

Vertical alliances and innovation

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Vertical alliances and innovation: A systematic review of the literature and a future research agenda

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ABSTRACT

For this paper, we conducted a systematic review of 116 articles on vertical alliances and innovation published in 35 leading journals between 2000 and 2021, and provide an integrative and in-depth evaluation of the current state of the vertical alliances and innovation literature. Through such review, this article makes three key contributions to the extant literature. First, it provides an integrative overview of vertical alliances and innovation. Second, it maps the depth and scope of the study of vertical alliances and innovation by highlighting the research methods, geographical coverage, industries, and theoretical perspectives deployed by the extant scholarship. Third, it develops a multi-level framework of the vertical alliances and innovation relationship, and discusses the findings based on research linkages between antecedents, mediators, outcomes, and moderators. This framework led us to identify key research gaps and to highlight additional theoretical approaches that may shed light on this important topic, given the growing importance of technological advancement and networks for innovation.

1. Introduction

A longstanding and venerable stream in the strategy and organization literature is concerned with the boundaries of firms (Galbraith, 1977; Rumelt et al., 1994; Thompson, 1967). Most of the extant research suggests that spanning firm boundaries through strategic alliances is critical for firm performance (Panico, 2017; Reuer, 2004; Steensma and Corley, 2000), given that critical resources and knowledge are spread across networks of firms. A strategic alliance refers to a “voluntary arrangement between firms involving exchange, sharing, or codevelopment of products, technologies, or services” (Gulati, 1998, p. 293). Strategic alliances are important sources of competitive advantage because they lead to the expansion of firms’ resources and knowledge bases, and of their capabilities across organizational boundaries (Gomes et al., 2011; Shijaku et al., 2020). They facilitate new product development and the innovation of firms by offering technological knowledge and promoting

inter-organizational learning (Christofi et al., 2019; Ovuakporie et al., 2021). In recent years, notable and high-profile examples of such alliances have included: that between Kabam (a video game startup) and Ford to mutually reconnoiter digital connectivity, artificial intelligence and cloud computing; the investment of the Alibaba Group in several technology firms including Tango (a messaging application); that between Facebook and Deloitte Digital for the development of digital business; and that between Google and Intel for the adoption of the cloud. The primary strategic orientation of these alliances is not product diversification; it is on emerging technologies with bustling inventive activities.

In relation to such alliances, a vital decision for firms is the choice of appropriate partners (Martínez-Noya and García-Canal, 2021). Firms can enter into horizontal alliances (Weber and Heidenreich, 2018) with their competitors to achieve collective aims such as improving their market power and position, or in vertical ones (Zhang and Tong, 2021)

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with their suppliers and customers/clients along the value chain to achieve common objectives such as the design of new products. Each type of alliance offers the possibility of accessing different types of external knowledge (Belderbos et al., 2018). Horizontal alliances are generally suited for future technologies and innovation in non-core domains, compensating for access to scarce knowledge (van den Oever and Martin, 2019). These alliances, however, carry risks because competitors have a greater ability to absorb and appropriate each other's core expertise and tacit knowledge, which facilitates an undesirable flow of knowledge and create a tendency for free-ridership (Belderbos et al., 2018; Zhu et al., 2019). As such, vertical alliances are an attractive strategic choice for innovation due to their advantages of providing access to a broad knowledge base of upstream and/or downstream partners (Hipp and Binz, 2020; Liao et al., 2017). Vertical alliances offer operational efficiencies suited to manage demand variability, enable the effective commercialization of new products and accomplishment of process improvements (Mudambi and Puck, 2016; Shen et al., 2021), and allow firms to engage in in-house R&D activities and to gain technical know-how from their customers/suppliers (Lahiri and Narayanan, 2013).

Vertical alliances can also be established with: (1) organizations that are upstream in the value chain, such as research partners, manufacturers, and suppliers, and (2) organizations that are downstream in the value chains, including customers and distributors (Dutta and Hora, 2017; Fang et al., 2015). Prior studies suggest that upstream and downstream alliances lead to innovation through different paths (Kang and Park, 2012; Rothaermel et al., 2006). For example, upstream alliances are established primarily to generate new basic knowledge or for exploratory activities, while downstream alliances are centered on generating and exploiting knowledge (i.e., they are focused on marketing and production activities, see Hess and Rothaermel, 2011). Upstream alliances are formed in order to share and acquire tacit knowledge suited to the generation of new ideas and the development of new products/services (Haeussler et al., 2012). In contrast, downstream alliances generally combine the efforts of customers and distributors to gain regulatory know-how and market knowledge for the commercialization of products/services and the enhancement of distribution channels (Dutta and Hora, 2017; Musarra et al., 2021).

Despite the unique natures of upstream and downstream alliances, scholars have hitherto rarely incorporated these differences into the innovation research agenda (Weber and Heidenreich, 2018). We still know little about the uniqueness, importance, governance structure, and recognition of upstream and downstream alliances for different types of innovation (Ozdemir et al., 2020), which results in overlaps between their constituencies, processes, and outcomes (Filiou, 2021; Geleilate et al., 2021). Greater clarity and consensus on the role of upstream vs. downstream alliances for innovation could be achieved, given that *“research integration and synthesis provides an important, and possibly even a required, step in the scientific process”* (Palmatier et al., 2018, p. 1). Therefore, the aim of this article is to offer a comprehensive understanding of the relationship between vertical alliances (upstream and downstream) and innovation by means of a systematic review of the extant literature. Specifically, this paper complements the up-to-date knowledge on upstream and downstream alliances for innovation by addressing the major methodological approaches, geographic scope, industries, theoretical perspectives, and major research themes underpinning this line of research. To this end, we adopted a systematic literature review (SLR) approach to categorize and synthesize the evidence on vertical alliances and innovation of firms in order to answer the following research questions: *“What is the state of the vertical alliance and innovation literature in terms of general themes and challenges?”* and *“What implications and opportunities for future research do our findings suggest?”*

We conducted a two-tier SLR consisting of bibliometric and content analysis of existing studies on this topic. The former enabled us to carry out a transparent, systematic, and replicable SLR of the extant research and to provide a comprehensive knowledge map of the research field

(Maseda et al., 2022; Vrontis et al., 2020; Zhao et al., 2021). After mapping the vertical alliances and innovation research domain by means of bibliometric analysis, we performed a content analysis to review what has been hitherto addressed in the literature in terms of the association of vertical alliances and innovation (Luo et al., 2019). The complementarity of our bibliometric and content analysis provided us with a solid foundation suited to identify the key aspects of the aforementioned association, and to provide systematic and integrative insights on new perspectives for future research (Rialti et al., 2019; Vallaster et al., 2019).

Based on our review, we found 116 articles published in 35 leading journals, signaling a widely researched association between vertical alliances and innovation. Further, we found our vertical alliance and innovation sample studies to focus on either upstream or downstream alliances, with only some exceptions having integrated both alliance types in single studies. Moreover, we found that a diverse range of topics—such as firm characteristics, alliance governance mechanisms, knowledge exchange mechanisms, and joint innovation tasks—have been examined, but have not been integrated into an organizing framework. To address these issues, we organized the reviewed research in a framework suited to illustrate the relationship between vertical alliances and innovation, and identified the antecedents, mediators, moderators, and outcomes of this relationship. In this article, we also summarize the key differences we found between upstream and downstream alliances in relation to innovation. Then, to encourage new streams of research, we provide a future research agenda.

The findings of our review make unique contribution to the field of strategy and innovation, especially the vertical alliances and innovation, in several ways. First, despite their value and insightfulness, previous literature reviews on vertical alliance and innovation had focused on strategic alliances in general (see Table 1), thereby failing to highlight the uniqueness of vertical alliances and their implications for innovation. Our review, therefore, contributes to existing understanding of vertical alliances by delving into how upstream versus downstream vertical alliances differently facilitate innovation in relation to the rapid rise of network capitalism and to their distinct role in new product development and innovation, which has been one of the fundamental questions that hitherto received inadequate attention. Second, our review advances the existing literature on the vertical alliances and innovation phenomenon by not only illustrating the intellectual structure of the research field but more importantly synthesizing existing research findings. The insights offered by our current study in terms of the limitations of existing theoretical perspectives adopted and methodological used, the topics that are being investigated as well as what have been under-represented will help researchers to better understand this field and become aware of potential directions for future research. Third, we go beyond synthesizing existing studies on the vertical alliances and innovation to develop a comprehensive multi-level framework by which we specify the key antecedents, mediators, moderators, and outcomes of the relationship between vertical alliances and innovation, explicitly explain the connections between them, and further deploy this framework as a platform to discuss the key directions for future research, all of which no doubt make significant contributions to the literature by helping formulate new research questions suited to shape the healthy development of this important topic.

2. Methodology

SLRs have gained favor over traditional reviews based on the notion that they are characterized by enhanced rigor, validity, and generalizability (Denyer and Tranfield, 2009). SLRs are effective in offering practical and robust answers to focused review questions (Mallett et al., 2012). We, therefore, chose to conduct a SLR as a guiding tool to aggregate the fragmented research on vertical alliances and innovation. Our systematic review on this topic is in line with the arguments made by Parmigiani and Rivera-Santos (2011, p. 1130–1131) indicating that

Table 1
Exemplary review studies on alliances and innovation.

No:	Authors (Year)	Journal	Objective	Theme	Review period	Number of articles	What are the gaps?
1	Keupp et al. (2012)	International Journal of Management Reviews	Systematic review	The strategic management of innovation	1992 to 2010	342	Vertical alliances are not the key focus of this study
2	Pittaway et al. (2004)	International Journal of Management Reviews	Systematic review	Networking behavior and of firms for innovative capacity	1981 and 2003	179	It is focused on networking in general, without a specific focus on vertical alliances
3	Kohtamäki et al. (2018)	Industrial Marketing Management	Systematic review	Alliance capabilities	–	94	It is focused on all types of alliances and makes no mention of innovation
4	Castañer and Oliveira (2020)	Journal of Management	Systematic review	Collaboration, coordination, and cooperation	1948–2017	372	It is focused on collaboration in general, not specifically on vertical alliances and their links to innovation
5	Obradović et al. (2021)	Technovation	Systematic review	Open innovation in manufacturing industry	2003 to 2019	239	It is focused on collaboration in general, not specifically on vertical alliances
6	Becheikh et al. (2006)	Technovation	Systematic review	Innovation in manufacturing firms	1993 to 2003	108	It is not focused on any kind of alliances
7	Zahoor and Al-Tabbaa (2020)	Scandinavian Journal of Management	Systematic review	Inter-organizational collaboration and innovation of SMEs	2000 to 2019	113	It is focused on collaboration in general, not specifically on vertical alliances
8	Bengtsson and Raza-Ullah (2016)	Industrial Marketing Management	Systematic review	Coopetition	1996 to 2014	142	It is focused on horizontal alliances but not on vertical ones and not on linkages to innovation
9	Khosravi et al. (2019)	European Management Journal	Systematic review	Managerial innovation, organizational renewal and performance	1981 to 2017	66	It makes no reference to vertical alliances
10	Ardito et al. (2015)	International Journal of Management Reviews	Systematic review	Technological inventions to new products	1990 to 2013	100	It makes no reference to vertical alliances
11	Shamsollahi et al. (2021)	Journal of the Academy of Marketing Science	Systematic review	Buyer–supplier relationship dynamics	–	61	It is focused on buyer-supplier relationship dynamics in general, without linking them to innovation
12	Carpenter et al. (2012)	Journal of Management	Systematic review	Social capital in inter-organizational research	–	–	It makes no distinction between alliance types and makes no reference to linkages with innovation
13	Schmeisser (2013)	Journal of International Management	Systematic review	Offshoring value chain activities	1998 to 2012	63	It makes no reference to innovation
14	Wong and Ngai (2019)	Industrial Marketing Management	Systematic review	Supply chain innovations	1999 to 2016	155	It has no focus on how vertical alliances drive innovation

“there seems to be considerably more reviews and studies describing horizontal dyads (e.g., research alliances) rather than vertical relationships along the value chain.” To ensure transparency, we carried out our SLR in five successive steps ([Denyer and Tranfield, 2009](#)).

