

Strategic networks: On the intertwinedness of network structure and resources

Jesse Karjalainen

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**Aalto University
School of Science
Department of Industrial Engineering and Management**

Supervising professor

Professor Ilkka Kauranen, Aalto University School of Science, Finland

Thesis advisor

Dr. Dr. Dr. Jürgen Poesche

Preliminary examiners

Professor Joel Baum, Rotman School of Management, University of Toronto, Canada

Associate Professor Annapoornima Subramanian, National University of Singapore, Singapore

Opponent

Associate Professor Juha Uotila, Warwick Business School, University of Warwick, UK

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Abstract

Strategy scholars have a long history of attributing firm performance differentials to the internal characteristics of the firm. In contrast, strategic network scholars typically posit that superior firm performance is linked to the firm's external network of interfirm ties. While both of these perspectives have been instrumental in improving our understanding of the sources of firm performance variance, the research on strategic management has sought to integrate these two streams for a more nuanced and comprehensive understanding. However, there are still significant gaps in our understanding of the interplay between networks and resources. Towards this end, the objective of this dissertation is to contribute to an improved understanding of how the resources of a strategic network affect the performance of the focal firm. This objective is addressed through five independent analyses, each of which is presented in a separate research paper.

The first paper empirically examines and the second paper theoretically elaborates how the structure and the resources of a strategic network interact to affect the performance of the focal firm. By focusing on knowledge resources, the first paper finds that the resource levels at each network node and, more broadly, the resultant distributions of resources in the network matter for the focal firm performance. The second paper theoretically extends these notions and proposes a concept of network resource distribution, which enables the operationalization and subsequent quantitative testing of the firm performance implications of such distributions. The third paper empirically analyzes how the resources in a strategic network interact with one another to affect the performance of the focal firm. It finds a significant interaction between knowledge resources, suggesting that interactions among resources in a network, in general, can have significant firm performance implications. The fourth paper and the fifth paper empirically investigate how the resources endowed by individuals in strategic networks affect the performance of the focal firm. By focusing on the manufacturing industry, the fourth paper finds the resources furnished by individuals yield multiple benefits, including fresher ideas, broader design support, and quicker delivery times, that are beyond those provided by firm resources. By focusing on the co-creation of consumer apparel designs in social media, the fifth paper finds that to better ensure that their designs are aligned with market needs, firms utilize design resources contributed by individuals. Taken together, these results show that the structure and the resources of a strategic network are intertwined in complex ways.

By using various perspectives to examine firm performance implications of resources in strategic networks, this dissertation contributes to the literature on interfirm alliances and networks by theoretically extending and empirically testing its key concepts.

Keywords Strategic management, strategic networks, strategic alliances, resource-based view, firm performance

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Tekijä

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Strategiset yritysverkostot: Verkoston rakenteen ja resurssien yhteen nivoutuneisuudesta

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Strategiatutkijoilla on pitkä perinne selittää yrityksiä välisiä suorituskykyeroja yrityksiä sisäisillä tekijöillä. Strategisten yritysverkostojen tutkijat sen sijaan liittävät yritysten suorituskyvyn yritysten ulkopuolisiin, yrityksiä välisistä yhteyksistä muodostuviin yritysverkostoihin. Vaikka molemmat näistä näkökulmista ovat kasvattaneet merkittävästi ymmärrystämme yritysten välisen suorituskykyerojen syistä, strategisen johtamisen tutkijat ovat pyrkineet yhdistämään nämä näkökulmat entistä hienosyisemmän ja kokonaisvaltaisemman ymmärryksen muodostamiseksi. Tästä huolimatta ymmärryksemme yritysverkostojen ja yritysten resurssien välisestä vuorovaikutuksesta sisältää edelleen merkittäviä aukkoja. Tämän väitöskirjan tavoite on kasvattaa ymmärrystämme strategisten yritysverkostojen sisältämien resurssien vaikutuksesta yritysten suorituskykyyn. Tähän tavoitteeseen vastataan viidellä itsenäisellä osatutkimuksella, joista kukin muodostaa yhden tämän väitöskirjan artikkelin.

