in the last three years; Number of radical products introduced by the firm in the last three years; Compared to your major competitor, this firm introduced more radical new products in the last three years; This firm frequently introduced radical new products into markets totally new to the firm in the last three years.	
PP	Administrative Innovation Performance: Responsiveness to environmental changes; Innovative administration in planning procedures; Innovative administration in process control systems; Innovative administration in integrated mechanisms.	Chen and Huang 2009
PP, PSP	Technical Innovation Performance: Developing new technologies; Incorporating technologies into new products; Facilitating new processes to improve quality and cost.	
MP, FP	Product Innovation Performance: Market share relative to the firm's stated objectives; Sales relative to stated objectives; Return on assets relative to stated objectives; Return on investment related to stated objectives; Profitability relative to stated objectives.	Luca and Atuahene-Gima 2007
MP, PSP	New Product Performance: Meeting objectives … Relative to your firm's original objectives for this product, this product is very successful in terms of customer satisfaction. Relative to your firm's original objectives for this product, this product is very successful in terms of technological advancement. Relative to your firm's original objectives for this product, this product is very successful in terms of overall performance.	Nakata and Im 2010
PSP, PP, FP	Innovation Performance (product, process and organizational innovation): Whether the company can improve its product quality by innovation; Whether the company can accelerate the commercialization pace of the new products by innovation; Whether the company make considerable profit from its new products; Whether the company can develop new technology to improve operation process; Whether the company purchases new instruments or equipment to accelerate productivity.	Chen, Lin, and Chang 2009
MP	Innovation Performance:	Kostopoulos et al. 2011

	The ratio of the annual sales (for the year 2000) that originated from new or substantially improved products/services introduced over the period 1998–2000 divided by the total annual sales of the company for the same period. Alternative measure as robustness check: A dummy variable that equals 1 if the firm has introduced a product or process innovation over the period 1998–2000 and 0 otherwise.	
MP	Innovation Performance (use of three proxies): [Radical Innovation] The fraction of the firm's turnover relating to products new to the world market; [Incremental Innovation] The fraction of the firm's turnover pertaining to products new to the firm; [Incremental Innovation] The fraction of the firm's turnover pertaining to products significantly improved	Laursen and Salter 2006
FP, PP	New Product Development Performance: From an overall profitability standpoint, our new product development program has been successful; Compared with our major competitors, our new product development program is far more successful; Compared with our major competitors, our new product development cycle time has been shorter; Our product lines are much broader than those of our competitors.	Song, Kawakami, and Stringfellow 2010
MP, PSP, PP	New Product Development Performance: New products do not provide a significant source of revenues for the company (reverse coded); Our company develops better products than its competitors; Over time, we continually improve our product development processes; Our company is more innovative than its competitors; Our company consistently meets our technical objective in new product development.	Marsh and Stock 2006
MP	Success Rate: Think about the group of international new product projects that entered development and had significant amounts of money spent on them. Over the last three years . . . (1) percent (rough estimate) were launched and are commercial successes? (%)	De Brentani and Kleinschmidt 2004

Source: (Schmelzle 2017)
MP = Market Performance (e.g., sales, sales growth, product introductions, customer satisfaction)
FP = Financial Performance (e.g., profitability, return on investment, return on assets)
PSP = Product and Service Performance (Characteristics) (e.g., functionality, quality, technology)
PP = Process Performance (e.g., development cycle time, effectiveness of workflows, routines, and practices)

Apparently, market, financial, product, and process performance measures are frequently applied to assess innovation performance. In many studies, innovation performance is assessed relative to the organization's own objectives for their new products and services (Nakata and Im 2010). Researchers have applied a diverse set of measures such as market performance (incl. sales volume, market share, and number of product introductions) or financial performance (e.g., profitability) (Knudsen and Mortensen 2011; Yuen and Thai 2016). Others have focused on the achievement of internal objectives related to process performance, product/service performance

(e.g., functionality and quality), and technological achievements (e.g., patents) (Chen, Lin, and Chang 2009; Marsh and Stock 2006).

Future research could benefit from scale harmonization and a refined definition of innovation performance that addresses market, product, and process dimensions. In this article, *innovation performance* is defined holistically as the extent of how well an organization has procedurally implemented or commercialized new ideas in their product/service offerings. In summary, organizations collaborate with their suppliers and assimilate relevant new knowledge from them to improve their products, services, and processes, which should strengthen their competitiveness in the marketplace.

Methodology

A systematic literature review method was applied, which is an appropriate approach to determine theoretical inconsistencies and potential knowledge gaps impeding the future development in the field (Keupp and Gassmann 2009). As illustrated in figure 1, scholars suggested five distinct stages in performing a systematic literature review (Fischl, Scherrer-Rathje, and Friedli 2014). By following those systematic steps in a transparent way, the risk of bias is minimized, and a potential study replication is enabled. The first three steps are covered in this section, while the remaining two steps regarding article analysis and research agenda will be addressed in subsequent, stand-alone sections.

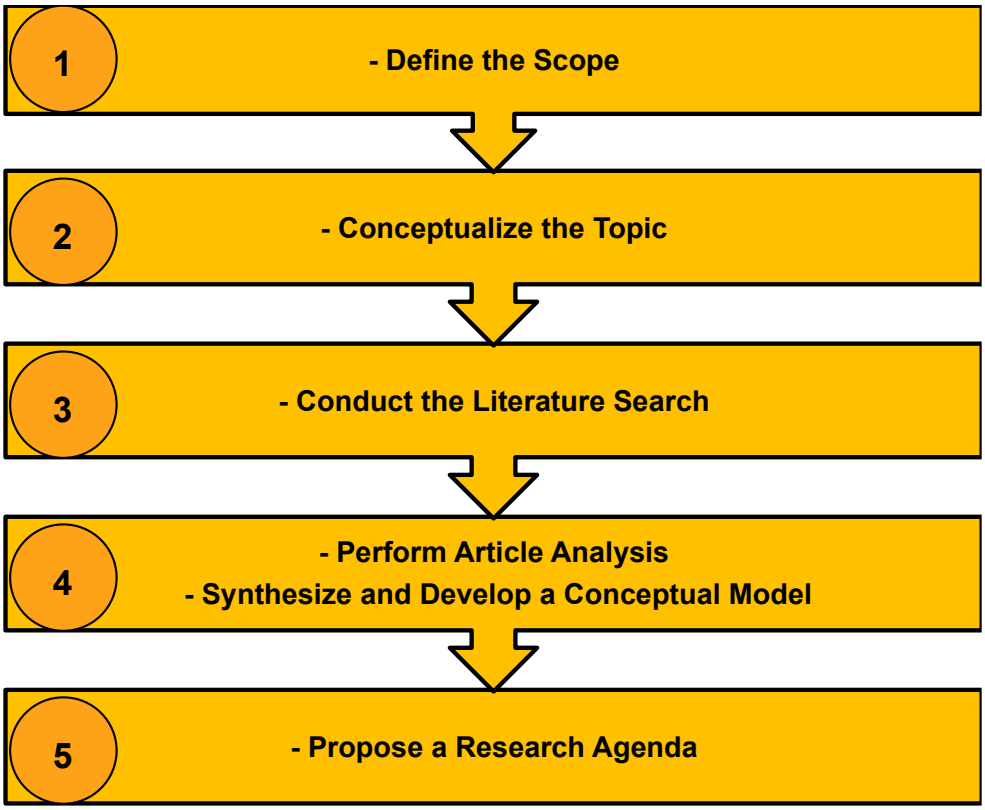

Figure 1 Five-step procedure for systematic literature review (Fischl, Scherrer-Rathje, and Friedli 2014)

Scope of Literature Review

The focus of the literature review lies primarily on deriving theoretical contributions and practical implications. Specifically, the goal of this research is to enhance the understanding of the dimensions of innovation sourcing and its relationship to innovation performance, to synthesize the current empirical literature focusing on this topic, and to develop a future research agenda. This article is based on a representative coverage strategy, which refers to the degree to which relevant articles are considered in this literature review. Following Fischl, Scherrer-Rathje, and Friedli (2014), a representative coverage strategy was chosen because an exhaustive approach

appears unfeasible in light of the characteristics of the knowledge base, which is noticeably growing, widely dispersed, and of a cross-disciplinary nature.

Topic Conceptualization

This research is intended to contribute to the scholarly debate about how the sourcing processes might enhance organizational innovation. The article focuses on the concept of innovation sourcing, its critical dimensions, and its relationship with innovation performance. Innovation sourcing deals with finding new knowledge from external suppliers and bringing those new ideas into the organization to improve its product, service, and process portfolio. This process requires integration between the new external and the existing internal knowledge.