2.1. Review question

The success of a SLR depends on the initial formulation of a clear review question ([Rojon et al., 2021](#); [Vrontis et al., 2022](#)). Following [Adams et al. \(2016\)](#), we set our main research question as: “*What role do vertical alliances play in innovation?*” Based on previous studies ([Zahoor and Al-Tabbaa, 2020](#)) and on the specific boundaries of ours, we further broke down our main review question into two sub-questions:

RQ1 *What is the state of the vertical alliance and innovation literature in terms of general themes and challenges?*

RQ2 *What implications and opportunities for future research do our findings suggest?*

2.2. Review scope and boundaries

Following recent SLR studies ([Vrontis and Christofi, 2021](#); [Zahoor et al., 2020](#)), we applied five inclusion/exclusion criteria for our sample articles: (1) conceptual boundaries; (2) publication type; (3) specified timeframe; (4) search boundaries; and (5) keywords.

First, we sought to define the conceptual boundaries of the key terms *vertical alliance* and *innovation*. In the literature, the *vertical alliance* has been defined as a cooperative relationship established between

customers/clients and/or suppliers with the aim of achieving collective ends ([Belderbos et al., 2011](#); [Mesquita et al., 2008](#)). Conversely, *innovation* has been given different definitions in the literature. The first was provided in the late 1920s by Schumpeter, who defined it in terms of novel outputs like new markets, new supply sources, or new organizational structures. Then, [Van de Ven and Angle \(1989\)](#) defined *innovation* as the “*generation, accumulation and implementation of ideas, processes, products or services*” (p. 20). Following previous studies ([Camisón-Zornoza et al., 2004](#); [Vrontis and Christofi, 2021](#); [Zahoor and Al-Tabbaa, 2020](#)), we chose to define innovation as the translation of ideas into new or modified products, processes, services critical for the development of competitive advantage.

Second, in terms of publication type, we chose to focus on academic journal articles published in the English Language, thereby excluding non-academic articles, book chapters, editorials, conference papers, and book reviews ([Debellis et al., 2021](#); [Nolan and Garavan, 2016](#); [Pereira et al., 2021](#)). Also, following previous high-impact reviews ([Purkayastha & Kumar, 2021](#); [Soundararajan et al., 2018](#)), we only included articles that had appeared in 3, 4, or 4* rated journals, based on the 2021 journal ranking guide of the Chartered Association of Business Schools (CABS).

Third, we specified our sample timeframe from January 2000 to August 2021 period. We did so for two reasons: (1) the global upsurge in R&D and outsourcing that has emerged post-2000 ([UNCTAD, 2005](#)) and has given rise to the involvement of firms in global value chain activities; (2) the plethora of evidence published over two decades.

Fourth, we set our search boundaries to electronic databases—including the Wiley Online Library, Emerald, ScienceDirect, SAGE, ABI/Inform, and Business Source Ultimate. This decision was

based on the comprehensive journal coverage of the business and management field found in such databases (Endres and Weibler, 2017; Zahoor et al., 2020).

Finally, we identified our keywords based on discussions with academics and literature scoping (e.g., Shamsollahi et al., 2021; Vrontis and Christofi, 2021; Zahoor and Al-Tabbaa, 2020). We identified keywords for two categories: (1) vertical alliances and (2) innovation (see Table 2). Also, we combined the keywords in each group with the Boolean OR operator to create search strings. An example of a search formula used is “(vertical alliance OR customer-supplier linkage) AND (innovation OR innovative)”.

2.3. Identifying, screening, and selecting relevant studies

In line with our inclusion/exclusion criteria, we identified, screened, and selected relevant studies in four stages. First, we conducted a literature search in various databases, using our keyword combinations (as shown in Table 2) to identify the relevant articles published between 2000 and 2021. This step yielded 1137 articles as potentially relevant for our review. The identified articles were imported into the EndNote X9 bibliometric software.

Second, we used the ‘Find Duplicates’ function in EndNote X9. This enables us to recognize and remove 158 duplicates, reducing our sample of articles to 979. Next, we screened the articles against the CABS journal guide rankings to ensure the quality of our review. This process further reduced the number of articles to 426 for the selection stage.

Third, we scrutinized the remaining 426 articles against the fit-for-purpose criterion—which concerns the relevance of articles with the intended purpose of a SLR (Boaz and Ashby, 2003). Our fit-for-purpose criterion involved the inclusion of those studies that had made significant contributions and had provided insights into the relationship between vertical alliances and innovation. We excluded those studies that had focused only on vertical alliances or innovation or those that had considered mergers and acquisitions, horizontal alliances, or alliances in general (without distinguishing between vertical and horizontal ones) (Wu, 2014). At this stage, we read the abstract and introduction section of each article. In some cases, we read the full text. Ultimately, this led to the selection of 108 articles to be included in our study.

Finally, we manually checked the reference list of all the selected studies to ensure completeness (Dada, 2018). This step resulted in the retrieval of seven additional articles that were screened against inclusion and exclusion criteria by means of full text analysis. Thus, the final sample of our study was made up of 116 articles.

2.4. Analysis and synthesis

We subjected our sample 116 articles to bibliometric and qualitative content analyses (Luo et al., 2019). The former was used to identify statistical and descriptive patterns along the spatial and temporal dimensions. A data extraction form was used to report the features of each of our sample studies, including publication outlet, publication year, author’s geographic location, theoretical approach, methodology, geographical scope, and key findings (Vrontis and Christofi, 2021; Zahoor and Al-Tabbaa, 2020). We then performed a qualitative content analysis in order to identify research themes and sub-themes (e.g., Zhao et al., 2021). In doing so, we synthesized the vertical alliances and innovation literature by applying the extended version of the antecedents—mediators—moderators—outcomes (AMO) framework (Agostini and Nosella, 2017; Martineau and Pastoriza, 2016). The antecedents are those factors that determine the innovation of firms. The mediators relate to the intervening mechanisms for vertical alliances and innovation relationships. The moderators are the contingent factors that promote or hinder the antecedents—mediators—outcomes relationship. The outcomes pertain to innovation as a consequence of vertical alliances. Overall, the application of the bibliometric and qualitative content analysis methods helped us to develop a

Table 2
Keywords and search strings.

No:	Category	Search strings
1	Group string 1	“vertical alliances” OR “vertical networks” OR “vertical integration” OR “vertical collaboration” OR “vertical relationships” OR “supplier alliances” OR “supplier networks” OR “supplier integration” OR “supplier collaboration” OR “supplier relationships” OR “customer alliances” OR “customer networks” OR “customer integration” OR “customer collaboration” OR “customer relationships” OR “upstream alliances” OR “upstream networks” OR “upstream integration” OR “upstream collaboration” OR “upstream relationships” OR “downstream alliances” OR “downstream networks” OR “downstream integration” OR “downstream collaboration” OR “downstream relationships” OR “backward alliances” OR “backward integration” OR “backward networks” OR “backward collaboration” OR “backward relationships” OR “forward alliances” OR “forward networks” OR “forward integration” OR “forward collaboration” OR “forward relationships” OR “supplier-buyer alliances” OR “supplier-buyer networks” OR “supplier-buyer integration” OR “supplier-buyer collaboration” OR “supplier-buyer relationships” OR “buyer-supplier alliances” OR “buyer-supplier networks” OR “buyer-supplier integration” OR “buyer-supplier collaboration” OR “buyer-supplier relationships” OR “inter-organizational alliances” OR “inter-organizational networks” OR “inter-organizational integration” OR “inter-organizational collaboration” OR “inter-organization relationships” OR “inter-firm alliances” OR “inter-firm networks” OR “inter-firm integration” OR “inter-firm collaboration” OR “inter-firm relationships” OR “outsourcing”
2	Group string 2	“innovation” OR “innovative” OR “improvement” OR “enhancement” OR “product innovation” OR “process innovation” OR “technical knowledge” OR “technological innovation” OR “process improvement” OR “product improvement” OR “research and development” OR “research & development” OR “R&D” OR “research and development” OR “diffusion” OR “radical innovation” OR “incremental innovation” OR
3	Combined string 1	“vertical alliances” OR “vertical networks” OR “vertical integration” OR “vertical collaboration” OR “vertical relationships” OR “supplier alliances” OR “supplier networks” OR “supplier integration” OR “supplier collaboration” OR “supplier relationships” OR “customer alliances” OR “customer networks” OR “customer integration” OR “customer collaboration” OR “customer relationships” OR “upstream alliances” OR “upstream networks” OR “upstream integration” OR “upstream collaboration” OR “upstream relationships” OR “downstream alliances” OR “downstream networks” OR “downstream integration” OR “downstream collaboration” OR “downstream relationships” OR “backward alliances” OR “backward integration” OR “backward networks” OR “backward collaboration” OR “forward alliances” OR “forward networks” OR “forward integration” OR “forward collaboration” OR “forward relationships” OR “supplier-buyer alliances” OR “supplier-buyer networks” OR “supplier-buyer integration” OR “supplier-buyer collaboration” OR “supplier-buyer relationships” OR “buyer-supplier alliances” OR “buyer-supplier networks” OR “buyer-supplier integration” OR “buyer-supplier collaboration” OR “buyer-supplier relationships” OR “inter-organizational alliances” OR “inter-organizational networks” OR “inter-organizational integration” OR “inter-organizational collaboration” OR “inter-organization relationships” OR “inter-firm alliances” OR “inter-firm networks” OR “inter-firm integration” OR “inter-firm collaboration” OR “inter-firm relationships” OR “outsourcing” AND “innovation” OR “innovative” OR “improvement” OR “enhancement” OR “product innovation” OR “process innovation” OR “technological innovation” OR “process improvement” OR “product improvement” OR “research and development” OR “research & development” OR “R&D” OR “research and development” OR “diffusion” OR “radical innovation” OR “incremental innovation”

comprehensive review by synthesizing the collective insights and to explore any understudied yet critical issues (cf. Gaur & Kumar, 2018).

3. Bibliometric findings

This section presents the bibliometric findings in terms of publication outlet, publication year, author's geographic location, methodological approach, geographic scope, industry, and theoretical perspectives.

3.1. Publication outlet and year distribution

Table 3 presents the publication outlet distribution of our sample articles. Most of them had been published in *Industrial Marketing Management* (14), followed by the *Journal of Product Innovation Management* (13), the *Journal of Business Research* (9), the *Journal of Operations Management* (8), and *Technovation* (5). The remaining articles had been published in a variety of journals within diverse areas. However, it is worth noting that articles in the areas of strategy, organization & management science, organization studies, and entrepreneurship and small business management were underrepresented, thereby presenting

Table 3
Publication of vertical alliances and innovation research in leading journals.

Journal	Number of papers	CABS 2021 ranking
International Business & Area Studies (n = 10)		
Journal of International Business Studies	2	4*
Journal of World Business	1	4
Management International Review	2	3
Asia Pacific Journal of Management	2	3
International Business Review	2	3
Journal of International Management	1	3
Marketing (n = 21)		
Journal of the Academy of Marketing Science	4	4*
Journal of Marketing	3	4*
Industrial Marketing Management	14	3
Operations and Technology Management (n = 27)		
Journal of Operations Management	8	4*
International Journal of Operations & Production Management	3	4
Production and Operations Management	1	4
Journal of Supply Chain Management	3	4
Journal of Purchasing and Supply Management	1	3
Production Planning & Control	1	3
International Journal of Production Economics	3	3
International Journal of Production Research	4	3
IEEE Transactions on Engineering Management	3	3
Organization & Management Science (n = 3)		
Omega	1	3
Decision Sciences	2	3
Organization studies (n = 2)		
Organization Science	2	4*
Entrepreneurship and Small Business Management (N = 3)		
Journal of Business Venturing	1	4
Journal of Small Business Management	2	3
Innovation (n = 26)		
Research Policy	3	4*
Journal of Product Innovation Management	13	4
Technological Forecasting and Social Change	1	3
Technovation	5	3
R&D Management	4	3
General Management (n = 16)		
Academy of Management Journal	1	4*
Journal of Management Studies	5	4
British Journal of Management	1	4
Journal of Business Research	9	3
Strategy (n = 6)		
Strategic Management Journal	3	4*
Long Range Planning	3	3
Social science (n = 2)		
Business Strategy and the Environment	2	3
<i>Total</i>	<i>116</i>	

an opportunity for future researchers within the vertical alliances and innovation field.