Ensimmäinen artikkeli tutkii empiirisesti ja toinen artikkeli käsittelee teoreettisesti strategisen yritysverkoston rakenteen ja sen sisältämien resurssien yhdysvaikutusta yrityksen suorituskykyyn. Ensimmäisessä artikkelissa käsitellään tietämysresursseja. Siinä osoitetaan, että verkoston jokaisen yksittäisen solmukohdan resurssitasoilla ja laajemmin todettuna verkoston kaikkien solmukohtien resurssitasoista muodostuvilla verkoston laajuisilla jakaumilla on yhteys yrityksen suorituskykyyn. Toinen artikkeli laajentaa asiaa koskevaa tietämystä teoreettisesti. Tutkimuksessa on kehitetty uusi konsepti, joka on nimetty yritysverkoston resurssijakaumaksi. Tämä konsepti mahdollistaa yritysverkoston resurssijakaumien operationalisoinnin ja siten resurssijakaumien vaikutuksien kvantitatiivisen testaamisen yrityksen suorituskyvyn näkökulmasta. Kolmas artikkeli tutkii empiirisesti strategisen yritysverkoston resurssien yhdysvaikutuksia yrityksen suorituskykyyn. Tutkimuksessa löydettiin tilastollisesti merkitsevä kahden eri tietämysresurssin yhdysvaikutus. Artikkelissa esitetään, että strategisen yritysverkoston resurssilla voi yleisemminkin olla tilastollisesti merkitseviä yhdysvaikutuksia yrityksen suorituskykyyn. Neljännessä ja viidennessä artikkelissa tutkitaan empiirisesti, miten yksittäisten henkilöiden strategiselle yritysverkostolle tarjoamat resurssit vaikuttavat yrityksen suorituskykyyn. Neljäs artikkeli käsittelee valmistavaa teollisuutta. Siinä osoitetaan, että yksittäisten henkilöiden tarjoamat resurssit voivat tarjota parempia etuja kuin yritysten tarjoamat resurssit. Viides artikkeli käsittelee sitä, miten vaatetustoimialalla hyödynnetään sosiaalista mediaa kehitystyössä. Löydöksenä on, että yritykset hyödyntävät yksittäisten henkilöiden tarjoamia suunnitteluresursseja erityisesti vastatakseen paremmin markkinakysyntään. Kaikki nämä löydökset yhdessä osoittavat, että strategisten yritysverkostojen rakenne ja resurssit ovat nivoutuneet toisiinsa monimutkaisella tavalla.

Tämä väitöskirja tuo uutta tietoa yritysten välisiä liittoumia ja verkostoja käsittelevään

Avainsanat Strateginen johtaminen, strategiset yritysverkostot, strategiset liittoumat, resurssipohjainen lähestymistapa, yrityksen suorituskyky

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Helsinki, 24 February 2020

Jesse Karjalainen

Contents

Acknowledgements.....	1
List of research papers.....	5
Author's contribution	6
1. Introduction.....	9
1.1 Overview	9
1.2 Theoretical background.....	11
1.3 Unit of analysis	12
1.4 Objective	12
1.5 Scope.....	14
2. Data and methods.....	16
2.1 Strategic networks of high-tech firms	16
2.2 Alliance portfolios of high-tech firms	17
2.3 Individuals in production networks.....	17
2.4 Co-creation with individuals in fashion firms	18
3. Results and contributions	19
3.1 Interaction between resources and network structure.....	19
3.2 Interactions among resources within a network	21
3.3 Individuals as sources of valuable resources	22
3.4 Synthesis.....	23
4. Discussion.....	25
4.1 Implications for the literature	25
4.2 Implications for the practice	28
5. Limitations.....	29
6. Further research	30
7. Conclusion	32
References.....	33
Research paper 1.....	39
Research paper 2	51
Research paper 3	97
Research paper 4	135
Research paper 5.....	147

List of research papers

This dissertation consists of this summary and the following five research papers:

1. Karjalainen, J., and Valtakoski, A. 2010. On the role of partners in a multi-disciplinary business network: A knowledge management perspective. *Proceedings of the 43rd Hawaii International Conference on System Sciences, Lihue, Hawaii, USA*. 10 pages. ISSN: 1530-1605. DOI: 10.1109/HICSS.2010.466
2. Karjalainen, J., Valtakoski, A., and Kauranen, I. 2019. Interfirm network structure and firm resources: Towards a unifying concept. 44 pages. Working paper¹.
3. Karjalainen, J., and Valtakoski, A. 2019. Alliance portfolio diversity and firm performance: Technological knowledge, customer knowledge, and portfolio effect. 36 pages. Working paper².
4. Hamalainen, M., and Karjalainen, J. 2017. Social manufacturing: When the maker movement meets interfirm production networks. *Business Horizons*, volume 60, pages 795-805. ISSN: 0007-6813. DOI: 10.1016/j.bushor.2017.07.007
5. Karjalainen, J., and Hamalainen, M. 2020. Co-creating designs with laypersons in social media: An empirical study of design firms in the consumer apparel industry, 21 pages. Working paper³.

¹ A previous version of this paper has been submitted to *Organization Science* on 7th of September, 2019. The submitted version of this paper is in the review process in *Organization Science*.

² A previous version of this paper has been submitted to *R&D Management* on 10th of October, 2019. The submitted version of this paper is in the review process in *R&D Management*.

³ This paper has been submitted to *Creativity and Innovation Management* on 13th of February, 2020. This paper is in the review process in *Creativity and Innovation Management*.