Literature Search

The phenomenon of innovation sourcing touches the fields of supply management, strategic management, marketing, innovation/technology management, engineering, and entrepreneurship. Therefore, the EBSCOhost (business source complete) database was selected because it addresses all those areas extensively, and it has been applied by similar systematic literature review research on boundary-spanning topics (Fischl, Scherrer-Rathje, and Friedli 2014; Gligor 2014). EBSCOhost is considered one of the most extensive databases in management (Gligor 2014; Tachizawa and Wong 2014). Moreover, Google Scholar (GS) and Science Direct (SD) were utilized to ensure a broad coverage of relevant literature.

In 2003 Chesbrough published his seminal book on open innovation. At that time, he referred to an emerging conversation among scholars and practitioners about capturing external knowledge for the focal organization. Quinn, another important scholar, published a seminal article

about outsourcing innovation as the new growth engine (2000). Based on the research by Quinn, the year 2000 is used as the foundational year for innovation sourcing in this literature review. Due to research purpose and target audience, the data collection is based on peer-reviewed scholarly journals, not practitioner-based journals (Gligor and Holcomb 2012), to benefit from the rigor of the prior review process, which ensures a higher-quality result (Newbert 2007). Only peer-reviewed academic journals in English were considered. Editorials, book reviews, conceptual papers, and literature reviews were excluded (Fischl, Scherrer-Rathje, and Friedli 2014).

According to Seuring and Gold (2012), the two most common approaches of literature reviews in the SCM domain are (1) title, abstract, keyword searches or (2) a focus on selected journals (determined a priori). The former was chosen to avoid a potential premature exclusion of relevant articles when limiting the search to specific journals a priori. In this way, the multidisciplinary breadth of the topic was accounted for by covering articles from related fields in the search (Seuring and Gold 2012). The first activity was to define the keyword strings (Pashaei and Olhager 2015), which were sourc*, innovat*, strateg*, and purchas*. The results were compiled, compared, and sorted to identify potential duplications. This round yielded 538 published articles, with a search time horizon of January 2000 to March 2015. Next, the titles and keywords of each article were verified to ensure a fit to the research question. In case of doubt, the article was kept to have a rather extensive (inclusive) literature foundation. Consequently, 242 articles remained in the pool for the next round, when two researchers evaluated all abstracts. The results were compared, with an interrater reliability of above 80 percent. All discrepancies were discussed and a final agreement was reached. One researcher functioned as a "judge," read the conflict-causing abstracts, and ultimately made the final decision.

After the initial screening (duplicate removal; title and keyword screening; abstract screening), a total of 118 articles remained potentially relevant for the research. In the final round, all remaining articles were read completely, assessed, and categorized according to type (empirical, conceptual), topic, context, main theoretical frameworks, critical definitions, methodology, methodological rigor, main constructs (independent and dependent variables), and contribution/findings. This process included an assessment of whether the article matched the scope and purpose of this study. At this stage, it was ultimately decided to solely focus on empirical work (Newbert 2007). The detailed inclusion and exclusion steps are provided in appendix A. Two researchers read and flagged articles where a discussion was deemed necessary. The analysis results and categorization decisions were compared (Miles and Huberman 1994), and a common categorization was found. In this final screening, a number of articles were assessed as not fitting with the overall research purpose (only partial fit or peripheral coverage), lacking a solid theoretical foundation, or showing methodological weaknesses. In addition, some articles were assessed as redundant when other papers of the sample were more comprehensive. This final screening round reduced the number of papers from 118 to 30 papers (table 3).

Table 3/Article Screening

Round	Description	EBSCO	Science Direct	Google Scholar	Result
1	Remove duplicates	425	73	40	538
2	Screen titles/keywords	169	46	27	242
3	Screen abstracts	72	31	15	118
4	Analyze full articles	19	7	4	30

Notes: Intercoder agreement: all disagreements were discussed among the researchers and settled (a common categorization was found) (Schmelzle 2017). The Google Scholar list was limited to the first 100 hits.

Conceptual Development—Three Main Dimensions of Innovation Sourcing

The article analysis revealed that innovation sourcing is a multidimensional construct. The three primary dimensions of innovation sourcing are external knowledge integration, internal knowledge integration, and innovation propensity (fig. 2).

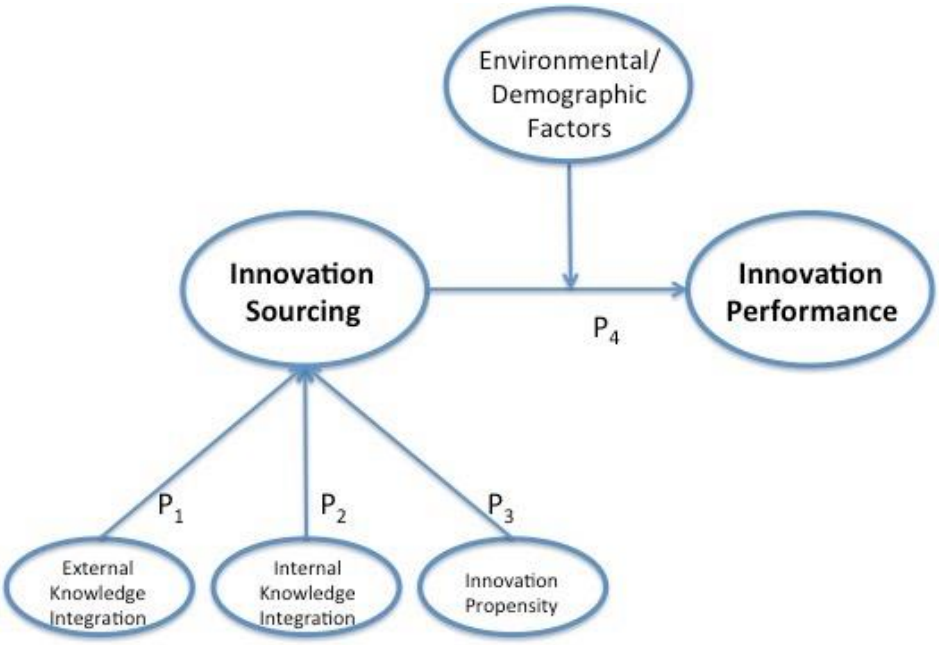

Figure 2 Conceptual framework of innovation sourcing

External Knowledge Integration

External knowledge integration practices are a key dimension of innovation sourcing. *External integration* refers to the cooperation of the focal organization with external partners (Schoenherr and Swink 2012). In contrast, *external knowledge integration* is defined as the effective utilization and leveraging of externally provided ideas or solutions for the benefit of product, service, or process improvement (Gallego, Rubalcaba, and Suárez 2013; Slowinski et al. 2009; Teece 2007). The latter is defined more narrowly, focusing on the integration of intangible input (e.g., ideas),

while the former is a much broader, strategic concept of the interorganizational cooperation or collaboration literature. The practices and processes of external knowledge integration were categorized into three areas. The first area relates to searching, scouting, or scanning practices. The second area involves external collaboration and knowledge exchange. The third area category concerns the interactive learning process to integrate the external knowledge in the organization.

Searching, Scouting, and Scanning

One of the key components of external knowledge integration relates to the knowledge acquisition from external entities (Cassiman and Veugelers 2006) and its influence on internal information processing and knowledge exploitation processes. The searching, scouting, and scanning process involves a set of organizational practices with the purpose of monitoring the market development and recognizing when opportunities evolve that offer potential benefits for the organization. This process includes the practice of nurturing external links to various new entities in formal or informal arrangements to gain access to critical knowledge, and of establishing a scouting mechanism to enhance awareness of industry trends (Chen, Chen, and Vanhaverbeke 2011). According to Eisenhardt and Santos (2002), multiple knowledge searching and acquisition mechanisms exist (e.g., probing processes [experimental products] or advice networks). Overall, organizations continuously scan their environment and attempt to acquire critical knowledge, which is not available in-house.

External Collaboration and Knowledge Exchange

While the first category dealt with establishing fresh new ties to companies outside of the established supply base, the second category focuses on collaborative ties to existing suppliers.

Collaboration with innovative organizations is essential for maintaining an up-to-date knowledge base (repository) for the organization (Bierly, Damanpour, and Santoro 2009). The effective utilization of network collaboration appears to be decisive for innovation performance in a particular context such as high-velocity environments (Eisenhardt and Santos 2002), but it requires effective knowledge integration practices (Gallego, Rubalcaba, and Suárez 2013). Scholars have emphasized that effective integration practices focus on the orchestration of collaborative interorganizational knowledge exchange and on enabling the effective and efficient in-house utilization of this newly obtained knowledge (Revilla and Villena 2012).