The distribution of our sample publications by year is shown in Fig. 1. We noticed three different phases: an embryonic one ending in 2004, with 15 articles. A second one spanning the 2005–2011 period, with 38 articles—a 253% increase on the first— and a third (current) phase beginning in 2012, with 63 articles—a 165.79% increase on the second. In particular, considering our whole sample period, we noticed a generalized increasing trend.

3.2. Geographic analysis of authorship

Our sample articles had been written by 274 authors from 147 different countries. We further identified the number of authors and their associated countries for each sample article (see Table 4). In terms of authorship, our findings reveal that some articles (17) had been authored by a single researcher, but the vast majority of them had been published by two (47) or three or more authors (52). For the authors' geographical locations, our findings suggest that a large number of articles had been published in a single country (84), followed by two (26) and three or more countries (6). These findings suggest fruitful research collaboration across the globe. In addition, we analyzed the geographical regions and countries of each first author. In terms of geographical region, most authors were found to be from Europe (53), followed by America (44) and Asia (19). Authors from the Middle East, Africa, and Australia were found to be absent within this research stream. Further, the contributions were dominated by the authors from the US (42), followed by substantial contributions from the UK (14), Taiwan (10), and the Netherlands (9). This finding that only a small number of authorship teams had focused on vertical alliances and innovation phenomena is surprising, given the availability of advanced technologies suited to trigger international research collaborations.

3.3. Contextual and industry orientations of the sample studies

The contextual orientation of the sample studies suggests that they were focused on 27 different countries and, as shown in Table 5, most (106) had been conducted within a single country setting. Thus, our findings confirm a persistent lack of contextual comparisons in vertical alliances and innovation research. Fig. 2 further reveals that the US is the most popular research context, with 34 studies. This finding correlates with the economic growth, a growing number of vertical alliances across various industries and research focused community of the US. The UK, Germany, the Netherlands, and Taiwan were found to be the countries most often studied after the US. It is worth noting that emerging countries—like India, Russia, Brazil, Pakistan, South Africa and others—were found to be missing in the extant vertical alliances and innovation literature. Given their rapid economic growth and pro-market reforms, emerging markets offer fruitful avenues for future research.

In regard to the industry orientation of our sample studies, most were found to concentrate on industries within the high-technology sector (63)—e.g., automotive, electronics, information technology, and pharmaceutical—and within the manufacturing one (31). A fair number of the studies (10) had used samples from multiple industries, whereas five were found to not provide any indication of the sector from which their sample had been drawn.

3.4. Methodological approaches

Table 6 provides a summary of the research methods and data sources used to conduct our sample studies. The dominant method employed was found to be quantitative (86), based mostly on surveys (62) as the primary data source. This was mostly due to difficulties in obtaining archival data found in many countries with low information transparency. Regression analysis was found to be the most commonly

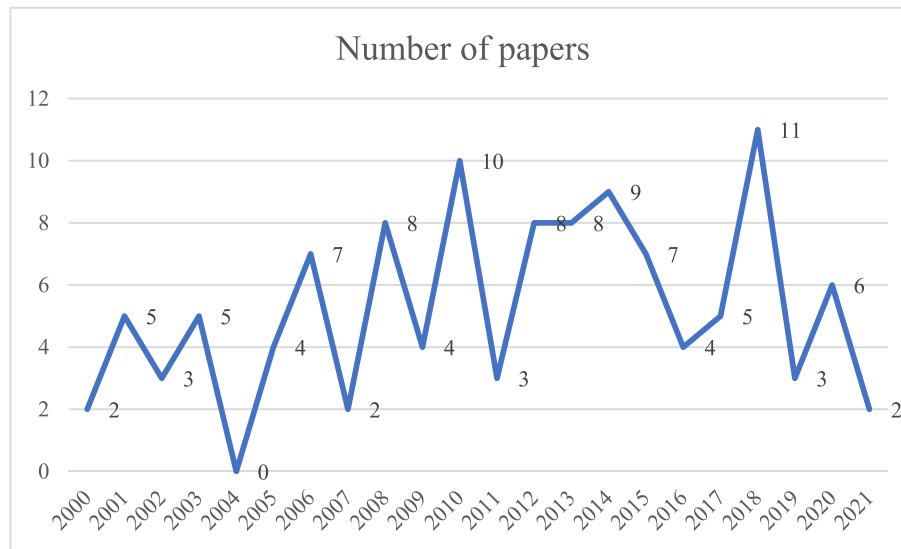


Fig. 1. Number of articles year on year (2000–2021).

Table 4
Authorship analysis of sample articles.

Number of authors	Number	Percentage (%)
One	17	14.66
Two	47	40.52
Three or more	52	44.83
Total	116	100
Number of author countries	Number	Percentage (%)
One	84	72.41
Two	26	22.41
Three or more	6	5.17
Total	116	100
Geographic region of first author	Number	Percentage (%)
Europe	53	45.69
Asia	19	16.38
America	42	36.21
Canada	2	1.72
Total	116	100
Country of first author	Number	Percentage (%)
Belgium	2	1.72
Canada	2	1.72
China	2	1.72
Denmark	1	0.86
Finland	3	2.59
France	4	3.45
Germany	6	5.17
Hong Kong	2	1.72
Ireland	1	0.86
Italy	3	2.59
Japan	1	0.86
The Netherlands	9	7.76
Norway	1	0.86
The Republic of Korea	3	2.59
Singapore	1	0.86
Spain	2	1.72
Sweden	5	4.31
Switzerland	2	1.72
Taiwan	10	8.62
The UK	14	12.07
The US	42	36.21
Total	116	100.00

used method (44), followed by structural equation modeling (SEM) (37). The qualitative method had been used by 26 articles primarily based on a single case (21) and multiple case studies (5). Within these articles,

Table 5
Countries and industries studied in the sample articles.

Number of countries studied	Number	Percentage (%)
One	106	92.317
Two	2	1.72
Three or more	8	6.89
Total	116	100
Industry sectors	Number	Percentage (%)
High-technology	63	54.31
Manufacturing	31	26.72
Multiple industries	10	8.62
Low-technology	7	6.03
Not clear	5	4.31
Total	116	100

only five had adopted a longitudinal case study design. Specifically, the use of the qualitative method had helped to explore new phenomena relating to the relationship between vertical alliances and innovation, and to develop new theories—e.g., individualistic, structuralist, and interactive perspectives—as an extension of the network theory. The use of a mixed-method design was found to be less common (4) in the vertical alliances and innovation literature.

In terms of the data sources, 96 articles had mainly used single data sources, whereas 18 had used multiple ones. The latter had used primary data sources, combining them with others for triangulation. The most commonly used among them was found to be face-to-face interviews, with complementary sources such as document analysis, focus groups, and field observations.

3.5. Theoretical perspectives and vertical alliance types

The theories used in our sample articles are shown in Table 7. Chief among them were found to be the resource-based view (RBV), the knowledge-based view (KBV), resource-dependence theory (RDT), and transaction cost economics. The relational view, social exchange theory, and contingency perspectives were also found to be commonly used. The most recent studies in our sample were found to increasingly use theories from other fields such as signaling theory (Yan et al., 2020), media richness theory (Thomas, 2013), game theory (Yoo et al., 2015), and cognitive psychology and evolutionary economics theories (Walsh et al., 2016). We further identified that most of our sample studies had used a single theory (69), while others had integrated two or more (19).

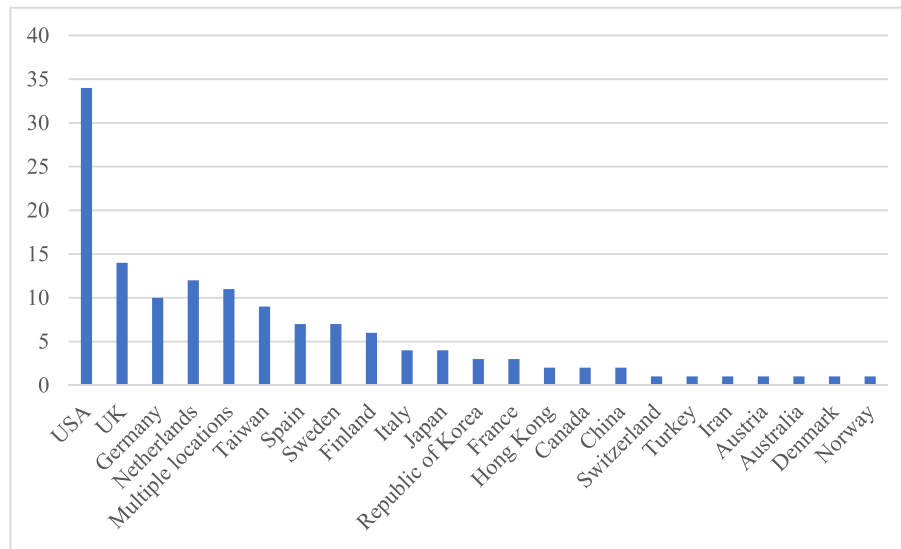


Fig. 2. Countries studied by the sample articles.

Table 6
Research methods and data sources.

	Primary (survey)	Secondary (archival)	Number
Quantitative	62	24	86
Quantitative statistic method			
Regression (OLS, logistic, probit, hierarchical)	22	22	44
SEM	35	2	37
Experiment	2	0	2
Fuzzy-set qualitative comparative analysis	1	0	1
Other statistical method (e.g. Heckman test, cluster analysis)	2	0	2
	Single case study	Multiple case study	Number
Qualitative	21	5	26
Mixed method	Survey	Case study	4

We further explored the focus of our sample articles in terms of either upstream or downstream alliances to achieve innovation. Our findings reveal that most of the studies had focused on upstream alliances (54), followed by downstream ones (28) and a combination of both (22). Some of our sample articles (7) did not mention vertical alliance types. The outlook of the vertical alliance context suggests an increased innovation research scope for downstream alliances and for the comparison between upstream and downstream ones.

4. Content analysis

This section presents the analysis and synthesis of the identified review data on vertical alliances and innovation. To do so, we adopted the extended AMO framework, consisting of four components: antecedents, mediators, moderators, and outcomes (e.g., Hutzschenreuter et al., 2020; Schmeisser, 2013; Shahbaz and Parker, 2021). On this basis, we developed a comprehensive and multi-level framework, as shown in Fig. 3. The following section presents a discussion of our findings pertaining to the depicted research linkages.

4.1. Outcomes: vertical alliances and innovation

We synthesized the outcomes at two levels: alliance and organizational. At the alliance level, the outcomes relate to information sharing,

Table 7
Theories used in vertical alliances and innovation literature.