Author's contribution

Research paper 1: On the role of partners in a multi-disciplinary business network: A knowledge management perspective

The author of this dissertation initiated the research project, identified the research gap, and developed the key ideas that underlie the study. He also collected the research data through interviews and analyzed the data with qualitative research methods. The writing of the final version of the manuscript was a collective effort of the two co-authors. The author of this dissertation made the prime contribution to the development of the ideas that represent the intellectual and academic contribution of research paper 1 to theory and research on strategic networks.

Research paper 2: Interfirm network structure and firm resources: Towards a unifying concept

The author of this dissertation initiated the research project, identified the research gap, and developed the key ideas that underlie the study. The writing of the final version of the manuscript was a collective effort of the three co-authors. The author of this dissertation made the prime contribution to the development of the ideas that represent the intellectual and academic contribution of research paper 2 to theory and research on strategic networks.

Research paper 3: Alliance portfolio diversity and firm performance: Technological knowledge, customer knowledge, and portfolio effect

The author of this dissertation initiated the research project, identified the research gap, and developed the key ideas that underlie the study. He also collected the research data through a survey and interviews as well as analyzed the data with statistical research methods. The writing of the final version of manuscript was a collective effort of the two co-authors. The author of this dissertation made the prime contribution to the development of the ideas that represent the intellectual and academic contribution of research paper 3 to theory and research on strategic networks.

Research paper 4: Social manufacturing: When the maker movement meets interfirm production networks

The author of this dissertation was instrumental in the initiation and planning of two former research projects on which the central ideas of research paper 4 are based. The research plan and the initial version of the abstract of research

paper 4 were developed by the other researcher. The author of this dissertation collected the research data through interviews and analyzed the data with qualitative research methods. The writing of the manuscript was a collective effort of the two co-authors. The author of this dissertation and the other researcher together made the contribution to the development of the ideas that represent the intellectual and academic contribution of research paper 4 to theory and research on strategic networks.

Research paper 5: Co-creating designs with laypersons in social media: An empirical study of design firms in the consumer apparel industry

The author of this dissertation initiated the research project, identified the research gap, and developed the key ideas that underlie the study. He also collected the research data through interviews and analyzed the data with qualitative research methods. The writing of the final version of the manuscript was a collective effort of the two co-authors. The author of this dissertation made the prime contribution to the development of the ideas that represent the intellectual and academic contribution of research paper 5 to theory and research on strategic networks.

1. Introduction

1.1 Overview

Strategy scholars have a long history of attributing firm performance differentials to the internal characteristics of a firm, usually expressed in the form of resources (Wernerfelt, 1984; Barney, 1991) or capabilities (Teece, Pisano, and Shuen, 1997). In contrast, strategic network scholars typically posit that superior firm performance is linked to the firm's external network of interfirm ties (Dyer and Singh, 1998; Gulati, Nohria, and Zaheer, 2000; Baum, Calabrese, and Silverman, 2000). While both of these perspectives have been instrumental in improving our understanding of the sources of firm performance variance, the research on strategic management has sought to integrate these two streams for a more nuanced and comprehensive understanding (Zaheer and Bell, 2005; Wassmer, 2010; Lavie, 2007; Lee, Kirkpatrick-Husk, and Madhavan, 2017; Subramanian and Soh, 2017; Jiang, Tao, and Santoro, 2010). However, despite these efforts, there are still considerable gaps in our understanding of the interplay between networks and resources (Phelps, Heidl, and Wadhwa, 2012; Gulati, Lavie, and Madhavan, 2011; Phelps, 2010). Towards this end, the objective of this dissertation is to contribute to an improved understanding of how the resources of a strategic network affect the performance of the focal firm.

The objective of this dissertation is approached from three different perspectives, each formulated as a separate sub-objective. The sub-objective 1 of this dissertation is to contribute to an improved understanding of how the structure and the resources of a strategic network interact to affect the performance of the focal firm. The sub-objective 2 of this dissertation is to contribute to an improved understanding of how the resources in a strategic network interact with one another to affect the performance of the focal firm. Finally, the sub-objective 3 of this dissertation is to contribute to an improved understanding of how the resources endowed by individuals in strategic networks affect the performance of the focal firm. These sub-objectives are addressed through five independent analyses, each of which is presented in a separate research paper.