Essential is the development of a collaboration capability (collaborative know-how) to facilitate the knowledge exchange among respective constituents (Bierly, Damanpour, and Santoro 2009). This process includes effective collaborative practices of creating, maintaining, and utilizing the necessary communication channels with a network of suppliers (Gallego, Rubalcaba, and Suárez 2013). Furthermore, the resource allocation among external partners needs to be organized effectively in a collaborative manner (Powell, Koput, and Smith-Doerr 1996). In addition to the use of formal network connections such as alliances, informal research collaborations are another complementary element of the innovation sourcing mechanism (Gallego, Rubalcaba, and Suárez 2013). In complex and dynamic environments such as biotechnology establishing boundary-spanning networks with informal relationships facilitates the acquisition of external knowledge and the subsequent knowledge exchange between the focal firm and research laboratories or universities (Liebeskind et al. 1996).

Interactive Learning

Researchers have also highlighted the critical impact of interactive learning practices involved in knowledge integration (Azadegan and Dooley 2010). Learning can be understood as a process of accumulating knowledge for the organization. Scholars have characterized learning practices as being experience-driven and focused on enhancing organizational routines (Eisenhardt and Santos 2002) and the organization's knowledge repository (Cohen and Levinthal 1990). Looking at industries characterized by complex, expanding, and dispersed knowledge, research suggests that innovation is originating from networks of learning rather than individual firms (Powell, Koput, and Smith-Doerr 1996). This origin implies that the innovation sourcing process is not solely about the transfer of "finished" knowledge from external partners but rather about learning processes (Manuj, Omar, and Yazdanparast 2013). In this regard, learning mechanisms form the essential operational routines for the innovation process (Jiang, Waller, and Cai 2013; Oke and Kach 2012). Interorganizational learning is the essential foundation for creating new organizational capabilities, which will ultimately lead to a competitive advantage (Marsh and Stock 2006; Manuj, Omar, and Yazdanparast 2013).

How can this support the innovation objectives of the organization? One option is to integrate knowledge more quickly and effectively and enhance the knowledge assimilation and retention activities (Marsh and Stock 2006). Essential aspects include operational routines to capture relevant knowledge, which then facilitates the internal knowledge absorption and exploitation process (Abecassis-Moedas and Mahmoud-Jouini 2008; Zahra and George 2002). External knowledge integration with various providers of valuable, non-redundant knowledge serves as a fundamental dimension of the innovation sourcing concept. In summary, all three

external knowledge integration categories influence innovation sourcing, which leads to the first research proposition:

> P1: A higher level of external knowledge integration is associated with a higher level of innovation sourcing.

Internal Knowledge Integration

Internal knowledge integration refers to two main categories. The first category is an internal knowledge absorption process, and the second category is knowledge resource management and cross-functional integration. While innovation sourcing from various external sources is an increasing trend (Linder, Jarvenpaa, and Davenport 2003), organizations need to maintain a sufficient level of internal R&D capabilities in-house (Tsai and Wang 2009). Firms cannot simply acquire only external knowledge (Chen, Chen, and Vanhaverbeke 2011). External and internal knowledge integration activities are complementary (Cassiman and Veugelers 2006). On one hand, external technology sources might lack the essential "local or contextual knowledge of markets, supply chains, and firm specific factors" (Tether and Tajar 2008). On the other hand, the focal organization needs to maintain the capabilities of evaluating the external knowledge and then amending its internal technological base through effective knowledge integration practices (Marsh and Stock 2006). This adaptation necessitates an effective knowledge integration competence (Bierly, Damanpour, and Santoro 2009).

Knowledge Absorption

In the literature, absorptive capacity (Cohen and Levinthal 1990), and its critical impact on innovation performance, have been empirically validated (Laursen and Salter 2006). Researchers have described the internal skills of effectively exploiting the externally acquired knowledge

(Cassiman and Veugelers 2006), including the capability to create more sophisticated knowledge combinations from different sources (Chesbrough 2003). Others have emphasized the internal capability of retaining and refining available knowledge for future use (Marsh and Stock 2006). Overall, the essential internal knowledge integration capability encompasses the corresponding routines and administrative processes that facilitate the integration and utilization of knowledge (Roper, Du, and Love 2008).

Knowledge Resource Management and Cross-Functional Integration

Consequently, this discussion on knowledge absorption leads to the second important category. The organization might need to align the internal capabilities of different functions to ensure an effective exploitation of the externally acquired knowledge. In the literature, cross-functional integration has been identified as an essential aspect in this regard (Atuahene-Gima 2005). Overall, the internal integration success appears very dependent on an effective knowledge resource management process at the organizational level (Chen and Huang 2009; Cuijpers, Guenter, and Hussinger 2011). Effective internal knowledge sharing requires management policies be developed to enhance cross-functional integration (Song, Kawakami, and Stringfellow 2010). Organizations must establish the adequate governance structure that fits to the strategic intent (Vrande, Lemmens, and Vanhaverbeke 2006), the specific developmental or technological life cycle stage(s) (Cuijpers, Guenter, and Hussinger 2011), the environmental context (e.g., competitiveness, technological dynamism, uncertainty) (Cantarello et al. 2011; Chen, Chen, and Vanhaverbeke 2011), as well as to the prior experiences of the partners (Slowinski et al. 2009).

Cross-functional integration has been associated with successful technology commercialization (Iansiti 1995; Zahra and Nielsen 2002). Critical is the ability to overcome

internal political turf wars. The not-invented-here syndrome is an indicator of noticeable in-house resistance to the sourcing and utilization of external knowledge, which has been described as a knowledge assimilation barrier (Bierly, Damanpour, and Santoro 2009). Thus, the organization needs to avoid this internal inhibitor of effective innovation sourcing. Researchers have noted additional substantial risks related to internal knowledge integration (Marsh and Stock 2006). Poor internal cooperation can lead to project delays and even termination (Cuijpers, Guenter, and Hussinger 2011). Cuijpers, Guenter, and Hussinger (2011) recommend that organizations provide sufficient resources (financial and nonfinancial) for coordination efforts to enable effective innovation sharing. This is another indication that organizations carefully assess the internal environment and context when pursuing innovation sourcing activities. To sum up this section, innovation sourcing will be successful when emphasizing effective internal knowledge integration. This leads to the next research proposition:

> P2: A higher level of internal knowledge integration is associated with a higher level of innovation sourcing.

Innovation Propensity

A broad variety of constructs and cognitive aspects in terms of mindset, attitude, or inclination to support the organizational innovation activities have been mentioned in the literature, two of which are particularly adequate for this context. On one hand, innovation orientation is the inclination to encourage and support internal creative processes and experimentation, intended to lead to new products or services becoming introduced to the market (Lumpkin and Dess 1996; Rosenbusch, Rauch, and Bausch 2013). The construct refers to an organizational "strategy of developing and introducing innovative new products or services into the market before their competitors" (Knudsen and Mortensen 2011, 56). On the other hand, innovation propensity is the inclination to

actively seek, acquire, and exploit beneficial new ideas from external constituents to bolster internal innovation processes. Both constructs entail an organizational mindset embracing innovation, but there are important differences between them. Innovation orientation has an emphasis on the strategic internal innovation process, while innovation propensity captures the consideration of externally available knowledge to support the innovation processes. Two main aspects of innovation propensity relate to an organizational openness toward innovation sourcing and a shared understanding valuing external knowledge (Marsh and Stock 2006).

Openness toward Innovation Sourcing

Research has identified organizational culture as influencing the effectiveness of innovation sourcing (De Brentani and Kleinschmidt 2004). The analysis revealed the need for an organizational mindset emphasizing innovation and open to applying a knowledge-based sourcing strategy (Knudsen and Mortensen 2011). The latter, openness, poses as a central theme of innovation propensity. The organizational tendency to seek, acquire, and exploit beneficial externally available knowledge is a main aspect of innovation propensity. One example is an organizational attentiveness to new ideas from the supply base and a commitment for continuous collaborative innovation (Slowinski et al. 2009). Successful organizations are systematically assessing externally available know-how and create a climate that is receptive to external ideas (Cassiman and Veugelers 2006; Katz and Gartner 1988). This requires an innovation-focused decision-making process supporting innovation sourcing and an organizational openness toward externally available knowledge (Azadegan and Dooley 2010; Chen, Chen, and Vanhaverbeke 2011; Naranjo-Valencia, Jiménez-Jiménez, and Sanz-Valle 2011).

Shared Understanding about External Knowledge Value

A critical aspect of innovation sourcing is the necessity to achieve a shared understanding of the innovative value of external ideas (Marsh and Stock 2006). Essential characteristics are a cognitive mindset and a general culture of embracing the use of external knowledge (Azadegan and Dooley 2010; Chen, Chen, and Vanhaverbeke 2011; Naranjo-Valencia, Jiménez-Jiménez, and Sanz-Valle 2011). This serves as a foundation for collective actions and decision-making. To achieve this common interpretation of external knowledge, a common thought world about the meaningfulness of innovation is helpful, which illustrates the second main perspective of innovation propensity. Organizations with high innovation propensity recognize the criticality of external knowledge inflow to remain competitive in the long run. Based on the literature review, the innovation propensity concept emphasizes organizational attentiveness especially in regards to externally available knowledge. Nonetheless, it does not only involve technical/engineering but organizational and administrative process knowledge (Naranjo-Valencia, Jiménez-Jiménez, and Sanz-Valle 2011). In summary, innovation sourcing requires a firm-wide commitment (Chen, Chen, and Vanhaverbeke 2011). Hence, innovation propensity is the third dimension of innovation sourcing, and the following is proposed:

> P3: A higher level of innovation propensity is associated with a higher level of innovation sourcing.