Theory (in order of weight)	Number ^a	Percentage (%)
Resource-based view	19	13.77
Knowledge-based view	16	11.59
Resource dependence theory	10	7.25
Transaction cost economics	11	7.97
Relational view	9	6.52
Social exchange theory	8	5.80
Contingency perspective	6	4.35
Dynamic capability perspective	5	3.62
Organizational learning theory	5	3.62
Internalization theory	3	2.17
Network theory	3	2.17
Institutional perspective	2	1.45
Commitment-trust theory	2	1.45
Principal-agent theory	3	2.17
Social capital theory	2	1.45
Media richness theory	1	0.72
Life cycle theory	1	0.72
Ouchi's theory of governance mechanisms (1980)	1	0.72
Human capital theory	1	0.72
Information processing theory	1	0.72
Game theory	1	0.72
Resource orchestration theory	1	0.72
Signaling theory	1	0.72
Stakeholder theory	1	0.72
Strategy perspective	1	0.72
Supply chain management theory	1	0.72
Evolutionary economics theory	1	0.72
Cognitive psychology perspective	1	0.72
No specific theory	21	15.22
Total	138	100

^a The total number of theories is greater than the total number of articles (116) because some studies used more than one theory.

new product development (NPD) projects, and innovation generation with upstream and/or downstream partners. Our sample studies suggest that upstream alliances offer increased technological knowledge and cost related information that may help to avoid any unforeseeable problems in manufacturing and in the refinement of a product's design (Le Dain and Merminod, 2014; Maffin and Braiden, 2001). Also, upstream alliances facilitate NPD projects by enabling the coordination of the development activities between first- and second-tier suppliers, potentially suggesting alternative technologies suited to yield high quality products, evaluating product design, and promoting the standardization of designs and parts (Lakemond et al., 2006; Parker et al.,

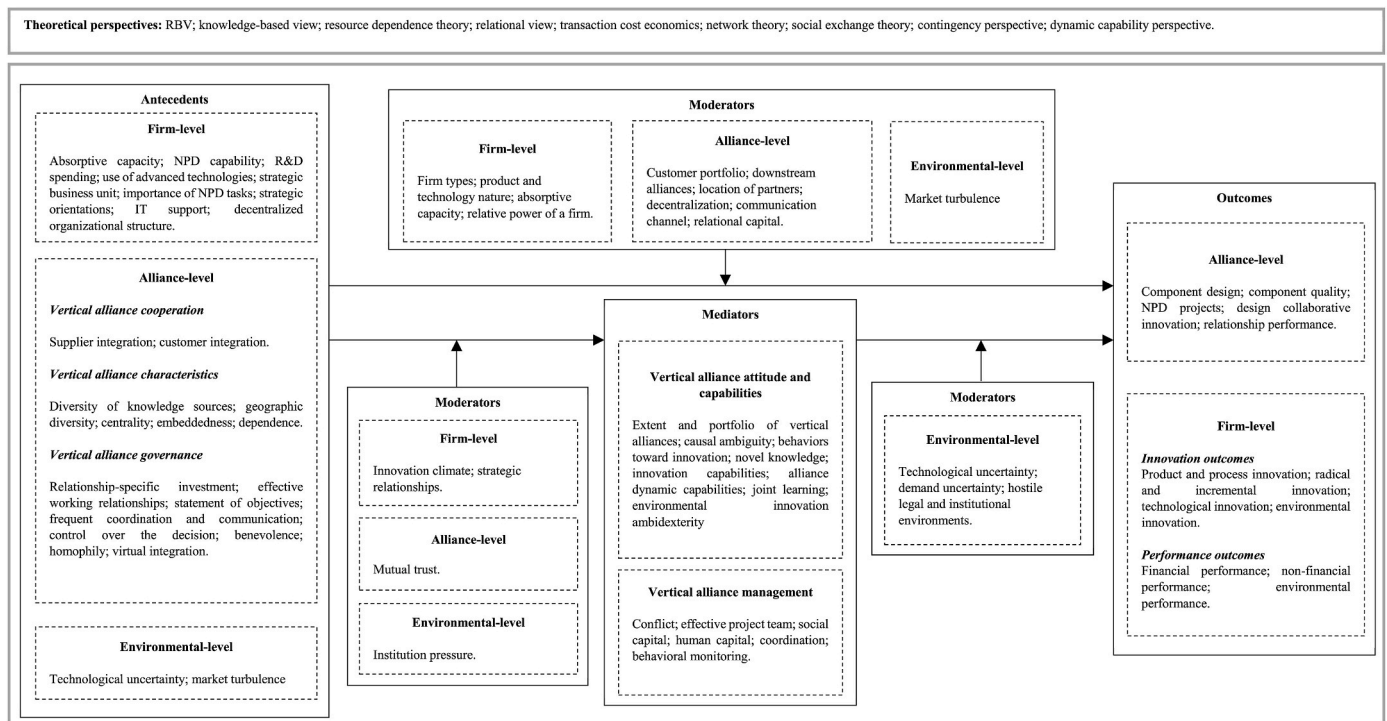


Fig. 3. A multi-level framework of the vertical alliances and innovation research.

2008; Van Echtelt et al., 2008). However, the presence of any causal ambiguity with upstream partners was found to have the potential to lead to NPD project failure, as it might restrict the decision-maker's ability to understand the causal connections within it (Petersen et al., 2003; Potter and Lawson, 2013). In this regard, frequent communication, involvement in decision-making, shared training programs, and information sharing can reduce any ambiguity and promote NPD project performance (Jayaram, 2008; Primo and Amundson, 2002; Yan et al., 2020). Furthermore, our sample articles were found to suggest that the benevolence and homophily of customers and suppliers can promote collaborative innovation (Johnsen et al., 2006; Schoenherr and Wagner, 2016; Wagner and Bode, 2014). Li and Yayavaram (2019) stressed that membership change in upstream alliances can disrupt knowledge sharing routines (e.g., common language and resource coordination channels), ultimately having a negative effect on collaborative innovation. Similarly, others were found to suggest that the use of information technology can help to manage diverse and dispersed upstream/downstream alliances—which, in turn, may lead to increased collaborative innovation (Ettli and Pavlou, 2006; Hardwick and Anderson, 2019; Khanagha et al., 2018; van Burg et al., 2014).

At the firm-level, we identified two types of outcomes: innovation and performance.

Innovation outcomes concern the generation of product/process, radical/incremental, technology, and environmental innovations. Our sample studies were found to suggest that embedded relationships with upstream and/or downstream partners can increase the efficiency of information exchange, which is conducive to product and process innovations (Koufteros et al., 2007; Tomlinson, 2010; Tomlinson and Fai, 2016; Yli-Renko and Janakiraman, 2008). For example, downstream alliances aid firms in identifying market opportunities for technology development, but also reduce the chances of poor component design quality in the early stages of product design and development (Takeishi, 2001; Tsai, 2009; Wynstra et al., 2010). Customer concentration enables firms to gain the market knowledge and potential product information needed to facilitate R&D intensity (Jean et al., 2010). Considering radical innovation, our sample scholars were found to have highlighted that proactive customer orientation encourages joint learning between

vertical alliance partners—which, in turn, enhances radical innovation (Johnsen, 2011; Lahiri and Narayanan, 2013). However, our sample's findings from the resource dependence perspective reveal that customers are price-sensitive and tend to bargain for cost, thereby controlling supplier profits and lowering R&D investments and innovations (Krolikowski and Yuan, 2017). In relation to upstream alliances, our sample studies were found to suggest that they act as sources of tacit knowledge and engineering inputs that can shorten product life cycle and accelerate sophisticated product development (Yoo et al., 2015; Zhao et al., 2014). Supplier awareness of component specifications means that their involvement in product design can reduce design errors (Song and Di Benedetto, 2008). Upstream partners support cost-efficient production and provide technical knowledge for radical and incremental innovations (Menguc et al., 2014; Thomas, 2013). Considering environmental innovation, our sample studies were found to argue that both upstream and downstream alliances enable firms to focus on sustainability issues and improve green innovation performance (Chang and Gotcher, 2020; Melander, 2018). Based on these pieces of evidence, future studies could capitalize on environmental innovation by providing a better understanding of how customer-supplier linkages affect environmental and social innovations, which are also vital to achieving net-zero carbon waste across different industrial sectors. Such studies could also examine the reverse knowledge transfer from vertical alliance partners to their clients/buyers and its impact on buyers' environmental innovation.

Performance outcomes were found to be focused on firm and environmental performance. For firm performance, our sample studies were found to argue that upstream alliances provide access to knowledge and resources that are conducive not only to innovation but also to improving financial and non-financial performance (Najafi Tavani et al., 2013; Petersen et al., 2005). However, upstream alliances in global markets were argued to have the potential to constrain the quality and richness of information, which may negatively affect explorative innovation and, subsequently, financial performance (Verwaal, 2017). In this regard, it was argued that vertical integration with both upstream and downstream partners may increase combinational facilities for novel innovation solutions, thereby improving firm performance (Lahiri and

Narayanan, 2013). In regard to environmental performance, Wang et al. (2021a,b) found that upstream alliances serve as a complementary asset to a firm's own sustainable design practices, thereby enhancing environmental gains.

4.2. The antecedents-outcomes linkage: vertical alliances and innovation

A large number of our sample studies was found to link the antecedents and outcomes in upstream and downstream vertical alliances and innovation research. We disaggregated such antecedents at three levels of analysis: firm, alliance, and environmental (see Fig. 3).

4.2.1. Firm-level

The *firm-level* sample research was found to link organizational attributes to innovation. The sample studies in this research stream suggest that a firm's absorptive capacity enables the accurate prediction of the nature and commercial potential of technological advancement and, consequently, the introduction of greater innovation (Najafi Tavani et al., 2013). Similarly, a firm's increased NPD capability—in terms of, for example, R&D spending and human capital—elevates the pace of organizational activities, thus resulting in improved or novel products (Carli Lorenzini et al., 2018; Kang and Park, 2012). However, NPD capability increases coordination costs and engenders tensions between customers and suppliers, thereby resulting in higher product faultiness due to outsourced component errors (Galli Geleilate et al., 2021). As such, the use of advanced technologies—such as CAD/CAM systems, electronic data interchange, workflow management system, and product data management—can directly link suppliers and customers, facilitating the exchange of information and increasing their involvement in NPD projects (Garengo and Panizzolo, 2013; Jean et al., 2010). Also, the availability of strategic business units with R&D, purchasing teams, and decentralized organizational structures can be critical for the effective management of upstream/downstream partner involvement in NPD (Markman et al., 2009; van Echtelt et al., 2007).

4.2.2. Alliance-level

Our sample studies conducted at the *alliance-level* can be divided into three groups depending on their foci: (1) vertical alliance cooperation, (2) vertical alliance characteristics, and (3) vertical alliance governance.

The first group was found to consider vertical integration as a cooperative relationship capable of influencing innovation and/or firm performance. The sample studies within this group were found to suggest that both upstream and downstream alliances are conducive to innovation because they enable firms to perform a variety of functions with suppliers and customers—including communication, foresight and diagnostic, information exchange, and knowledge processing (Afuah, 2001; Shin et al., 2016; Zeng et al., 2010). This is in line with the innovation literature that regards product development and process refinement as a problem-solving exercise that requires tacit knowledge and experimentation (Kapoor and Adner, 2012; Onofrei et al., 2020). Thus, in this case, upstream and downstream partners offer technological solutions, cost sharing, and knowledge provisions that are conducive to idea generation, NPD, and innovation commercialization (Dutta and Hora, 2017; Parida et al., 2012; Walsh et al., 2016). On the one hand, by aligning with upstream partners, customers can gain access to quality inputs, technology and human training, and on time delivery for production, thus improving levels of product and process innovation (Jean et al., 2014; Laseter and Ramdas, 2002; Tsai, 2009; Un and Asakawa, 2015). On the other hand, downstream alliances are important because they enable suppliers/manufacturers to ensure that products are designed to meet customer requirements and market needs, while also facilitating opportunities for joint learning synergies whereby partners can draw from each other's expertise (Gruner and Homburg, 2000; Tomlinson, 2010). However, a small number of our sample studies were found to argue that the relationship between upstream/downstream alliances and innovation resembles an inverted U-shaped

function (Tomlinson and Fai, 2016); specifically, that extensive upstream and downstream integrations can produce diminishing effects on innovation due to higher coordination costs, increased mobility and exit barriers, greater bureaucratic costs, and a lack of strategic freedom (Li and Tang, 2010; Rothaermel et al., 2006).