The first paper empirically examines and the second paper theoretically elaborates how the structure and the resources of a strategic network interact to affect the performance of the focal firm. By focusing on knowledge resources, the first paper finds that the resource levels at each network node and, more broadly, the resultant distributions of resources in the network matter for the focal firm performance. The second paper further argues about the rel-

evance of analyzing firm performance through the distributions of resources in a strategic network. Moreover, it proposes a novel concept of *network resource distribution*, which enables operationalization and subsequent quantitative testing of theoretical arguments combining the structure of a strategic network with the information about the location and the levels of the resources in the network. The third paper empirically analyzes how the resources in a strategic network interact with one another to affect the performance of the focal firm. It finds a significant interaction effect between two knowledge resources, suggesting that interactions among resources in a network can have significant firm performance implications. The fourth and fifth papers empirically investigate how the resources endowed by individuals in strategic networks affect the performance of the focal firm. By focusing on the manufacturing industry, the fourth paper finds that the resources furnished by individuals yield multiple benefits, including fresher ideas, broader design support, and quicker delivery times, that are beyond those provided by firm resources. By focusing on the co-creation of consumer apparel designs in social media, the fifth paper finds that to better ensure that their designs are aligned with market needs, firms utilize design resources furnished by individuals.

By using various perspectives to investigate the firm performance implications of resources in strategic networks, this dissertation contributes to the literature of interfirm alliances and strategic networks by theoretically extending and empirically testing its key concepts. The first paper initiates a new viewpoint on strategic networks, namely, the perspective of resource distributions in networks. The second paper theoretically elaborates and extends the theory behind such distributions and facilitates further integration of the resource-based and the network-based explanations for firm performance variance by introducing a novel concept enabling quantitative research on the resource distributions in networks. The third paper provides much needed empirical evidence for the predominantly theoretical arguments that interactions among resources in a strategic network are indeed potential sources of firm performance variance. The fourth and fifth papers illuminate how resources endowed by individuals can yield firm performance benefits above and beyond those yielded by resources furnished by firms, and the papers thereby stress the importance of considering the organizational form encapsulating the resources at the each node of a network. Taken together, the five research papers emphasize the need to analyze the resource microstructure of a strategic network when scrutinizing the performance of a firm embedded in a network of various ties.

This dissertation is structured as follows. In the remainder of this section, the theoretical background, the unit of analysis, the objective, and the scope of this dissertation are presented. In section 2, the data and methods employed to address the objective are discussed. In section 3, the results and contributions are presented and synthesized. In section 4, the implications of the results for theory and practice are discussed. In section 5, limitations of this dissertation are examined. In section 6, further research avenues are suggested. Section 7 concludes the dissertation.

1.2 Theoretical background

A key question in the field of strategy research is why firms differ in their performance (Rumelt, Schendel, and Teece, 1991). Researchers in strategy have a long tradition of viewing firms as autonomous entities that draw their competitive advantage from *internal* characteristics commonly denoted in the form of resources (Wernerfelt, 1984; Barney, 1991) or capabilities (Teece et al., 1997). According to this so-called resource-based view of the firm school, a firm can achieve superior performance by first internalizing valuable bottleneck resources and then creating and wrapping value-creating strategies around these resources. The inimitable and nonsubstitutable nature of these valuable resources within the core of a firm's business strategy makes it difficult for competitors to copy the firm's strategy and hence the firm can enjoy sustained above-average performance.

In contrast, strategic network scholars view firms as embedded in networks of social, professional, and exchange relationships with other organizational actors—who could be they suppliers, customers, competitors, or other entities—arguing that competitive advantage is related to such *external* characteristics (Dyer and Singh, 1998; Gulati et al., 2000; Baum et al., 2000; Gulati, 1998). These strategic networks are formed of enduring interorganizational ties that are of strategic significance for the participating firms, can span across industries and countries, and include strategic alliances, joint ventures, long-term buyer-supplier partnerships and a variety of akin ties (Gulati et al., 2000). According to this school of thought, strategic networks enable embedded firms to access and acquire valuable bottleneck resources beyond the firm's boundaries and that the strategic network itself can serve as one (Gulati, 1999). However, strategic networks can also impose constraints on the embedded firms by potentially locking them into unproductive alliances and by blocking them from entering viable alliances (Gulati et al., 2000). In this sense, strategic networks are sources of both benefits and constraints. As argued with the resource-based view of the firm, strategic networks enable firms to achieve sustained above-average performance when the firms craft their value-creating strategies around network resources that are valuable, rare, inimitable, and nonsubstitutable.

Although both of these perspectives have significantly aided our understanding of why there are sustained performance differences among firms, strategy scholars have started to integrate these perspectives for a more nuanced and comprehensive understanding. For example, it has been argued that the extent to which firms can draw competitive advantage from their internal resources is influenced by the network structure surrounding the firm (Zaheer and Bell, 2005) and by the resources and capabilities of the organizational actors in the network (Lee et al., 2017; Hagedoorn, Lokshin, and Zobel, 2018; Subramanian and Soh, 2017; Baum, Calabrese, and Silverman, 2000; Wassmer, 2010; Jiang, Tao, and Santoro, 2010; Lavie, 2007). However, there are still significant gaps in our understanding of how the resources possessed by organizational actors in a strategic network affect the performance of the focal firm.