In conclusion, the main dimensions of innovation sourcing are external knowledge integration, internal knowledge integration, and innovation propensity. These all affect different operational and managerial practices of the organization, which are enumerated in table 4 along with the most important contextual factors.

Table 4/Main Innovation Sourcing Practices and Processes

	Innovation Sourcing Practices and Processes	**Environmental/ Demographic Factors**	**Examples**
External Knowledge Integration	Searching, scouting, and scanning	Market and technological dynamism (innovation intensity); industry; innovation type and scope; firm size and age; developmental maturity; R&D expenditures	Laursen and Salter 2006; Leiponen and Helfat 2010; Chen, Chen, and Vanhaverbeke 2011; Oke and Kach 2012; Jiang, Waller, and Cai 2013
	External collaboration; knowledge exchange		Almeida and Phene 2004; Cassiman and Veugelers 2006; Abecassis-Moedas and Mahmoud-Jouini 2008; Gallego, Rubalcaba, and Suárez 2013; Sabidussi et al. 2014
	Interactive learning		Almeida and Phene 2004; Marsh and Stock 2006; Kang and Kang 2009; Azadegan and Dooley 2010; Chen, Chen, and Vanhaverbeke 2011; Oke and Kach 2012; Revilla and Villena 2012; Jiang, Waller, and Cai 2013
Internal Knowledge Integration	Knowledge absorption	Firm size and age; market and technological dynamism; technological/ development lifecycle; R&D expenditures	Cassiman and Veugelers 2006; Marsh and Stock 2006; Kang and Kang 2009; Knudsen and Mortensen 2011; Sabidussi et al. 2014
	Knowledge resource management; cross-functional integration		Roper, Du, and Love 2008; Cuijpers, Guenter, and Hussinger 2011; Knudsen and Mortensen 2011; Wang et al. 2014
Innovation Propensity	Innovation-focused decision-making; openness for innovation sourcing; open innovation culture	Firm size and age; innovation type	Laursen and Salter 2006; Marsh and Stock 2006; Azadegan and Dooley 2010; Chen, Chen, and Vanhaverbeke2011; Knudsen and Mortensen 2011; Naranjo-Valencia, Jiménez-Jiménez, and Sanz-Valle 2011; Wang et al. 2014

Innovation Sourcing and Its Performance Implications

When organizations develop effective mechanisms for conducting innovation sourcing, they will be more innovative and successful in the marketplace (Chen, Chen, and Vanhaverbeke 2011). All three dimensions of innovation sourcing are positively associated with innovation performance. External relationships with suppliers matter, which includes developing the appropriate level of

breadth (diversity of external relationships) and depth (relational intensity) (Laursen and Salter 2006). Effective searching and scouting processes as well as knowledge exchange coordination are relevant for high innovativeness (Kang and Kang 2009; Oke and Kach 2012). Research has emphasized the importance of knowledge integration practices of externally acquired knowledge to influence innovation success (Cassiman and Veugelers 2006). Organizations facilitate the external and internal knowledge exchange to initiate joint learning and increase innovation performance (Chen, Lin, and Chang 2009). This necessitates effective organizational learning processes to assimilate the new ideas (Kang and Kang 2014; Knudsen and Mortensen 2011; Wang et al. 2014). Furthermore, researchers underscore the importance of firm-level knowledge resource management within the organization (Cuijpers, Guenter, and Hussinger 2011). Enhancing cross-functional integration will lead to successful innovation outcomes (Evanschitzky et al. 2012).

The level of innovation propensity influences organizational performance as well. In particular, an effective organizational climate geared toward innovation strengthens new product development performance (Evanschitzky et al. 2012). This can be related to innovation propensity as an attitudinal aspect of the organization that emphasizes the appreciation for external knowledge inflow. To improve innovation, an innovation-focused mindset of the organization has been described as a critical success factor (Chen, Chen, and Vanhaverbeke 2011; Knudsen and Mortensen 2011). Innovation propensity appears to be a positive contributor to organizational innovation (Chen, Chen, and Vanhaverbeke 2011). To sum up this section, multiple scholars have noted the positive impact of innovation sourcing on innovation performance (Cassiman and Veugelers 2006; Perez-Luno, Gopalakrishnan, and Cabrera 2014). Thereby, innovation sourcing supports the organizational innovation process and can ultimately enhance organizational

performance. As researchers have identified a positive correlation between innovation sourcing and innovation performance, the following is proposed:

> P4: A higher level of innovation sourcing is associated with a higher level of innovation performance.

The performance impact of innovation sourcing is moderated by a number of contextual factors such as market/technological environment, firm size and age, industry, or type of innovation (Kirche and Srivastava 2010). Figure 3 illustrates the essential practices and processes of the three innovation sourcing dimensions to summarize the findings of the applicable literature.

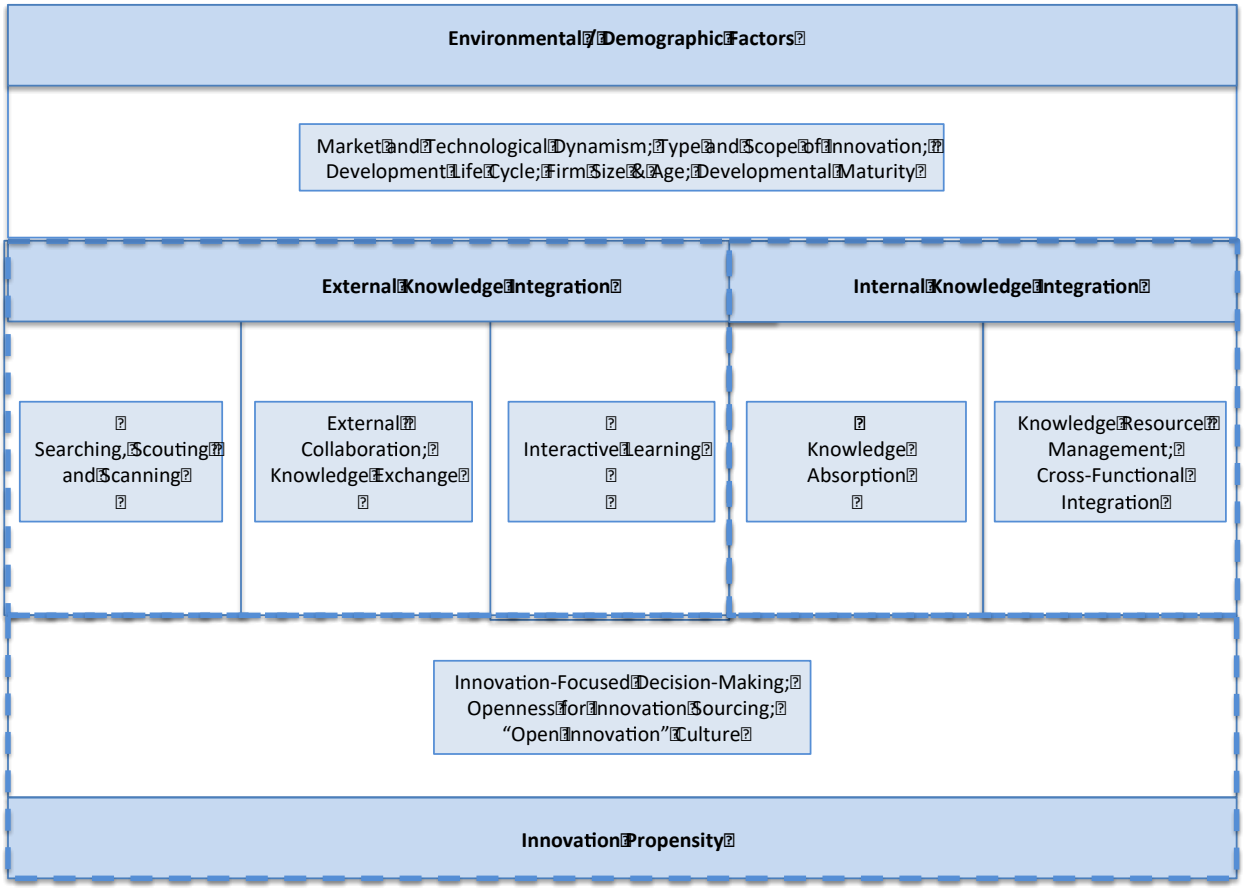

Figure 3 Structural overview of innovation sourcing

An Agenda for Future Research

The extant innovation sourcing literature was synthesized to develop a conceptualization of this phenomenon (Schmelzle 2017). The analysis established the main conceptual dimensions and the relationship with innovation performance, addressing the first two research questions. This section will concentrate on the third question on how to move this research forward. The fragmented research stream has resulted in noticeable gaps, and a focused research agenda will assist in bridging some of those gaps. Macro- (strategic) and micro- (operational) level aspects need to be differentiated when addressing the gaps around the phenomenon of innovation sourcing. Based on the literature review, three aspects of innovation sourcing are recommended for further investigation:

- What are the strategic implications of the emergent innovation sourcing phenomenon?
- What are operational implications of innovation sourcing?
- How can organizations establish a culture of innovation-focus to support innovation sourcing?