The second group, vertical alliance characteristics, was found to have focused on characteristics such as alliance diversity, centrality, and dependence. In terms of alliance diversity, our sample scholars had suggested that a diversity of knowledge sources (e.g., upstream and downstream alliances) enhances the vision of partners and increases the probability of gaining useful knowledge, thus leading to more valuable innovation (Hora and Dutta, 2013; Sivakumar et al., 2011; Walsh et al., 2016). However, others had suggested that heterogenous knowledge sources produce less innovation returns by making external knowledge integration more difficult beyond a specific point (Garcia Martinez et al., 2019). Depending on the product development stages, firms need specific types of partners to facilitate collaborative innovation (Ylimäki, 2014). For example, the black-box development stage requires upstream partners to provide solutions to customer needs; grey-box development requires both upstream and downstream partners to undertake joint design planning; and white-box development is downstream partner-driven through comments product design (Le Dain and Mermiod, 2014; Ylimäki, 2014). With respect to geographic diversity, our sample researchers found that global upstream alliances reduce explorative innovation because of customer and supplier differences in knowledge, language, and culture (Verwaal, 2017). Furthermore, the centrality of vertical alliances was found to provide access to inter-task knowledge capabilities by building stronger value chains and thereby promoting innovation (Turkina and Van Assche, 2018). This also establishes embedded relationships characterized by close and exclusive ties suited to share information and provide access to capital (Koufteros et al., 2007; Krolikowski and Yuan, 2017). As such, customers and suppliers comfortably interact with each other and exchange information, thus supporting innovation performance (Hora and Dutta, 2013; Van Echtelt et al., 2008). However, in downstream alliances, customer bargaining power can hinder product innovation because of the large pool of suppliers suited to access inputs (Krolikowski and Yuan, 2017). This issue can be overcome when customers are more dependent on a partner's specialized expertise, which can reduce their bargaining power and promote learning efforts to enhance technological innovation (Lin, 2018). Luo and Triulzi (2018) extended this finding by pointing out that, compared to sequential relationships, cyclic dependence can reinforce feedback, design iteration, and information exchange for innovation performance.

The third group relates to the alliance governance mechanisms that can promote innovation and firm performance outcomes (Ness, 2009). The sample studies in this group suggest that greater relationship-specific investment by upstream and downstream partners can increase their involvement and good faith during collaborative innovations (Oinonen et al., 2018; Song and Di Benedetto, 2008). However, Wagner and Bode (2014) argued that relationship-specific investment by suppliers can generate positive economic spillover values for transactions with the same and other customers, thereby increasing process-related information sharing. However, a highly invested supplier has little interest in sharing product innovations with the customer firm, as this may result in changes in the product that the relationship-specific investment was supposed to support (Wagner and Bode, 2014). In this regard, a clear statement of objectives and frequent coordination and communication between suppliers and customers partners was found to have the potential to support product innovation (Fliess and Becker, 2006; Jayaram, 2008; Wagner and Hoegl, 2006; Yan and Dooley, 2013). Also, upstream and downstream alliances benefit from direct intervention (e.g., the choice of key first-tier suppliers) along with the delegation of tasks to suppliers capable of helping to gain better innovation performance outcomes (Johnsen et al., 2006; Johnsen, 2011). This was confirmed by Jean et al. (2017), who suggested that

customer control over the decisions made by suppliers in downstream alliances can positively influence supplier innovation performance due to the establishment of standards for quality, delivery, and operational aspects for the suppliers in NPD processes. In addition, benevolence and homophily in upstream alliances ensure an equitable reciprocation of partner efforts and reduce opportunism, thus enabling collaborative innovation (Schoenherr and Wagner, 2016).

4.2.3. The environmental level

At the *environmental level*, our sample studies were found to view technological uncertainty as a determinant of innovation generation. Unpredictable changes in the technological environment can rapidly render existing technologies obsolete (Jean et al., 2017). To minimize the risk of obsolescence, firms need to pursue innovations that depart from the existing products, processes, and services (Jean et al., 2012, 2014).

4.3. The antecedents-mediators linkage: vertical alliances and innovation

Most of our sample studies in this category investigated how firm-, alliance-, and environmental-level characteristics impact mediators.

4.3.1. Firm-level

At the firm-level, a handful of our sample studies considered the firm-related determinants of mediators. Zhao et al. (2014) challenged the assumption of upstream alliance usefulness by introducing the importance of NPD tasks. They argued that, if a firm has the competencies needed to fulfil an NPD task and this task is important to it, it is less likely to integrate with upstream partners. Indeed, Honda keeps manufacturing small engines in-house because they are related to its core competencies. Other firms—like IBM, Natsteel, and Microsoft—also pursue internal R&D for core NPD tasks. Our sample studies on downstream alliances found that the strategic orientations of firms (e.g., long-term and proactive customer orientation) encourage them to seek novel ideas from customers, which supports joint learning (Jean et al., 2018). Others argued that superior IT support makes a firm better able to exploit any information available from its upstream/downstream partners and to develop dynamic capabilities (e.g., absorptive capacity, collective mind, and coordination capability) (Ettlie and Pavlou, 2006).

4.3.2. Alliance-level

The sample studies linking *alliance-level* antecedents to mediators can be divided into two groups: (1) vertical alliance attitude and capabilities and (2) vertical alliance management.

The first group emphasized mediating factors like alliance portfolio, causal ambiguity, knowledge acquisition, and innovation capability. For instance, a firm's past innovation performance and persistent vertical alliances will induce a need to initiate customer-supplier relationships in order to further develop innovative ideas, thereby increasing the propensity to augment the extent and portfolio of vertical alliances (Belderbos et al., 2018; Parker et al., 2008). Also, greater involvement in vertical alliances across multiple stages of the development process can reduce any causal ambiguity pertaining to the linkages of valuable resources within the NPD project (Harryson et al., 2008; Potter and Lawson, 2013). Moreover, effective working relationships (i.e., higher communication, trust, and dependence) promote partners' attitudes and behaviors toward innovation due to a higher willingness to invest in customer-specific technology and NPD processes (Yeniyurt et al., 2014). When partners are closely linked and connected via advanced technologies, they can effectively interact with each other and co-create relevant and novel knowledge (Mahr et al., 2014; Sjoerdsma and van Weele, 2015; Thomas, 2013). Some sample studies also suggest that the protection and tacitness of knowledge make it difficult to transfer it to downstream partners, which ultimately reduces knowledge acquisition (Liu, 2012). However, dyad-specific investment helps to customize communication and get immediate feedback suited to promote knowledge acquisition. In a similar way, the commitment of vertical partners

enables firms to be exposed to innovative behaviors and to exploit their knowledge for innovation capabilities (Oke et al., 2013; Weber and Heidenreich, 2018; Wynstra et al., 2010). Particularly, customer homophily (similarity among the characteristics of partners) and reliance on a single supplier make the alliance more stable and foster communication, which can facilitate innovation capabilities (Lawson et al., 2015; Wagner, 2010). Chang and Gotcher (2020) further suggested that cooperative production with downstream partners can accelerate the generation of new environmental protection ideas and the exchange of new pollution-prevention knowledge, which are conducive to environmental innovation ambidexterity.

The second group considers the conflict, coordination, social capital, and behavioral monitoring related mediators. Intense cooperation with upstream and downstream partners requires behavioral norms aimed at preventing ambiguous expectations. This is particularly true in the context of geographically diverse relationships (Garcia Martinez et al., 2019) and of cooperative agreements involving mixed motives (i.e., cooperative and competitive ones) (Chai et al., 2020) that can increase conflict and potential disputes between customers and suppliers due to one party maneuvering to better exploit the other's available resources/expertise. In such situations, firms need to assess their partners' technical knowledge and business in order to form effective project teams (Petersen et al., 2005). In addition, diverse downstream and upstream partners should be utilized to promote both social and human capital (Garcia Martinez et al., 2019; Onofrei et al., 2020). Also, video-conferencing enables partners to engage, share tacit knowledge, and understand technical issues, thereby promoting social capital (Hardwick and Anderson, 2019). Other sample scholars highlighted that higher degrees of task dependence and diverging expectations between downstream and upstream partners can be exploited to evaluate which information to share and to increase the efficiency of any coordination efforts (Andersen and Drejer, 2009; Fang et al., 2008; LaBahn and Krapfel, 2000; Lakemond et al., 2006). While, in domestic alliances, face-to-face interaction facilitates task coordination, it might be challenging in international alliances, given the geographic distance between partners. In such cases, electronic integration can help firms to not only cooperate with their international customers but also monitor their behaviors and outputs (Jean et al., 2010).

4.3.3. Environmental-level

The sample *environmental-level* studies were found to consider how technological uncertainty influences vertical collaboration. The occurrence of technological changes in turbulent environments requires firms to approach both upstream and downstream partners in order to obtain technical knowledge and share cost information (Ozdemir et al., 2020; Petersen et al., 2003).

4.4. The mediators-outcomes linkage: vertical alliances and innovation

The sample studies on mediators-outcomes relationships were found to have mostly investigated *alliance-level* and innovation-focused *firm-level* outcomes. A handful of our sample studies also considered the implications of mediators for performance-related *firm-level* outcomes. The sample studies in this category found that, in cooperative downstream alliances, conflict can either promote or hamper innovation. For example, affective conflict can inhibit individuals in assessing new information sourced from customers and thus limit process innovation efficiency, whereas cognitive conflict increases the open-mindedness and flexibility that can trigger improvements in existing processes (Chai et al., 2020). Also, joint learning in downstream alliances can help partners to access diverse knowledge domains and uncover new approaches that are conducive to both incremental and radical innovations (Jean et al., 2012, 2018). Similarly, the co-creation of relevant and novel knowledge by suppliers and downstream partners can promote trial and experimentation activities that are conducive to innovation performance (Mahr et al., 2014). However, it is worth mentioning that

suppliers with higher levels of knowledge acquisition and utilization are better able to integrate customer knowledge into their existing capabilities, which leads to higher innovation performance (Liu, 2012). Others suggested that environmental innovation ambidexterity in downstream alliances and exploitation complementarity help firms to consistently promote the development of environmental innovations (Chang and Gotcher, 2020).

In the context of upstream alliances, our findings reveal that any causal ambiguity between partners can reduce innovation performance due to a lack of knowledge sharing and higher levels of misunderstanding (Potter and Lawson, 2013). Also, our sample scholars argued that the attitudes and behaviors of suppliers in regard to co-innovation can increase customer innovation performance (Yeniyyurt et al., 2014).

Some of our sample studies considered the impact of mediators on outcomes in both alliances' contexts—upstream and downstream. For example, the scholarship argued that the coordination efforts and information sharing that takes place between downstream and upstream partners increase the innovation performance due to the availability of information on product specifications and control over development cost (Fang et al., 2008; Oke et al., 2013). In a similar fashion, human and social capital shape the interactive experience between upstream and downstream partners, which is conducive to NPD projects (Hardwick and Anderson, 2019; Parker et al., 2008). Similarly, a firm's innovation capabilities (e.g., its innovation portfolio, innovation learning, innovation culture, and external learning) improve upstream innovation performance (Schoenherr and Wagner, 2016; Wynstra et al., 2010) and, subsequently, firm performance due to the increased ability to exploit knowledge for inventions and commercialization (Weber and Heidenreich, 2018). Moreover, firms endowed with the higher dynamic capabilities afforded by NPD partnerships can have successful NPD due to their increased resistance to changes in the market and technical environments (Ettlie and Pavlou, 2006).