First, strategic network studies accounting for the resource heterogeneity of network actors have mostly been limited to the dyadic level of analysis, often considering only the focal firm and its immediate network partners, leaving our understanding narrow regarding how the network structure and the resources in a strategic network interact to affect the focal firm performance beyond such ego networks (Guan and Liu, 2016; Phelps et al., 2012; Gulati et al., 2011; Phelps, 2010). Second, studies investigating the interactions among resources in a strategic network are sparse and have yielded mixed results, limiting our understanding of how the resources in a strategic network jointly impact the performance of the focal firm (Hagedoorn et al., 2018; Lee et al., 2017; Wassmer, 2010; Phelps et al., 2012). Third, the literature on strategic networks is mostly firm-centric, and only limited attention has been given to the recent proliferation of individuals as valuable components of strategic networks; this has resulted in our having a narrow understanding as to how the resources furnished by individuals affect the performance of the focal firm and, perhaps more interestingly, as to whether such resources have firm performance implications in excess of those endowed by firms (Belk, 2014; Kuppuswamy and Bayus, 2018; Cheng, 2016; Arsel and Dobscha, 2011; Yan and Guan, 2018). The analyses of the five research papers in this dissertation contribute to an improved understanding of these issues.

1.3 Unit of analysis

The unit of analysis in this dissertation is a firm. In this dissertation, firms are analyzed through three different facets of strategic networks: First, paper 1 and paper 2 analyze firms from the *interfirm networks* perspective. Second, paper 3 continues the theme of interfirm relationships but examines firms from the *alliance portfolio* perspective. Third, shifting the research context from firm-firm to firm-individual relationships, paper 4 and paper 5 investigate firms from the organizations' *network partner* perspective that consists of single individuals.

1.4 Objective

This dissertation focuses on firms and their strategic networks, aiming to unearth new sources of firm performance variance and thereby to advance our understanding of why some firms are able to perform better than others. More specifically, the objective of this dissertation is as follows:

Objective:

The objective of this dissertation is to contribute to an improved understanding of how the resources of a strategic network affect the performance of the focal firm.

The objective of this dissertation is approached from three perspectives, each formulated as a separate sub-objective. Understanding how the social and pro-

fessional context in which the resources are embedded moderates the impact of the resources on firm performance is central to our understanding of how firms can capture value from the resources in their strategic networks (Uzzi, 1997; Gulati, 2000). However, limited empirical studies exist that account for both the network structure beyond the dyadic level, including the whole network level, and the resources of the organizational actors forming the network (Guan and Liu, 2016; Phelps et al., 2012; Gulati, Lavie, and Madhavan, 2011; Zaheer and Bell, 2005; Phelps, 2010). Towards this end, the first sub-objective focuses on the interaction between the structure and the resources of a network, as explicated in the following sub-objective statement:

Sub-objective 1:

The sub-objective 1 of this dissertation is to contribute to an improved understanding of how the structure and the resources of a strategic network interact to affect the performance of the focal firm.

This sub-objective is examined in paper 1 and paper 2. The objective of paper 1 is to examine firm performance implications of accessing resources in a network through intermediating partners. Through a qualitative study (Yin, 2013; Patton, 1990), the paper proposes a general logic of how the interaction between the structure and the resources of a network affects the performance of the focal firm. Paper 2 builds upon paper 1 by theoretically elaborating and extending its key findings with an objective of developing a new concept that advances the empirical testing of the interaction between the structure and the resources of a network. Specifically, the objective of paper 2 is to propose a unifying concept that—by accounting for both the resource-based and network-based perspectives—enables detailed analysis of how firm resources and network structure interact beyond the dyadic level of analysis to affect firm performance.

A major component of the comprehensive understanding of how the resources in a strategic network affect the performance of the focal firm is the interaction among the resources in the network. In the existing literature, however, studies addressing this end are limited and have resulted in non-consistent results (Hagedoorn et al., 2018; Lee et al., 2017; Phelps et al., 2012; Wassmer, 2010; Vassolo, Anand, and Folta, 2004). This is the focus of the second sub-objective, which is stated formally as follows:

Sub-objective 2:

The sub-objective 2 of this dissertation is to contribute to an improved understanding of how the resources in a strategic network interact with one another to affect the performance of the focal firm.

This sub-objective is empirically investigated in paper 3. By focusing on alliance portfolios composed of the focal firm's immediate network partners (Wassmer, 2010) and on knowledge resources (Grant, 1996; Grant and Baden-

Fuller, 2004), the objective of paper 3 is to contribute to an improved understanding of how technological knowledge and customer knowledge in downstream alliance portfolios affect the focal firm performance. Paper 3 provides an account of how these resources individually and jointly affect the performance of the focal firm.