What are the strategic implications of the emergent innovation sourcing phenomenon?

Organizations have shifted more and more knowledge generation activities from make to buy (Quinn 2000; Slowinski et al. 2009). As the buy decision becomes more important to innovation, the innovation sourcing process might become more strategically relevant for the organization. Research has not kept pace with practice in this context so that essential questions have remained unanswered. Critical research questions include: How does innovation sourcing relate to corporate and/or functional strategies? What is the appropriate level of innovation sourcing for an organization in a given environment? How does innovation sourcing influence innovation and financial performance? What are the implications of “too much” innovation sourcing for the organization? What are further strategic benefits of innovation sourcing?

To address those questions, research could assess whether and how innovation sourcing might result in a competitive advantage for the organization. What innovation sourcing subprocesses are particularly impactful, and under what contingencies? More analysis in this regard could reveal additional competitive benefits or outcomes resulting from effective innovation sourcing. Research could also study the consequences when innovation sourcing practices are well aligned or misaligned. This would involve both vertical alignment (e.g., purchasing to corporate strategy) and horizontal alignment (e.g., R&D strategy to purchasing strategy).

Innovation Sourcing as a Competitive Advantage

Organizations need to determine a long-term strategy for growth in accordance to specific market environments (Kang and Kang 2009). Next, the necessary assets (capabilities) to support this strategy can be defined, and potential gaps to existing competencies identified. At this point, developing an integrated procurement strategy (congruent to corporate strategy) might assist in recognizing which capabilities should be developed internally and which should be externally sourced (make or buy).

Future research could explore the foundation for innovation sourcing decisions. How are the organization's core capabilities and strategic resource needs defined? In regards to competitiveness, how are the critical capabilities protected (sustaining a competitive advantage) when engaging in collaboration with external partners? To close potential knowledge gaps, individual innovation sourcing subprocesses might be analyzed in detail. Future research could investigate whether and how innovation sourcing can support the organization's strategic adaptation to environmental changes. One interesting option would be to analyze the diverse set

of strategic outcomes that could lead to a competitive advantage. For example, does innovation sourcing enhance trust and commitment in external relationships? How does innovation sourcing affect the market position of the organization? Another key question concerns the financial effects of innovation sourcing. Researchers could investigate in more depth whether innovation sourcing results in better organizational performance. Different methodologies appear applicable to address this. Qualitative interviews and nonparticipant observations of managerial meetings could reveal the extent of existing innovation sourcing competence and its perceived strategic relevance in different market environments. Archival data could be used as a separate source to gain financial performance data and relate it to innovation sourcing subprocesses.

Organizational Alignment

To cope with the innovation challenges, organizations need to ensure a fit of their innovation sourcing strategy to the organizational requirements. This involves both vertical and horizontal alignment. First, innovation sourcing should be aligned to the overarching purchasing and corporate strategy. Practitioners need guidance in this regard. The purchasing strategy should direct innovation sourcing decisions. The former will be based on the given tradeoffs between various innovation and purchasing performance dimensions and the corporate objectives (Fisher 1997). Researchers could compare the consequences of coordinated versus uncoordinated activities in regards to innovation sourcing (Chesbrough 2006). Naturally, an innovation sourcing strategy emphasizing high-end, high-technology component sourcing might contradict an overarching cost leadership corporate strategy.

Second, scholars could investigate the horizontal alignment of functional strategies. Organizations need to manage the innovation sourcing process carefully, avoiding the “over-

search" phenomenon when spreading scarce internal resources (Laursen and Salter 2006). Innovation sourcing needs to be executed in a balanced way, considering intraorganizational capabilities and constraints as well as learning opportunities (Marsh and Stock 2006). As this might significantly differ across functions, research could contrast the innovation sourcing impact on different functions such as purchasing or engineering. To avoid commercial pitfalls, purchasing and engineering should work together closely and enhance their internal cooperation in practice. Calls for research to investigate processes at the intersection between engineering and purchasing could be addressed (Brattström and Richtnér 2014).

Researchers have investigated some aspects of cross-functional collaboration between purchasing and other functions such as engineering (Cuijpers, Guenter, and Hussinger 2011). But in light of the emergence of innovation sourcing, more research appears warranted to explore further the consequences and tradeoffs of cross-functional integration and horizontal alignment. To empirically assess the level of alignment, perceptional measures would need to be used. Thus, a cross-sectional survey could be applied to verify the influence of strategic alignment of innovation sourcing on innovation and financial performance of the organization. Alternatively, the analysis of secondary data (e.g., publicly available reports about procurement and corporate strategies, along with innovation activities) could be a suitable methodology to approach relevant research questions in this area.

The Strategic Role of Purchasing

The trend toward innovation sourcing might affect purchasing's strategic role within the organization. Thus, an important avenue for research concerns purchasing's objectives in this regard. Potential research questions for future studies include: What is the strategic impact of

purchasing on the company's innovation performance? What is purchasing's role in facilitating innovation sourcing? Within the emerging trend toward innovation sourcing, does purchasing enhance its strategic relevance and clout within the organization? A specific aspect would concern the facilitator role concerning innovation sourcing. As such, who is critically supporting or nurturing innovation sourcing within the organization? Who is the most appropriate driver of innovation sourcing within the organization? What are performance differences when innovation is driven top-down from (upper-echelon) management in contrast to being driven from the purchasing function? Should purchasing simply support the innovation sourcing processes under the guidance of engineering? Or should it take a more active role? What is the performance impact when purchasing is driving innovation sourcing? How does this influence the other purchasing processes?

This literature review confirms that more research attention to the role of purchasing is justified. Strategically, the purchasing function might shape this process by taking an active role as the innovation sourcing driver. As innovation sourcing practices are emerging as a growing trend, a new role of purchasing in strategically managing this process might appear fruitful for some organizations. Research could investigate such circumstances and provide relevant advice to practitioners. Qualitative research methodologies such as ethnography or phenomenology could be suitable to enhance the detailed understanding of purchasing's role in innovation sourcing. Case studies could lead to additional insights in different contexts.

What are operational implications of innovation sourcing?

Innovation sourcing is affecting the organization at an operational level. Ultimately, innovation implies a constantly evolving product, service, and process portfolio. For innovation sourcing to

emerge as a core competency, organizations need to develop innovation sourcing practices (Marsh and Stock 2006). Therefore, researchers are encouraged to dive deeply into the operational details of the innovation sourcing process to provide guidance about the necessary innovation sourcing routines that lead to better organizational performance. The detailed innovation sourcing mechanism has not yet received sufficient scholarly attention on an operational level. Researchers have already identified a lack of procedure as an inhibitor of the effective knowledge inflow, and eventually of innovation performance (Almeida and Phene 2004). For example, effective and efficient innovation sourcing practices might impact organizational performance differently, depending on each organizational function. Potential research questions include: What specific operational subprocesses enhance innovation performance, and how? What practices facilitate innovation sourcing performance, and what aspects inhibit it? How should those functional routines be developed and implemented? What are the operational implications?

To address these questions, three main avenues for further research are proposed. First, research could assess whether and how innovation sourcing shows a functional operational impact, and how this relates to organizational performance. For instance, research could investigate the influence of operational routines of different functions on innovation performance. Second, scholars could focus on knowledge integration practices and its performance consequences. Third, the potentially moderating influence of environmental and demographic factors on the relationship between innovation sourcing and innovation performance could be analyzed.

Functional Impact of and on Innovation Sourcing

The phenomenon intersects a number of fields such as supply management or innovation management. How could the body of knowledge of both the supply chain management and the

innovation literature be enhanced when studying the innovation sourcing phenomena at an operational level, comparing different functional perspectives? Many empirical studies of this literature review have noted that without enhancing innovation sourcing practices, an organization's innovation performance will remain limited. Researchers need to better understand the relevant workflows and procedures on the micro-level, and how the end-to-end business processes are affected. Innovation sourcing practices step outside of the traditional functional boundaries, impacting marketing, logistics, manufacturing, or engineering workflows. What is the operational impact of innovation sourcing outside of the new product and service development domain? Interesting and relevant research studies could focus on the interplay between knowledge flow and organizational learning when comparing different organizational functions (Marsh and Stock 2006).