4.5. Moderators: vertical alliances and innovation

Some of our sample studies investigated the moderators of upstream/downstream vertical alliances and innovation. We categorized these studies based on three research linkages: (1) antecedents and outcomes, (2) antecedents and mediators, and (3) mediators and outcomes.

4.5.1. Antecedents and outcomes

In regard to *firm-level moderators*, our sample researchers considered firm type, the nature of the technology/product, absorptive capacity, and firm power. For example, Un and Rodríguez (2018) posited that the benefits of upstream and downstream alliances for product innovation depend on the firm type (subsidiaries vs. domestic firms). They found that the subsidiaries of foreign firms can benefit from downstream partners because the latter provide deep local knowledge related to the customers' needs and experiences with the firm's products and services, whereas domestic firms can achieve greater degrees of innovation by relying on combinations of supplier global knowledge, inputs, and materials to meet the needs of local customers. Likewise, the nature of a product or a technology determines the impact of goal congruence and communication on NPD projects in upstream alliances, with upstream and downstream alliance relationships being stronger when joint projects involve complex products and novel technologies (Yan and Dooley, 2013). Also, absorptive capacity acts as a moderating factor for the relationships between upstream and downstream alliances and innovation performance (Haeussler et al., 2012; Najafi Tavani et al., 2013). Specifically, high levels of absorptive capacity enable firms to enhance their technological and product innovations by minimizing the conflict between any externally acquired and internal technologies and maximizing the resulting complementary advantage (Shin et al., 2016; Tsai, 2009). Song and Di Benedetto (2008) suggested that the relative power held by customers over suppliers in upstream alliances strengthens the impact of relationship-specific investment on innovation performance

by causing any investments made at a particular stage of the production to yield greater returns.

When considering *alliance-level moderators*, some of our sample scholars suggested that, in downstream alliances, large customer portfolios reduce the impact of relational embeddedness on product innovation, given the higher transaction costs and thinly managed managerial attention (Yli-Renko and Janakiraman, 2008). Also, Jean et al. (2012) argued that the impact of technological uncertainty on supplier innovation performance will be strengthened when suppliers are less dependent on their customers in downstream alliances. In terms of upstream alliances, our sample scholars found that longer contract and relationship durations can reduce any negative impact of relationship-specific investments on product innovation due to the resulting increased trust between customers and suppliers (Wagner and Bode, 2014). Similarly, they found that any relational capital (i.e., trust and mutual understanding) present in upstream alliances can weaken any negative impact of global outsourcing and explorative innovations due to increases in the compatibility of knowledge practices between distant partners (Verwaal, 2017). Also, a close engagement with suppliers in upstream alliances was found to have the potential to reduce the effect of NPD capability on product errors due to the shared experience and exchange of tacit information (Galli Geleilate et al., 2021). Others argued that, in upstream alliances, a higher decentralization is desirable because it can reduce the negative effect of membership changes on innovation performance (Li and Yayavaram, 2019). In fact, decentralization increases the operational autonomy between customers and suppliers and therefore enables partners to accommodate membership changes by efficiently identifying solutions. In regard to downstream alliances, Mahr et al. (2014) considered communication channels to be contingency factors and found that, in downstream alliances, face-to-face communication can increase the impact of closeness on knowledge novelty with customers, whereas voice-to-voice communication can increase the impact of closeness on knowledge relevance with customers. Interestingly, some scholars investigated the interaction between downstream and upstream alliance for innovation performance (Dutta and Hora, 2017). They argued that downstream partners can add their greater higher market understanding to the exploratory and technological knowledge held by their upstream counterparts and use it to bring about appropriate innovations. Likewise, in terms of partner location, our sample research was found to suggest that upstream alliances are more effective with domestic partners due to the resulting ease of transferring knowledge for innovations, whereas downstream alliances with foreign partners are conducive to innovations as they provide knowledge about international markets and enhance product diffusion (Quintana-García and Benavides-Velasco, 2005).

In relation to *environmental-level moderators*, Schoenherr and Wagner (2016) were found to be the sole study within our sample to have used market turbulence as a contingency factor. The authors found that the impacts of benevolence and homophily on collaborative innovation in upstream alliances are reduced when market turbulence is high because increased environmental unpredictability weakens the likelihood of gratification and reciprocation.

4.5.2. Antecedents and mediators

Only a limited number of our sample studies on the antecedents-mediators relationship considered firm-, alliance-, and environmental-level moderators.

In regard to *firm-level moderators*, innovation climate and strategic relationships were identified. Specifically, Oke et al. (2013) found that highly innovative climates and strong strategic relationships strengthen the association between partner innovativeness and focal firm innovation capability due to the cross-fertilization of ideas and creativity between downstream and upstream partners.

In relation to *alliance-level moderators*, mutual trust deteriorates the negative impact of cooptation on the conflict in downstream alliances by mitigating any perceived opportunism (Chai et al., 2020).

Regarding *environmental-level* moderators, some of our sample authors argued that institutional pressure enhances the positive association between co-production in downstream alliances and environmental innovation ambidexterity (Chang and Gotcher, 2020). The logic is that suppliers exposed to rigorous institutional pressures are more likely to pursue explorative and exploitative environmental innovation activities via joint production with customers in order to respond to environmental changes.

4.5.3. Mediators and outcomes

The sample studies in this stream were found to have merely considered *environmental-level* moderators. For example, some studies looked at technological uncertainty and argued that, in both upstream and downstream alliances, high levels of such uncertainty reduce the impact of joint learning on innovation due to difficulties in knowledge exchange and higher costs of coordination in the innovation process (Jean et al., 2018; Zhao et al., 2014). However, in the presence of demand uncertainty, joint learning in downstream alliances becomes more valuable for incremental and radical innovation to cater for the greater needs of the market (Jean et al., 2018). Also, hostile legal and institutional environments weaken the positive relationship between innovation capability and relationship performance in downstream alliances (Jean et al., 2014).

5. Comparison between upstream and downstream alliances for innovation

To further explore the assertions made earlier in regard to the importance of vertical alliances, it is useful to compare the findings of our sample studies in relation to upstream and downstream alliances for innovation. To this end, we selected the antecedents, mediators, moderators, or outcomes of upstream and downstream alliances. Table 8 presents a summary view of the findings.

As outlined in Table 8, our sample studies in the context of upstream alliances had focused on a wide variety of theoretical perspectives. Contrastingly, our sample downstream alliance research had encompassed limited theoretical perspectives—particularly, the KBV, social exchange theory, and transaction cost economics. This suggests an increased scholarly emphasis on upstream alliances for innovation that involves capturing a range of relevant concepts from diverse theoretical standpoints and also reflects a need to enhance the theoretical insights in the context of downstream alliances for innovation.

In regard to comparing antecedents, some of our sample studies on upstream alliances for innovation emphasized firm-level antecedents, indicating that absorptive capacity, R&D support, IT support, the use of advanced technologies, and the importance of NPDP tasks are important determinants of innovation (Carli Lorenzini et al., 2018; Takeishi, 2001; van Echtelt et al., 2007). Alliance-level antecedents were also at the center of upstream alliances, including diverse knowledge sources, relation-specific investments, communication and coordination, geographical diversity, and virtual integration. However, environmental-level antecedents remained under-represented, with a mere focus on technology and market uncertainty. The subtle differences in relation to downstream alliances and innovation relationships are noted in Table 8. Our sample researchers often explored alliance-level determinants of innovation, such as the depth and scope of partner portfolios, coopetition, co-production, and effective working relationships. Limited scholarly attention was found to be devoted to firm-level and environmental-level antecedents, which suggests novel opportunities for future research.

In terms of mediators, an overlap was found in our sample upstream and downstream alliance research. However, their implementation in vertical alliances was found to potentially vary. For instance, higher partner expectations in upstream alliances may give rise to considerable supplier quality and knowledge challenges (Dutta and Hora, 2017), whereas downstream alliances require social capital and coordination to

Table 8
Comparing innovation in upstream and downstream alliances.

Themes	Upstream alliances	Downstream alliances	Notable comparisons
Theoretical perspectives	Resource-based view; resource dependence theory; dynamic capability perspective; social exchange theory; transaction cost economics; knowledge-based view; relational view; information processing theory; signaling theory; media richness theory; game theory; principal-agent theory.	Resource-based view; resource dependence theory; knowledge-based view; social exchange theory; transaction cost economics; institutional theory;	Broader theoretical focus in upstream alliance research
Antecedents			
<i>Firm-level</i>	NPD capability; IT support; importance of NPDP tasks; absorptive capacity; strategic business unit (Garengo and Panizzolo, 2013; Najafi Tavani et al., 2013; van Echtelt et al., 2007)	Strategic orientations; IT support; organizational structure (Jean et al., 2010, 2018)	Limited evidence of firm-level characteristics and attributes facilitating innovation in downstream alliance research
<i>Alliance-level</i>	Relation-specific investment; effective working relationship; supplier rivalry; statement of objectives; supplier quality control; coordination and communication; homophily; benevolence; geographic diversity of partners; customer power advantage; embeddedness; membership change (LaBahn and Krapfel, 2000; Primo and Amundson, 2002; Wagner and Bode, 2014; Yenyurt et al., 2014)	Depth and scope of downstream partners' portfolio; coopetition; co-production; effective working relationship; embeddedness; virtual integration (Hardwick and Anderson, 2019; Hora and Dutta, 2013; Liu, 2012; Yli-Renko and Janakiraman, 2008)	Some similar antecedents in both upstream alliance and downstream alliance streams. Upstream alliance research focuses more on supplier quality, relational quality, and governance
<i>Environmental-level</i>	Technology uncertainty; market turbulence (Luzzini et al., 2015; Petersen et al., 2005)	Technology uncertainty (Jean et al., 2012)	Lack of evidence regarding environmental-level antecedents in both upstream alliance and downstream alliance streams
Mediators	Behavioral monitoring; attitude toward co-innovation; human and social capital; dynamic capabilities (Hardwick and Anderson, 2019; Parker et al., 2008; Yenyurt et al., 2014)	Conflict; joint learning; novel knowledge; environmental innovation ambidexterity; human and social capital; dynamic capabilities (Chai et al., 2020; Jean et al., 2012, 2018)	Some similarities in relation to mediators in downstream and upstream alliances. Additional mediators identified in downstream alliances

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Table 8 (continued)

Themes	Upstream alliances	Downstream alliances	Notable comparisons
Moderators	Firm type; nature of product and technology; absorptive capacity; relative power of customers; relationship age; contract length; relational capital; decentralization; technological uncertainty; market turbulence (Schoenherr and Wagner, 2016; Un and Rodríguez, 2018; Verwaal, 2017; Yan and Dooley, 2013; Zhao et al., 2014)	Absorptive capacity; communication channel; mutual trust; technological uncertainty; institutional pressure; demand uncertainty; customer portfolio (Chai et al., 2020; Chang and Gotcher, 2020; Dutta and Hora, 2017; Jean et al., 2014)	Predominant focus in upstream alliance is firm-level and alliance-level moderators. Downstream alliances considered environmental context with also a focus on institutional environment

gain market knowledge and commercialize innovations (Filiou, 2021; Musarra et al., 2021). Comparing our sample empirical literature in terms of moderators, we found that various contingency factors had been considered for the relationship between upstream/downstream alliances and innovation. However, we observed that the moderators had not been frequently studied and that the environmental context had been the subject of limited focus.

Overall, we observed progress in both the upstream and downstream domains for innovation, although our sample researchers had taken different perspectives that reflected their different priorities. Further progress appeared to have been made in the upstream alliance setting, creating a critical gap in relation to downstream alliances. Developing this point, the following section provides suggestions for future research in the vertical alliances and innovation research domain.