The literature on strategic networks is predominantly firm-centric and the networks are typically composed of interconnected firms. However, the social and professional context in which firms are embedded is increasingly more complex and not limited to just firms. Consequently, the resources in a strategic network are not always furnished by firms. In particular, strategic networks increasingly embody resources endowed by individuals rather than those provided by firms (Belk, 2014; Kuppuswamy and Bayus, 2018; Cheng, 2016; Arsel and Dobscha, 2011). The proliferation of individuals as providers of resources that are central to the value creation of strategic networks is a fairly recent phenomenon, and consequently, our understanding of the firm performance effects of such resources is still limited. This is the focus of the third sub-objective, which is stated formally in the following:

Sub-objective 3:

The sub-objective 3 of this dissertation is to contribute to an improved understanding of how the resources endowed by individuals in strategic networks affect the performance of the focal firm.

This sub-objective is investigated in paper 4 and paper 5. Paper 4 acknowledges that digital content creation and service industries have already been revolutionized by firms building upon resources rendered by individuals (Zervas, Proserpio, and Byers, 2017; Belk, 2014; Bruns, 2008; Benkler, 2006) but that much less is known about the role of such resources in the production of physical goods. To this end, paper 4 adopts an individual network member perspective and consequently shifts the research focus from firm-firm to firm-individual relationships in the manufacturing context. Specifically, the objective of paper 4 is to investigate how resources furnished by individuals in strategic networks affect the performance of the focal firm in the context of physical goods production. Acknowledging the proliferation of social media and its transformative power in facilitating new connections and extending existing ones between firms and individuals, paper 5 continues the theme of paper 4 by more specifically focusing on how firms use social media to access the product design resources rendered by individuals. By focusing on design firms in the consumer apparel industry and on nonprofessional individuals, the objective of the paper 5 is to contribute to an improved understanding of how design firms use social media to co-create designs with laypersons.

1.5 Scope

This dissertation focuses on investigating firm performance implications of resources in strategic networks through the theoretical lenses of interfirm alli-

ances and strategic networks (Gulati, 1998; Dyer and Singh, 1998; Gulati et al., 2000; Wassmer, 2010) and co-creation (Prahalad and Ramawamy, 2004; Sanders and Stappers, 2008). This dissertation intends to make its primary contributions to the former discourse on interfirm alliances and strategic networks, and the lens of co-creation is used merely as a way to gain novel insights into the intended discussion on interfirm alliances and strategic networks.

Further, this dissertation focuses on a static perspective on strategic networks (cf. Chiambaretto and Wassmer, 2019), in which a significant amount of work still remains to be done. Adding the time-dimension to studies on strategic networks opens up significant further opportunities. The ideas for employing a dynamic perspective on strategic networks are given in the further research section.

Finally, in the broader management literature, there are streams of literature that are thematically related to the discussion on interfirm alliances and strategic networks. These literature streams include ecosystems (Jacobides, Cennamo, and Gawer, 2018; Autio and Thomas, 2014; Adner and Kapoor, 2010; Kapor and Lee, 2013; Rajala et al., 2018; Tsujimoto et al., 2018) and supply chain networks (Lambert and Enz, 2017; Lambert and Cooper, 2000). While the literature stream on ecosystems derives inspiration from biological ecosystems as opposed to sociology and although the stream on supply chain networks is more geared towards the operational level than the strategic level of organizations, these literature streams have provided significant insights into how firms create and capture value. Integrating these streams of literature with the stream on interfirm alliances and strategic networks—rooted in economics, sociology, and strategy—has the potential to unlock significant new insights into how firms derive their competitive advantage. Suggestions for proceeding with the integration are made in the further research section.

2. Data and methods

To address its objective, this dissertation uses various data sources, most of which were specifically collected for the purposes of this dissertation, and employs both qualitative and quantitative methods to analyze the data. Altogether, this dissertation comprises four different data sets: (1) strategic networks of high-tech firms, (2) alliance portfolios of high-tech firms, (3) individuals in interfirm production networks, and (4) co-creation with individuals in design firms. Each of these data sets, the associated research papers, and the methods used to analyze the data are elaborated in the following subchapters. The empirical part of this dissertation is presented in paper 1, paper 3, paper 4, and paper 5. Theoretical elaborations are presented in paper 2.

2.1 Strategic networks of high-tech firms

The data set on the strategic networks of high-tech firms was composed at the beginning of this dissertation and is used to address the objective of the paper 1, in which the related empirical study is presented. The data set consists of information from four Finnish software firms. To positively affect the generalizability of the inferences made from the data, each of the firms selected had different levels of total sales and internationality, measured as the proportion of total sales originating beyond the borders of Finland.

The data set was collected by using semi-structured interviews (Seaman, 1999). Semi-structured interviews were used to extract rich data on collaboration strategies and knowledge resources in the focal firm's strategic network. Two to four interviews with top-level executives were carried out at each of these companies in 2007. Altogether, the data set comprised 10 interviews. Each interview lasted 40-60 minutes. Interviews were recorded and subsequently transcribed. In addition, notes were taken during the interviews to capture emergent ideas. The notes were analyzed and documented within 24 hours of the interview. Altogether, the transcribed interview recordings and the field notes yielded 90 pages of text for subsequent analysis.