Knowledge Integration Practices

Researchers could contrast different organizational routines in terms of innovation performance (Leiponen and Helfat 2010). Scholars might scrutinize knowledge integration and absorption practices and verify their effectiveness and efficiency. What are the best knowledge management routines to enhance innovativeness? How does management determine and measure a desired degree of knowledge integration efforts? Researchers could provide new insights when exploring the role of senior and middle management in this regard.

The causal effects between innovation sourcing and innovation performance should be analyzed in more depth. It is proposed that the former drives the latter. However, scholars could investigate whether in practice organizations determine a desired level of innovativeness first before developing the corresponding operational innovation sourcing practices. Overall,

researchers would need to shift attention toward a systematic, holistic approach on innovation sourcing. Insights from related scholarly fields (marketing, engineering, or strategic management, for example) could enhance the supply management literature. Inductive research methodologies could be applied to reveal the necessary depth and richness of the innovation sourcing subprocesses. By developing a more detailed conceptual framework, scholars could extend existing theory in this field.

Environmental Influence on Innovation Sourcing and Innovation Performance

Innovation decisions are highly context-dependent, so that generalizations require adequate caution. Future research should increase the understanding of those contextual factors that potentially alter the innovation sourcing decision-making and influence the performance outcomes (Cassiman and Veugelers 2006). A number of important research questions arise: How robust is the innovation sourcing to performance relationship under varying environmental conditions? What are critical contingencies in regards to the innovation sourcing mechanism? What are the most essential environmental factors that moderate the performance impact, and what factors determine boundary conditions? What contextual factors (e.g., market and technological environment; developmental life cycle; innovation type) are influencing (and how) the most appropriate governance structure? A cross-sectional survey methodology could be applied to test the environmental impact on innovation performance.

How can organizations establish a culture of innovation-focus to support innovation sourcing?

External collaboration is critical for achieving an effective innovation sourcing process (Almeida and Phene 2004; Azadegan and Dooley 2010). Nonetheless, internal collaboration is critical as well (Wagner 2010), and it can enhance the company-specific innovation processes and routines (Cuijpers, Guenter, and Hussinger 2011). Organizations might differ in encouraging innovation or facilitating innovation sourcing (De Brentani and Kleinschmidt 2004). Research could study how those cultural aspects influence organizational performance. How could management initiate and nurture a cultural change toward innovation? How important is culture to the innovation sourcing process? Researchers have highlighted that innovation sourcing will only be successful with a sufficient level of top management commitment, and it might even necessitate the adaptation of organizational culture toward innovativeness (Slowinski et al. 2009). But what cultural changes influence the level of innovation sourcing? Those aspects could benefit from further scholarly investigation. Analyzing the role of operational, middle, and senior management in enhancing the innovation sourcing process could be the focus of a future research stream.

Another interesting aspect would be to compare and contrast attitudes on an individual versus organizational level. In particular, the impact of those aspects on the fuzzy-front end phase of innovation projects, or the ideation, idea generating stages, could be a fruitful research opportunity, as this phase is particularly dependent on creativity and fresh ideas (McNally, Akdeniz, and Calantone 2011). Future research could be based on an experimental design methodology to investigate the interplay between cultural (attitudinal) and structural (governance) factors, and its corresponding performance implications.

Implications and Conclusion

This systematic literature review enables a better understanding of the phenomenon of innovation sourcing. The research has provided an agenda to initiate a subsequent research stream, which should make this exciting and relevant area of research more mainstream. There are some implications for theory to discuss.

Theoretical Contributions

This research study provides several theoretical contributions. First, the innovation literature is extended to include the concept of innovation sourcing with a particular focus on the upstream supply chain. The systematic review of an important supply chain concept along with a conceptual development of the main dimensions of innovation sourcing is a theoretical contribution. The conceptualization enhances the theoretical breadth and depth of the open innovation theoretical framework by detailing the complementary innovation sourcing perspective from the upstream supply chain. With this research, the strategic sourcing domain is extended by enhancing the theoretical understanding of its innovation sourcing subdomain.

Second, the innovation sourcing mechanism is more thoroughly explained. The key concepts of this phenomenon have been clarified and definitions of essential terms have been provided. The three main dimensions of innovation sourcing have been developed based on a broad set of empirical literature. The study provides a foundation for further analysis of subprocesses and the performance consequences. Specifically, the new framework can assist with identifying challenges in the innovation sourcing process and thereby support the innovation failure analysis. Consequently, enhancing the conceptual understanding of the innovation sourcing phenomenon is not solely theoretically interesting and important but also highly relevant for practitioners.

Third, the fragmented literature stream on innovation sourcing is synthesized and research gaps are noted. By providing an agenda for future research, those gaps can be addressed in subsequent investigations. As innovation sourcing relates particularly to procurement processes, for instance, a need for further research regarding the role of purchasing has been explained.

Fourth, supply chain management research is linked with innovation management research. A main contribution of this article is connecting the disparate literature streams (e.g., supply management, marketing, and strategic management body of knowledge) to create an overview of relevant definitions and operationalizations of innovation performance in the context of product/service innovation. Hence, a multidisciplinary body of knowledge has been synthesized to address the research questions.

Fifth, the systematic literature review has revealed a strong emphasis on external integration and exploitation in current scholarly work on innovation sourcing. Some researchers have already progressed toward linking external with internal knowledge integration, which have been identified as complementary aspects (Cassiman and Veugelers 2006). To obtain a more comprehensive understanding of this complex phenomenon, all three dimensions will need to be addressed holistically and (possibly) concurrently in future research.

In summary, there are a number of important theoretical contributions of this study. The systematic literature review has identified a lack of coherence in the body of knowledge on innovation sourcing. Following the proposed research agenda, future research could narrow the gap. This could yield interesting and insightful new perspectives on the innovation sourcing phenomenon.

Implications for Practice

This research illustrates potential improvement areas that managers can focus on to enhance the innovation performance of their organization. Innovation sourcing requires not only the effective integration of knowledge input from external partners but also an effective internal cross-functional integration structure facilitating the joint development activities. The research provides guidance regarding the critical dimensions of innovation sourcing. Managers need to consider the interplay between external and internal knowledge integration along with innovation propensity as a cultural element. Thereby, they could enhance the innovation success rate and avoid costly innovation failures.

This article explains the need for cross-functional alignment along with coordinated internal and external knowledge integration practices. In addition, the fundamental need to encourage and foster an innovation propensity mindset within the organization is highlighted. Overall, the research has illustrated the necessity for managers to combine all three dimensions to achieve higher innovation performance. The combined efforts of developing external relationships, encouraging cross-functional integration, and fostering innovation propensity will become increasingly a decisive success factor. Managers need to develop an integrative (holistic) approach toward innovation sourcing that is aligned with corporate strategy as well as with the suppliers' innovation strategies.

Appendix A
Exclusion and Inclusion Steps

The following systematic inclusion and exclusion steps were taken during the article screening (following Newbert 2007).

Exclusion and Inclusion Steps

Include papers published in peer-reviewed academic journals in English language.
Limit papers to the 2000–2015 time frame.
Limit papers to research papers and exclude editorials, book reviews; commentaries, special issue introductions, and similar nonrelevant papers.
Exclude all papers that do not have at least one corresponding keyword hit in either title or abstract or keyword list.
Exclude all papers, after reading the abstract, that are not relevant to the research questions; hence, include only papers with a clear research focus related to the research topic as described in Appendix B.
Exclude conceptual papers and literature reviews.

Appendix B

Exclusion and Inclusion Criteria (detailed content evaluation)

Type	**Criteria**
Exclusion	Focus on financial ownership perspective (e.g., M&A of technology companies)
	Focus on customers only / pure user involvement
	Crowdsourcing with pure user-input
	Pure Software development (open source)
	Focus on macroeconomic aspects (e.g., specific nations, or inter-country aspects)
	Focus on intellectual property aspects (legal or financial revenue, patent revenue emphasis)
Inclusion	Involvement of external entities (e.g., suppliers, universities, private (research) institutions, governmental institutions) for joint innovation
	All aspects of procurement and sourcing of technology, including sourcing strategy development
	Research focusing on resource (asset) and capability development based on external input or joint innovation activities
	Structure and governmental mechanisms of codevelopment (joint innovation)
	Cultural and social capital aspects of joint innovation
	Development and use of knowledge exchange mechanisms for codevelopment (joint innovation)

Note: Criteria utilized for exclusion and inclusion decision-making during the initial screening phase (title, key word, and abstract screening).

References

Abecassis-Moedas, C., and S. Ben Mahmoud-Jouini. 2008. "Absorptive Capacity and Source-Recipient Complementarity in Designing New Products: An Empirically Derived Framework." *Journal of Product Innovation Management* 25 (5): 473–90.