6. Discussion and future research directions

Over the last few decades, given the important role they play in reducing risk and enhancing the sourcing of key components and the development of new products, vertical alliances among organizations and partners have increased and have attracted significant research interest. The current literature provides important insights into these alliances, but has hitherto failed to provide a clear and systematic understanding of the role played by these alliances in innovation. Additionally, the current literature is fragmented, and thus offers few insights into the key antecedents, moderators, mediators and outcomes in terms of innovation achieved through vertical alliances. This paper was aimed at presenting a systematic review of the current state of the research on vertical alliances and innovation. In doing so, we advanced a comprehensive and multi-level framework intended not only to highlight the current state of the vertical alliances and innovation research but also to identify any important knowledge gaps for future research. The framework enabled us to identify the directions that future research might take and to outline some promising research questions (see Table 9). This section builds on the framework to identify those areas that require future scholarly attention.

6.1. Further incorporating antecedents and mediators of innovation outcomes

Prior research has relied heavily on alliance-level antecedents using the RBV, the relational view, and the transaction cost economics perspective. Future research could broaden our understanding of the vertical alliances and innovation phenomenon by drawing insights from

Table 9

Unanswered topics and future research implications.

Elements of the multi-level framework	Research gaps	Research directions	Exemplary research questions
Antecedents	Research having mostly relied on alliance-level antecedents	Examining the potential effects of individual attributes and firm strategies/capabilities in influencing vertical alliances and innovation	<ul style="list-style-type: none"> • How and to what extent do knowledge-oriented leaders in firms develop knowledge sharing practices and initiatives for collaborative innovation? • What are the individual attributes (e.g., age, nationality, tenure) that encourage or hinder vertical alliance formation for innovation? • Whether and how do firms' dynamic capabilities and learning mechanisms influence vertical alliance management for innovation? • To what extent do signals facilitate vertical alliance activities and the innovation of firms?
Mediators	Research has made limited efforts to take into consideration the role of mediators	Considering the factors that might intervene in the vertical alliances and innovation relationship	<ul style="list-style-type: none"> • Do firms' internal technological resources (e.g., specialists, specialized systems) promote absorptive capacity for technological innovation? If so, how? • How can social capital be leveraged to cooperate with vertical partners in transferring knowledge and promoting innovation? • How do geographically disperse vertical partners exchange knowledge for capability building technological upgradation?
Moderators	Research has remained limited to	Examining individual attributes, firm	<ul style="list-style-type: none"> • What are the processes needed to identify

(continued on next page)

Table 9 (continued)

Elements of the multi-level framework	Research gaps	Research directions	Exemplary research questions
	considering the contingency role played by individual, firm, and environmental-level factor characteristics	characteristics, and contextual factors (like industry, market, country, and institutions), which will lead to theoretical implications	<p>vertical partners that can promote ambidextrous learning for innovation?</p> <ul style="list-style-type: none"> • Do can dynamic capabilities influence vertical alliances and innovation? If so, how? • How does firm size affect vertical alliances and innovation? Are small sized-firms more inclined to pursue vertical alliances for innovation compared to large-sized ones? • Does digitalization foster or hamper the vertical alliances and innovation relationship? • How do firms in low-technology versus high-technology exploit vertical alliances to innovate? • How do national differences in terms of economic development, innovation capacity, and knowledge portfolios influence the choice of vertical alliance partners and innovation seeking activities? • To what extent do regional innovation systems influence a firm's vertical alliance formation decision for innovation? • To what extent do geo-political tensions affect the mechanisms of vertical alliances and innovation? • How does the economic crisis during and in the aftermath of the COVID-19 pandemic affect vertical alliances

Table 9 (continued)

Elements of the multi-level framework	Research gaps	Research directions	Exemplary research questions
Outcomes	A lack of research on defining innovation in different contexts and limited efforts made to study technological innovation	Conceptualizing innovation in developing countries and studying the factors that affect technological innovation	<p>and innovation outcomes?</p> <ul style="list-style-type: none"> • How do cultural understanding, cultural distance, and cultural shock effect vertical alliances and innovation? • How is innovation performance defined in developing country firms? • What are the determinants of technological innovation? • Do vertical alliances influence a firm's innovation ambidexterity? • Do vertical alliances play a role in developing environmental innovation?
Other elements of SLR	Research gaps	Research directions	Exemplary research questions
Geographical context	Research has increasingly focused on European countries and the US, thereby disregarding other developing emerging economies across the world. The manufacturing industry has dominated the vertical alliances and innovation field.	Addressing the contextual bias caused by an insufficient scope in Asian, African, Middle Eastern, and Latin American regions and the industrial bias resulting from scant attention paid to construction, digital platforms.	<ul style="list-style-type: none"> • How and why do the unique attributes of developing and emerging economies affect the vertical alliances and innovation relationship? • To what extent do firms from emerging economies differ from those from non-emerging economies in terms of vertical alliances and innovation? • How can firms in renewable energy, media, or other industries leverage their strengths to establish vertical alliances for innovation?
Methodological pitfalls	Research has been heavily dependent on the quantitative method with some use of qualitative methods, thus missing opportunities to	Moving beyond traditional methods as a static process to adopt longitudinal perspective and historical analysis methods	<ul style="list-style-type: none"> • How do vertical alliances and innovation processes unfold over time? • How do we adopt historical research methods in vertical alliances

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Table 9 (continued)

Elements of the multi-level framework	Research gaps	Research directions	Exemplary research questions
	capture the process of vertical alliances evolution, its nuances, and innovation implications		<p>and innovation research?</p> <ul style="list-style-type: none"> • How can we integrate the time dimension into quantitative and qualitative data in vertical alliances and innovation research? • How can we make stronger theoretical contributions by using temporal and longitudinal research?

diverse perspectives. First, a firm's managers may be particularly important in relation to exerting influence and engaging in decision-making activities (Chemmanur et al., 2020). It has been suggested that the knowledge value and knowledge sharing practices of managers affect collaborative innovation and firm performance (García-Granero et al., 2018; Singh et al., 2021). Managers can support employee commitment to exchange knowledge with external partners (Ardito et al., 2019; Wang et al., 2021a,b). Therefore, future studies could draw insights from the micro-foundations perspective to examine how managers can leverage vertical alliances for innovation performance. The micro-foundations perspective suggests emphasizing individuals, as value creation is rooted in managers/employees (Felin and Foss, 2005; Foss and Lindenberg, 2013). We hold that this perspective should be extended to the end of explaining how individual attributes and capabilities drive vertical alliances for different types of innovation. For example, a firm's decision to engage in vertical alliances, motivated by managerial dynamic capabilities, may be conducive to making choices. Also, knowledge-oriented leaders could emphasize the importance of knowledge management practices in regard to effectively sensing and seizing opportunities for innovation (Teece, 2009). Therefore, it would become imperative to understand whether knowledge-oriented firm leaders develop knowledge sharing practices and initiatives for collaborative innovation and what conditions support different types of innovation through vertical alliances.

Furthermore, dynamic and competitive marketplaces demand a more interdisciplinary approach to the study of the relationship between vertical alliances and innovation. In this regard, the micro-foundations perspective could be integrated with upper echelons theory to study how managerial diversity affects upstream/downstream alliances and subsequent innovation. In particular, researchers could examine how managerial attributes such as age, education, gender, tenure, or functional diversity may influence a firm's decision to seek upstream or downstream alliances and attain innovation outcomes; or how more international managerial attributes—such as language, religion, and nationality—reduce any flaws in the establishment of upstream and downstream alliances for collaborative innovation. It would also be important for future studies to consider any new managerial characteristics that have not hitherto received attention in the upstream/downstream alliances literature. For example, managers with higher cultural intelligence or familiarity might choose diverse international vertical partners and achieve better innovation outcomes.

In addition, firms around the globe are experiencing contextual upheavals driven by the challenges caused and opportunities provided by COVID-19. It is likely that the effects of COVID-19 will be long lasting and affect the range of capabilities that organizations will need to

overcome the related challenges and capture new opportunities as a new normal unfolds. To overcome any external disruptions, externally-focused capabilities—like strategic agility, organizational resilience, and flexibility—may be necessary to form upstream and downstream alliances in seeking innovation (Ferraris et al., 2021; Nyamrunda and Freeman, 2021). Therefore, researchers could explore how firms develop the strategic agility and resilience that, in turn, may lead to upstream/downstream alliance formation for innovation. For example, the microfoundations perspective could be adopted to study the individual-level factors (e.g., top management team member experience, age, cognitive capabilities, and decision-making ability) that can lead to strategic agility and organizational resilience. Also, the unique microfoundational capabilities of a firm can not only enhance its strategic agility but also foster collaborative innovation in upstream and downstream alliances. Studies could also explore the relevance of strategic agility in promptly supporting decision support in relation to upstream and downstream alliances and, ultimately, enhance innovation.

The vertical alliances and innovation research could also benefit from signaling theory, which has been used in the marketing field (Spence, 1973) and in strategy research (Connelly et al., 2010) to study how any information asymmetry between two parties can be reduced. Relatedly, the recent alliance literature has drawn on signaling theory to examine how firms can use signals for alliance transactions (Hoehn-Weiss and Karim, 2014; Reuer and Ragozzino, 2014). We posit that signaling theory may be extended to explain how signals can be interpreted in vertical alliances for innovation, which involve cooperation of customers and suppliers who perform divergent value chain activities and might exhibit transactional behaviors due to information asymmetries (Tomlinson and Fai, 2016; Un and Rodríguez, 2018). The adverse selection of vertical partners can have implications for deal structuring, negotiations breakdown, low knowledge gains, and innovation inefficiencies (Carli Lorenzini et al., 2018; Jean et al., 2017; Sahay and Riley, 2003). As such, signals may be particularly important in reducing the likelihood of adverse vertical partner selection and in enhancing innovation performance. Signaling theory may help to explain how firms use signals to avoid vertical alliance formation problems and to maximize the benefits brought by vertical partners. As a few examples of such signals, studies could consider the roles played by corporate name changes, board member characteristics, top management teams, announcements, information signals, governmental subsidies, the cross-listing of shares, and the carrying out of international activities. It would be useful to investigate whether these signals facilitate vertical alliance activities and firm innovation by facilitating exchanges in domestic and international markets.

6.2. Further exploring moderators and boundary conditions

The current research has predominantly examined the moderators for the antecedents-outcomes relationship, leaving the antecedents-mediators and mediators-outcomes ones underexplored. Also, research has mostly addressed the influence of alliance-level moderators, while overlooking important firm- and environmental-level factors.

When examining firm-level moderators, future studies could draw insights from the dynamic capability perspective in order to examine the factors that influence vertical alliances and innovation outcomes. As a consequence of rapid changes and competitive pressure, firms need to make decisions and take actions more effectively (Cao et al., 2019). By exploiting marketing analytics, “difficult-to-trade knowledge assets” (Teece et al., 1997, p. 521) can be created to sense any threats and identify any opportunities. Previous research suggests that business analytics capabilities can help firms to learn about customers, suppliers, and the broader market environment (Cao et al., 2019). Accordingly, future studies could examine the relevance of the business analytics capability for strategic decision making and in influencing the impact of vertical alliances on innovation. Relatedly, the concept of big data analytics capability could prove to be useful. The use of big data analytics

can enhance the agility, adaptability, and performance of vertical alliances (Wamba et al., 2020). For example, Walmart—a retail giant—gathers about 2.5 petabytes of information every hour on customer devices, locations, and behaviors to assess their life value (Bradlow et al., 2017). Organizations could also use big data analytics to improve their decision-making for all global value chain activities (Alicke, 2016). The use of Google-trend style information could enable firms to monitor any supply chain disruptions at the 2nd or 3rd tier suppliers' end. A big data analytics capability could help to answer any unexplored questions relevant to the vertical alliances-innovation relationship.