The data was analyzed by using broad principles of grounded theory (Glaser, 1978; Glaser and Strauss, 1967; Strauss and Corbin, 1990). A qualitative approach was chosen at this stage of the study to allow for novel insights and theory to emerge from the data and to create a general understanding of the

phenomenon by focusing on specific cases (Patton, 1990; Eisenhardt, 1989; Yin, 2013).

In paper 2, these insights are further theoretically elaborated to advance theory. In paper 3, some of the key proposition of paper 1 and paper 2 are tested by using quantitative methods. The data set used in paper 3 is described next.

2.2 Alliance portfolios of high-tech firms

The data set on the alliance portfolios of high-tech firms is used to address the objective of paper 3, in which the associated empirical study is described. The data set consists of 60 Finnish software firms. The sample was drawn from the annual Finnish software industry survey (Rönkkö et al., 2009). The respondents of the year 2009 survey were sampled with the following criteria: (1) the firm had to have a standard industrial classification code of 7372 (“prepackaged software”) and (2) the firm had to generate at least some of its total sales through partners. These criteria helped to control for the unobserved heterogeneity by ensuring that the firms were sufficiently similar and that the firms had alliances. Employing these criteria to the list of respondents resulted in a sampling frame of 90 firms.

The data originated from a survey, telephone interviews, and the Finnish trade registry. The data was collected in 2010 and in 2012. First, an email asking the representative to participate in the survey was sent to a top management team representative of each company. Through the survey, data for the knowledge resource levels in the alliance portfolio, the alliance experience, the economic magnitude of the alliance portfolio, and the alliance portfolio size were collected. Second, to increase the response rate, non-respondents were directly contacted via telephone and the same survey questions were asked over the phone. Later, these data were augmented with firm-specific data from the Finnish trade registry, from which data on the firms’ total sales, employees, and founding year were collected. In addition, firm-specific annual growth rates were calculated for the total sales data. In the end, responses from 70 firms were received but 10 of them had to be omitted because of incomplete or erroneous data entries, yielding a final data set of 60 firm observations, which represents 67 % coverage of the sampling frame.

The data set was analyzed by using an ordinary least squares regression analysis. This type of quantitative approach enables the statistical testing of whether the hypothesized effects are statistically significant and thus beyond just a random chance. The annual growth rate of total sales was used as the dependent variable. A one-year lag was used between the independent and the dependent variables to alleviate reverse-causality concerns.

2.3 Individuals in production networks

The data set on individuals in production networks is used to address the objective of paper 4, in which the related empirical investigation is presented.

The data set consists of two firms, which utilize resources furnished by external, independent individuals in their production networks.

The data set was collected in 2017 by using semi-structured interviews (Seaman, 1999). Semi-structured interviews were used to extract rich data on the firm-individual collaboration from an individual network member's perspective. Five interviews were conducted face-to-face with individuals working in the production network of either of the firms. The interviews typically lasted 30 to 45 minutes. Notes were written down during and immediately after each interview and later documented thoroughly for subsequent analyses.

The data set was analyzed by an inductive ground-up approach (Yin, 2013) built on the grounded theory method (Glaser, 1978; Glaser and Strauss, 1967). Because firm-individual cooperation in manufacturing industries remains a little-researched area, a qualitative approach to data collection and analysis was chosen to create a general understanding of a larger phenomenon by focusing on specific situations (Patton, 1990; Eisenhardt, 1989; Yin, 2013).

2.4 Co-creation with individuals in fashion firms

A data set on co-creation with individuals in fashion firms is used to address the objective of paper 5, in which the associated empirical study is described. The data set consists of longitudinal data on 20 design firms from the consumer apparel industry.

The data set was collected through interviews with the head designers or top management team representatives of the design firms in 2015 and in 2017. Semi-structured interviews (Seaman, 1999) were used to extract rich data on the firms' design practices, particularly probing for the use of social media, sources of design input, and the involvement of customers and individuals at large on social media. First, altogether, 20 interviews were carried out with representatives of 20 different fashion firms in 2015. The sampled firms originated from (the following countries are listed in alphabetical order) China, Cyprus, Finland, France, Germany, Italy, Japan, Spain, the UK, and the USA. The firms designed jewelry, clothing, fashion accessories, home accessories, hats, and handbags. The firms were under 10 years old with fewer than 10 employees. Notes were taken during and after the interviews and later thoroughly documented for subsequent analyses. In addition, the websites of the design firms were analyzed to quantify their use of distinct social media channels. Two years later, in 2017, the same design firms were contacted for follow-up interviews. Altogether, five follow-up interviews were conducted.