Allred, B. B., and K. S. Swan. 2014. "Process Technology Sourcing and the Innovation Context." *Journal of Product Innovation Management* 31 (6): 1146–66.

Almeida, P., and A. Phene. 2004. "Subsidiaries and Knowledge Creation: The Influence of the MNC and Host Country on Innovation." *Strategic Management Journal* 25 (8-9): 847–64.

Atuahene-Gima, K. 2005. "Resolving the Capability: Rigidity Paradox in New Product Innovation." *Journal of Marketing* 69 (4): 61–83.

Azadegan, A., and K. J. Dooley. 2010. "Supplier Innovativeness, Organizational Learning Styles and Manufacturer Performance: An Empirical Assessment." *Journal of Operations Management* 28 (6): 488–505.

Bierly, P. E., F. Damanpour, and M. D. Santoro. 2009. "The Application of External Knowledge: Organizational Conditions for Exploration and Exploitation." *Journal of Management Studies* 46 (3): 481–509.

Brattström, A., and A. Richtnér. 2014. "Good Cop–Bad Cop: Trust, Control, and the Lure of Integration." *Journal of Product Innovation Management* 31 (3): 584–98.

Calantone, R. J., and C. A. Di Benedetto. 2012. "The Role of Lean Launch Execution and Launch Timing on New Product Performance." *Journal of the Academy of Marketing Science* 40 (4): 526–38.

Cantarello, S., A. Nosella, G. Petroni, and K. Venturini. 2011. "External Technology Sourcing: Evidence from Design-Driven Innovation." *Management Decision* 49 (6): 962–83.

Cassiman, B., and R. Veugelers. 2006. "In Search of Complementarity in Innovation Strategy: Internal R&D and External Knowledge Acquisition." *Management Science* 52 (1): 68–82.

Chen, C., and J. Huang. 2009. "Strategic Human Resource Practices and Innovation Performance—The Mediating Role of Knowledge Management Capacity." *Journal of Business Research* 62 (1): 104–14.

Chen, J., Y. Chen, and W. Vanhaverbeke. 2011. "The Influence of Scope, Depth, and Orientation of External Technology Sources on the Innovative Performance of Chinese Firms." *Technovation* 31 (8): 362–73.

Chen, Y., M. James Lin, and C. Chang. 2009. "The Positive Effects of Relationship Learning and Absorptive Capacity on Innovation Performance and Competitive Advantage in Industrial Markets." *Industrial Marketing Management* 38 (2): 152–58.

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

———. 2006. *Open Business Models: How to Thrive in the New Innovation Landscape*. Boston, MA: Harvard Business School Press.

Chesbrough, H., and A. K. Crowther. 2006. "Beyond High Tech: Early Adopters of Open Innovation in Other Industries." *R&D Management* 36 (3): 229–36.

Clausen, T. H. 2013. "External Knowledge Sourcing from Innovation Cooperation and the Role of Absorptive Capacity: Empirical Evidence from Norway and Sweden." *Technology Analysis and Strategic Management* 25 (1): 57–70.

Cohen, W. M., and D. A. Levinthal. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation." *Administrative Science Quarterly* 35 (1): 128–52.

Combs, J. G., T. R. Crook, and C. L. Shook. 2005. “The Dimensionality of Organizational Performance and Its Implications for Strategic Management Research.” *Research Methodology in Strategy and Management* 2 (5): 259–86.

Cuijpers, M., H. Guenter, and K. Hussinger. 2011. “Costs and Benefits of Inter-Departmental Innovation Collaboration.” *Research Policy* 40 (4): 565–75.

De Brentani, U., and E. J. Kleinschmidt. 2004. “Corporate Culture and Commitment: Impact on Performance of International New Product Development Programs.” *Journal of Product Innovation Management* 21 (5): 309–33.

Di Benedetto, C. A. 1999. “Identifying the Key Success Factors in New Product Launch.” *Journal of Product Innovation Management* 16 (6): 530–44.

Eisenhardt, K. M., and F. M. Santos. 2002. “Knowledge-Based View: A New Theory of Strategy.” *Handbook of Strategy and Management* 1. London: Sage.

Enkel, E., O. Gassmann, and H. Chesbrough. 2009. “Open R&D and Open Innovation : Exploring the Phenomenon.” *R&D Management* 39 (4): 311–16.

Evanschitzky, H., M. Eisend, R. J. Calantone, and Y. Jiang. 2012. “Success Factors of Product Innovation: An Updated Meta-Analysis.” *Journal of Product Innovation Management* 29 (S1): 21–37.

Fischl, M., M. Scherrer-Rathje, and T. Friedli. 2014. “Digging Deeper into Supply Risk: A Systematic Literature Review on Price Risks.” *Supply Chain Management: An International Journal* 19 (5/6): 480–503.

Fisher, M. L. 1997. “What Is the Right Supply Chain for Your Product?” *Harvard Business Review* (March–April): 105–16.

Flint, D. J. 2006. “Innovation, Symbolic Interaction and Customer Valuing: Thoughts Stemming from a Service-Dominant Logic of Marketing.” *Marketing Theory* 6 (3): 349–62.

Gallego, J., L. Rubalcaba, and C. Suárez. 2013. “Knowledge for Innovation in Europe: The Role of External Knowledge on Firms’ Cooperation Strategies.” *Journal of Business Research* 66:2034–41.

Gassmann, O. 2006. “Opening Up the Innovation Process: Towards an Agenda.” *R&D Management* 36 (3): 223–28.

Gassmann, O., and E. Enkel. 2004. “Towards a Theory of Open Innovation: Three Core Process Archetypes.” In *Proceedings of The R&D Management Conference, Lisbon, Portugal, July 6–9.*, 1–18.

Gassmann, O., E. Enkel, and H. Chesbrough. 2010. “The Future of Open Innovation.” *R&D Management* 40 (3), 213–21.

Gatignon, H., and J. Xuereb. 1997. “Strategic Orientation of the Firm and New Product Performance.” *Journal of Marketing Research* 34:77–90.

Gligor, D. M. 2014. “The Role of Demand Management in Achieving Supply Chain Agility.” *Supply Chain Management: An International Journal* 19 (5/6): 577–91.

Gligor, D. M., and M. C. Holcomb. 2012. “Understanding the Role of Logistics Capabilities in Achieving Supply Chain Agility: A Systematic Literature Review.” *Supply Chain Management: An International Journal* 17 (4): 438–53.

Heidenreich, S., and T. Kraemer. 2016. “Innovations—Doomed to Fail? Investigating Strategies to Overcome Passive Innovation Resistance.” *Journal of Product Innovation Management* 33 (3): 277–97.

Iansiti, M. 1995. “Shooting the Rapids: Managing Product Development In Turbulent Environments.” *California Management Review* 38 (1): 37–58.

Jiang, L., D. S. Waller, and S. Cai. 2013. “Does Ownership Type Matter for Innovation? Evidence from China.” *Journal of Business Research* 66 (12): 2473–78.

Kang, K. H., and J. Kang. 2009. “How Do Firms Source External Knowledge for Innovation? Analysing Effects of Different Knowledge Sourcing Methods.” *International Journal of Innovation Management* 13 (1): 1–17.

———. 2014. “Do External Knowledge Sourcing Modes Matter for Service Innovation? Empirical Evidence from South Korean Service Firms.” *Journal of Product Innovation Management* 31 (1): 176–91.

Katz, J., and W. B. Gartner. 1988. “Properties of Emerging Organizations.” *Academy of Management Review* 13 (3): 429–41.

Keupp, M. M., and O. Gassmann. 2009. “The Past and the Future of International Entrepreneurship: A Review and Suggestions for Developing the Field.” *Journal of Management* 35 (3): 600–633.

Kirche, E. T., and R. Srivastava. 2010. “Real-Time Order Management with Supplier Capacity Reservation.” *International Journal of Manufacturing Technology and Management* 19 (1-2): 124–39.

Knudsen, M. P., and T. B. Mortensen. 2011. “Some Immediate but Negative Effects of Openness on Product Development Performance.” *Technovation* 31 (1): 54–64.

Kostopoulos, K., A. Papalexandris, M. Papachroni, and G. Ioannou. 2011. “Absorptive Capacity, Innovation, and Financial Performance.” *Journal of Business Research* 64 (12): 1335–43.

Laursen, K., and A. Salter. 2006. “Open for Innovation: The Role of Openness in Explaining Innovation Performance among U.K. Manufacturing Firms.” *Strategic Management Journal* 27 (2): 131–50.

Leiponen, A., and C. E. Helfat. 2010. “Innovation Objectives, Knowledge Sources, and the Benefits of Breadth.” *Strategic Management Journal* 31 (2): 224–36.