In addition to the avenues suggested above, there is a need to extend the organizational learning perspective to digital innovation via vertical alliances. With the growing recognition of the digital economy, technological advancement may increasingly affect the innovation activities of firms (Helfat and Raubitschek, 2018; Stallkamp and Schotter, 2021). However, little research has examined the potential of digital technologies for vertical alliances and innovation. Future studies could thus examine whether digital technologies broaden the sources of knowledge by expanding the scope of any existing ties and lowering the geographical obstacles linked with innovation. Relatedly, the use of digital technologies in emerging market firms may be limited to their developed country counterparts due to a lack of digital literacy and traditional administration functions. However, developed country firms might need to unlearn old technologies and re-learn new ones. Future studies could examine the unlearning and relearning of digital technologies in emerging and developed country customer-supplier dyads and the ways in which firms from different countries manage upstream and downstream alliances for innovation. In doing this, researchers could also consider the digital technology unlearning and relearning process in high- and low-technology firms to expand the industrial implications of their findings.

The technological war and geopolitical tensions between the US and China highlight the vulnerability of firms to political challenges (Alon and Kim, 2021; Evenett, 2019). National tensions may have negative implications for vertical alliances and the undertaking of innovation activities with international partners. The existing vertical alliance and innovation research has hitherto disregarded the effects of geopolitical tensions on firm innovation performance. Future studies could thus extend the vertical alliances and innovation literature by integrating insights from the international political economy (Frieden and Lake, 2002) to understand the extent to which established assumptions of vertical integration for innovation remain relevant in the current geopolitical tensions. Researchers could also take interdisciplinary approaches by combining insights from the international political economy and institutional perspectives in order to examine how the institutions of partnering countries cooperate with each other and how the quality of their relationships affects any vertical integration decisions for innovation. In addition, researchers could investigate whether geopolitical tensions force firms to form regional innovation systems and seek regional integration to support innovation, particularly during the post-Covid era. In doing so, future research could yield well-informed findings suited to capture the increasingly complex political landscape and its implications for the vertical alliances-innovation relationship. Furthermore, countries differ in terms of their economic development and innovation ecosystems (Sun et al., 2019; Thomas et al., 2021), with their respective institutional arrangements influencing the way resources are integrated, values are co-created, and eco-systems are established (Vargo et al., 2020). In this regard, a relevant question that awaits inquiry is how institutional heterogeneity determines regional innovation systems, vertical integration, and firm innovation in developed and developing countries.

Furthermore, a theoretical viewpoint useful to offer new insights into vertical alliances and innovation relationships is cultural familiarity theory (Li and Guisinger, 1991; Ozawa, 1979), which posits that an organization's familiarity with another country's culture determines the

way it frames a particular transaction. A high level of cultural familiarity with a partner's national culture reduces any perceived cultural distance and can thus moderate the relationship between vertical alliances and innovation. For example, greater cultural distances are generally associated with higher integration costs due to the liability of foreignness (Lim et al., 2016; Shenkar, 2012). However, any familiarity with each other's cultures already possessed by vertical integrators may ease the knowledge exchange process and facilitate innovation. Thus, future studies could investigate whether cultural familiarity, cultural distance, and cultural shock affect the vertical alliances-innovation relationship. There is also a need to incorporate variations in regional (Huo and Randall, 1991) and corporate culture (Uljin et al., 2010) and their interplay with national culture in order to approximate a realistic encounter of firms with vertical partners to seek innovations.

6.3. Exploring new outcomes

Prior studies have examined innovation outcomes by conceptualizing them in terms of products, processes, and services. This conceptualization has largely been established in developed countries and, as such, it may lack relevance and validity in developing countries, the firms of which generally lag behind in terms of technology and development (Granstrand and Holgersson, 2020; Zhao et al., 2021). As innovation performance involves complex and context-specific mechanisms, there is a need for future studies aimed at offering a consistent definition of innovation that is relevant to firms in developing countries—for example, investigating whether imitation is a success or failure factor in developing country firms and, if it is a success, how innovation failure is defined in this context.

Our review revealed an increased scholarly focus on radical (NPD) innovation. We thus see a need to consider other types of innovation outcomes, including technological innovation, the lack of attention to which is surprising, given the crucial role it plays in driving productivity and economic development, particularly in emerging countries (Leonidou et al., 2020; Zhou et al., 2021). Technological innovation acts as an equalizer, whittling down any inequalities across regions once a technological catch-up effect is observed in developing countries (Fischer et al., 2018; You et al., 2020). Drawing on this perspective, future studies could examine how vertical integration affects the technological innovation success of firms. For example, vertical alliances are generally perceived as valuable in generating innovation outcomes; however, some alliance partners may be riskier than others. Thus, there is an opportunity for researchers to evaluate the risks that each vertical partner may pose and examine their implications for technological innovation (Martínez-Noya and García-Canal, 2021). In a similar way, behavioral research suggests that a firm's attention to historical and future decisions changes based on its previous persistent or varying performance levels (Hu et al., 2017; Kacperczyk et al., 2014). Researchers could apply these insights to determine technological innovation aspirations, and examine how vertical alliance scope or depth leads to distinct responses to technological innovation. Furthermore, the outcomes should be considered through a more ambidextrous lens (Luger et al., 2018; Mom et al., 2018) to investigate whether vertical alliance ambidexterity (customers and supplier integration simultaneously) reinforces the level of innovation ambidexterity (e.g., radical and incremental, technological and non-technological, and organizational and structural).

It would also be important for scholars to investigate new strategic outcomes using vertical alliance elements as explanatory variables. For instance, firms are subject to increasing institutional pressure to engage in corporate social responsibility (CSR) activities and to operate in a sustainable fashion in order to establish legitimacy. It has been acknowledged that alliance partners play an important role in environmental-friendly initiatives (Inigo et al., 2020; Jolink and Niesnten, 2021). However, little attention has been paid to investigating how vertical alliances promote social, environmental, and responsible

innovation (Chang and Gotcher, 2020). Hence, future studies could explore how vertical alliances develop ethical global value chains or how vertical alliance partners' attributes or country experiences shape environmental innovation. Such studies could also draw insights from the GVCs' governance framework (cf. Gereffi et al., 2005), and examine market, hierarchy, captive, relational, and modular modes of governance and their impact on environmental innovation.

6.4. New opportunities for geographic and industry contexts

In terms of geographic contexts, we posit that any trend toward considering diverse countries (e.g., beyond the UK, the US, and Germany) is likely to uncover any new mechanisms of vertical alliances and innovation. For instance, emerging economies are renowned for their resilience; it would thus be interesting to investigate whether this context enables firms to overcome the challenges presented by the customer-supplier relationship for innovation activities. Along similar lines, developing-emerging economies are more prone to institutional voids, indigenous practices, and imitation; however, the manner in which firms overcome these issues in vertical alliances for innovation remains unclear. Any call for a developing-emerging economies perspective on research and practice therefore implies that business and management scholarship would have to be undertaken in these settings. Furthermore, the transferability of Western practices pertaining to vertical alliances and innovation to non-Western contexts implies performing a comparative analysis between developed and developing countries. Also, the various developing-emerging economies are distinct from each other in relation to their social and economic outlooks (e.g., South America and the Middle East), which suggests the need to consider a sample of developing-emerging countries for comparative analysis.

The vast majority of the vertical alliances and innovation literature is focused on the manufacturing industry sector, particularly the high-technology ones, such as electronics, machinery, IT, and automotive. Conducting research on other industry sectors—such as energy, digital platforms, construction, recycling, renewable energy, and professional services, which are characterized by greater technological and market turbulence in accordance with structural contingency theory—may go a long way to extend the existing knowledge and to deepen any theoretical developments (Ju et al., 2019; Khan et al., 2015; Soontornthum et al., 2020).

6.5. Research methodologies in the study of vertical alliances and innovation

Our review revealed the widespread adoption of static methodological approaches. To answer their research questions and uncover important dynamics, scholars are urged to face the challenge of moving beyond conventional research methods—e.g., by engaging in variance-based studies or cross-sectional surveys. First, the undertaking of temporal research to deepen our understanding of the vertical alliance evolution and its dynamics during the innovation process invites us to consider a variety of methods, including longitudinal qualitative and quantitative research designs. This approach to re-evaluation is even more important from the institutional perspective. Institutional voids may give rise to agency problems, dissuade vertical integration and, in some cases, caused its failure (Gartenberg and Pierce, 2017). Also, the inherent dynamism (changes over time) of the global economy creates complexities for vertical alliances and innovation research. It would thus be particularly useful to adopt a longitudinal evolutionary perspective, real options approaches, and event studies to examine how vertical alliances evolve and affect innovation in institutionally complex environments. Second, difficulties in collecting primary data from organizations and the absence of reliable secondary data, particularly in developing countries, can be problematic for vertical alliance and innovation research. One solution to this problem involves the use of

textual data—including text, images, videos, sounds, company reports, and executive interviews. Textual data, which is generated on various social media platforms—e.g., LinkedIn and Glassdoor—includes interviews with executives, podcasts, reviews, and corporate reports; imagery (e.g., photographs, graphics, and materials published by organizations); and video footage available on YouTube, Vimeo, and other social media websites. Future studies could use textual data to study the vertical alliances and innovation phenomenon, and analyze them using dictionary-based tools such as DICTION, LIWC, Google's Brain, Microsoft's Azure, among others. The wide variety of software tools currently available to researchers enables scholars to uncover and work with a spectrum of psychological and sociological constructs produced by organizations. Third, given the tacit nature of the innovation process through vertical integration, researchers could consider performing multi-level analyses to explore factors or actors at the network- or geographic-level that can offer theoretical and empirical answers to 'why', 'how', and 'what' questions.

7. Conclusion

The notion of the establishment of vertical alliances to promote firm innovation is increasingly receiving scholarly attention. However, an in-depth and systematic understanding of the vertical alliance and innovation relationship remains limited, which might hinder advancing the field. Thus, our study was aimed at providing a comprehensive understanding of the vertical alliances and innovation research by means of an SLR approach. To do so, we systematically reviewed 116 articles published over the 2000–2021 period in 35 leading journals from 10 disciplines. This enabled us to evaluate the existing literature on vertical alliances and innovation in relation to authorship, method, geographical coverage, theory, and empirical insights. Overall, our study makes three main contributions. First, it provides an overview of the vertical alliances' research by linking it to firm innovation, which offers a systematic understanding of the process through which firms interact with vertical partners, overcome challenges, exchange knowledge, and improve innovation. Second, it maps the depth and scope of the vertical alliances and innovation research by highlighting the research method, geographical coverage, industries, and theoretical perspectives. Third, it developed a multi-level framework and discussed the findings based on the research linkages between antecedents, mediators, outcomes, and moderators. This framework led us to identify research gaps, propose research questions, and suggest different theoretical perspectives suited to advance this field.

Our review, like all other reviews, has some limitations that future studies could address. First, given the central focus of our present interest on the relationship between vertical alliances and innovation, we systematically reviewed previous studies on this topic. We would like to acknowledge the limitation of paying relatively less attention to the vertical alliances-innovation relationship (Wu et al., 2021). This limitation opens up a very good opportunity for future studies to draw on insights from our study to address this limitation. Second, considering that vertical alliances are very relevant in the context of MNEs' global supply chain management (Lu et al., 2019), it will be particularly interesting for future studies to explore how MNEs from developed markets and MNEs originating from developing/emerging markets distinctly manage their respective global value chain. MNEs from emerging markets might structure and govern their vertical alliances differently such as giving them more autonomy and independence compared to developed markets' MNEs, thus it would be interesting to examine different types of innovations emerging in such alliances. Third, although we conducted an exhaustive search across various databases, perhaps some studies might still be missed due to various reasons (e.g., a concept has different terms, either innovation or vertical alliance or both have diverse interpretations by popular magazines versus by academic readings, by practitioners versus by scholars), which future studies are suggested to address. Finally, while this study relies on

high-ranked articles based on CABS journal guide to ensure the quality review and thus excluded grey sources (e.g., books, conference papers, working papers, dissertations, future studies are recommended to extend the framework and implication of our study to these areas.

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