Liebeskind, J. P., A. L. Oliver, L. Zucker, and M. Brewer. 1996. “Social Networks, Learning, and Flexibility: Sourcing Scientific Knowledge in New Biotechnology Firms.” *Organization Science* 7 (4): 428–43.

Linder, J. C., S. Jarvenpaa, and T. H. Davenport. 2003. “Toward an Innovation Sourcing Strategy.” *MIT Sloan Management Review* 44 (4): 43–49.

Luca, L. M., and K. Atuahene-Gima. 2007. “Market Knowledge Dimensions and Cross-Functional Collaboration: Examining the Different Routes to Product Innovation Performance.” *Journal of Marketing* 71 (1): 95–112.

Lumpkin, G. T., and G. G. Dess. 1996. “Clarifying the Entrepreneurial Orientation Construct and Linking It to Performance.” *Academy of Management Review* 21 (1): 135–72.

Manuj, I., A. Omar, and A. Yazdanparast. 2013. “The Quest for Competitive Advantage in Global Supply Chains: The Role of Interorganizational Learning.” *Transportation Journal* 52 (4): 463–92.

Marsh, S. J., and G. N. Stock. 2006. “Creating Dynamic Capability: The Role of Intertemporal Integration, Knowledge Retention, and Interpretation.” *Journal of Product Innovation Management* 23 (5): 422–36.

McNally, R. C., M. B. Akdeniz, and R. J. Calantone. 2011. “New Product Development Processes and New Product Profitability: Exploring the Mediating Role of Speed to Market and Product Quality.” *Journal of Product Innovation Management* 28 (S1): 63–77.

Miles, M. B., and M. A. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks, CA: Sage Publications.

Nakata, C., and S. Im. 2010. “Spurring Cross-Functional Integration for Higher New Product Performance: A Group Effectiveness Perspective.” *Journal of Product Innovation Management* 27 (4): 554–71.

Naranjo-Valencia, J. C., D. Jiménez-Jiménez, and R. Sanz-Valle. 2011. “Innovation or Imitation? The Role of Organizational Culture.” *Management Decision* 49 (1): 55–72.

Newbert, S. L. 2007. “Empirical Research on the Resource-Based View of the Firm: An Assessment and Suggestion for Future Research.” *Strategic Management Journal* 28 (2): 121–46.

Ogden, J. A., C. L. Rosetti, and T. E. Hendrick. 2007. “An Exploratory Cross-country Comparison of Strategic Purchasing.” *Journal of Purchasing and Supply Management* 13 (1): 2–16.

Oke, A., and A. Kach. 2012. “Linking Sourcing and Collaborative Strategies to Financial Performance: The Role of Operational Innovation.” *Journal of Purchasing and Supply Management* 18 (1): 46–59.

Pashaei, S., and J. Olhager. 2015. “Product Architecture and Supply Chain Design: A Systematic Review and Research Agenda.” *Supply Chain Management: An International Journal* 20 (1): 98–112.

Perez-Luno, A., S. Gopalakrishnan, and R. V. Cabrera. 2014. “Innovation and Performance: The Role of Environmental Dynamism on the Success of Innovation Choices.” *IEEE Transactions on Engineering Management* 61 (3): 499–510.

Powell, W. W., K. W. Koput, and L. Smith-Doerr. 1996. “Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology.” *Administrative Science Quarterly* 41 (1): 116–45.

Quinn, J. B. 2000. “Outsourcing Innovation: The New Engine of Growth.” *Sloan Management Review* 41 (4): 13–28.

Revilla, E., and V. H. Villena. 2012. “Knowledge Integration Taxonomy in Buyer–Supplier Relationships: Trade-Offs between Efficiency and Innovation.” *International Journal of Production Economics* 140 (2): 854–64.

Rigby, D., and C. Zook. 2002. “Open-Market Innovation.” *Harvard Business Review* 80 (10): 80–93.

Roper, S., J. Du, and J. H. Love. 2008. “Modelling the Innovation Value Chain.” *Research Policy* 37 (6–7): 961–77.

Rosell, D. T., and N. Lakemond. 2012. “Collaborative Innovation with Suppliers -A Conceptual Model for Characterising Supplier Contributions to NPD.” *International Journal of Technology Intelligence and Planning* 8 (2): 197–214.

Rosenbusch, N., A. Rauch, and A. Bausch. 2013. “The Mediating Role of Entrepreneurial Orientation in the Task Environment–Performance Relationship: A Meta-Analysis.” *Journal of Management* 39 (3): 633–59.

Rothaermel, F. T., and M. T. Alexandre. 2009. “Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity.” *Organization Science* 20 (4): 759–80.

Rothwell, R. 1994. *Towards the Fifth-Generation Innovation Process*. *International Marketing Review* 11 (1): 7–31.

Sabidussi, A., B. Lokshin, T. De Leeuw, G. Duysters, H. Bremmers, and O. Omta. 2014. “A Comparative Perspective on External Technology Sourcing Modalities: The Role of Synergies.” *Journal of Engineering and Technology Management* 33:18–31.

Schilling, M. A., and C. W. L. Hill. 1998. “Managing the New Product Development Process: Strategic Imperatives.” *Academy of Management Executive* 12 (3): 67–81.

Schmelzle, Ulrich. 2017. “Supply Chain-Driven Innovation: The Influence of Supply Chain Resource Orchestration on Organizational Performance.” Ph.D. diss., University of Tennessee, Knoxville.

Schoenherr, T., and M. Swink. 2012. “Revisiting the Arcs of Integration: Cross-Validations and Extensions.” *Journal of Operations Management* 30 (1–2): 99–115.

Seuring, S., and S. Gold. 2012. “Conducting Content-Analysis Based Literature Reviews in Supply Chain Management.” *Supply Chain Management: An International Journal* 17 (5): 544–55.

Slowinski, G., E. Hummel, A. Gupta, and E. R. Gilmont. 2009. “Effective Practices for Sourcing Innovation.” *Research Technology Management* 52 (1): 27–34.

Song, M., T. Kawakami, and A. Stringfellow. 2010. “A Cross-National Comparative Study of Senior Management Policy, Marketing–Manufacturing Involvement, and Innovation Performance.” *Journal of Product Innovation Management* 27 (2): 179–200.

Stock, G. N., and M. V. Tatikonda. 2008. “The Joint Influence of Technology Uncertainty and Interorganizational Interaction on External Technology Integration Success.” *Journal of Operations Management* 26 (1): 65–80.

Tachizawa, E. M., and C. Y. Wong. 2014. “Towards a Theory of Multi-Tier Sustainable Supply Chains: A Systematic Literature Review.” *Supply Chain Management: An International Journal* 19 (5/6): 643–63.

Teece, D. J. 2007. “Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance.” *Strategic Management Journal* 28 (13): 1319–50.

Tether, B. S., and A. Tajar. 2008. “Beyond Industry–University Links: Sourcing Knowledge for Innovation from Consultants, Private Research Organisations and the Public Science-Base.” *Research Policy* 37 (6–7): 1079–95.

Tsai, K., and J. Wang. 2009. “External Technology Sourcing and Innovation Performance in LMT Sectors: An Analysis Based on the Taiwanese Technological Innovation Survey.” *Research Policy* 38 (3): 518–26.

Venkataraman, N., and J. H. Grant. 1986. “Construct Measurement in Organizational Strategy Research: A Critique and Proposal.” *Academy of Management Review* 11 (1): 71–87.

Vrande, V., C. Lemmens, and W. Vanhaverbeke. 2006. “Choosing Governance Modes for External Technology Sourcing.” *R&D Management* 36 (3): 347–63.

Wagner, S. M. 2010. “Supplier Traits for Better Customer Firm Innovation Performance.” *Industrial Marketing Management* 39 (7): 1139–49.

Wang, F., J. Chen, Y. Wang, N. Lutao, and W. Vanhaverbeke. 2014. “The Effect of R&D Novelty and Openness Decision on Firms’ Catch-up Performance: Empirical Evidence from China.” *Technovation* 34 (1): 21–30.

Wowak, K. D., C. W. Craighead, D. J. Ketchen, and G.T. M. Hult. 2016. “Toward a ‘Theoretical Toolbox’ for the Supplier-Enabled Fuzzy Front End of the New Product Development Process.” *Journal of Supply Chain Management* 52 (1): 66–81.

Yuen, K. F., and V. V. Thai. 2016. “The Relationship between Supply Chain Integration and Operational Performances: A Study of Priorities and Synergies.” *Transportation Journal* 55 (1): 31–50.

Zahra, S. A., and G. George. 2002. “Absorptive Capacity: A Review , Reconceptualization, and Extension.” *Academy of Management Review* 27 (2): 185–203.

Zahra, S. A., and A. P. Nielsen. 2002. “Sources of Capabilities, Integration and Technology Commercialization.” *Strategic Management Journal* 23 (5): 377–98.