The data set was analyzed according to the broad principles of grounded theory (Glaser, 1978; Glaser and Strauss, 1967; Strauss and Corbin, 1990). A qualitative approach to both data collection and analysis was selected to establish a general understanding of a larger phenomenon by sampling specific cases (Patton, 1990; Eisenhardt, 1989; Yin, 2013). This type of inductive approach is well suited for creating a general understanding of a less-researched phenomenon.

3. Results and contributions

3.1 Interaction between resources and network structure

The first sub-objective of this dissertation is to contribute to an improved understanding of how the structure and the resources of a strategic network interact to affect the performance of the focal firm. This sub-objective is empirically addressed in paper 1 and further theoretically elaborated in paper 2.

Paper 1 investigates firm performance implications of accessing resources in a network through intermediating partners. The paper builds upon a classical notion that to create valuable offerings, a firm often needs access to complementary resources (Teece, 1986; Dibiaggio, Nasiriyar, and Nesta, 2014; Lee et al., 2017). In knowledge-intensive environments, however, these complementary resources are often tacit and hence costly to acquire (Szulanski, 1996). The paper finds that partners can have a pivotal role in facilitating a firm's access to such complementary knowledge resources. More specifically, the paper finds that the intermediating partners should have overlapping knowledge bases with both the sender and the subsequent receiver of the knowledge being transferred. This ensures, in particular, that the complementary knowledge resources flowing from a customer could be fully absorbed by the partner and subsequently successfully relayed to the focal firm in a form understandable by the firm, and vice versa. Such partners create a so-called knowledge transformation channel (or a knowledge adapter) that enables high relative absorptive capacity (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998) between two knowledgewise distant parties, enabling them to transfer knowledge effectively without having overlapping knowledge bases. A corollary of this argument is that by orchestrating its strategic network accordingly and thus forgoing investments related to the direct gathering of complementary knowledge, a firm can increase its competitive advantage through increased focus on its core competencies while still having access to the complementary knowledge. This argument suggests that a firm can achieve ambidexterity through interfirm networks (cf. March, 1991; Wassmer and Madhok, 2017).

More generally, following the aforementioned knowledge transformation logic, paper 1 finds that the levels of knowledge resources located at the network nodes and, more importantly, the resultant knowledge distributions within the network are related to firm performance. Paper 1 specifically focused on core knowledge related to the firm's core competencies (e.g., software development) and complementary knowledge related to the customer's core

competencies (e.g., industry-specific knowledge) in a network context in which a focal firm accesses customer's knowledge through intermediating partners. The paper finds that the level of the firm's core knowledge should be decreasing and the level of complementary knowledge should be increasing as a function of the network distance, defined as the number of edges between two network nodes, from the firm towards the customer. This result is illustrated below in Figure 1.

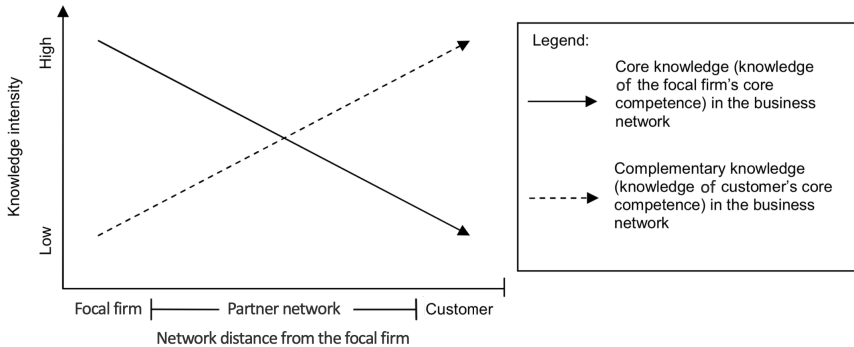


Figure 1. Beneficial knowledge distributions of a strategic network for the focal firm (adapted from paper 1)

Paper 2 further elaborates and extends these ideas to the context of resources in general by theoretically arguing about the relevance of analyzing firm performance through distributions of resources in a strategic network. To facilitate such an inquiry and to enable the quantitative testing of empirical arguments integrating the structure of a strategic network with the information of the network positions and the levels of the resources in the network, the paper proposes a new conceptual tool. The paper proposes a concept of *network resource distribution* defined as a spatial pattern of resources within an interfirm network, in which a specific location is related to specific levels of those resources. The key idea of the concept is to combine the information of *what* resources the network actors have and *where* in the network they are located. Thus, the concept effectively combines the resource-based theory (Barney, 1991; Wernerfelt, 1984; Teece et al., 1997) and the social network-based theory (Dyer and Singh, 1998; Gulati, 1998; Baum et al., 2000; Gulati et al., 2000) by viewing firms as bundles of resources and relating the bundles with one another based on interfirm relationships. An illustration of an interfirm network and its unique distribution patterns of the resources are shown in Figure 2.

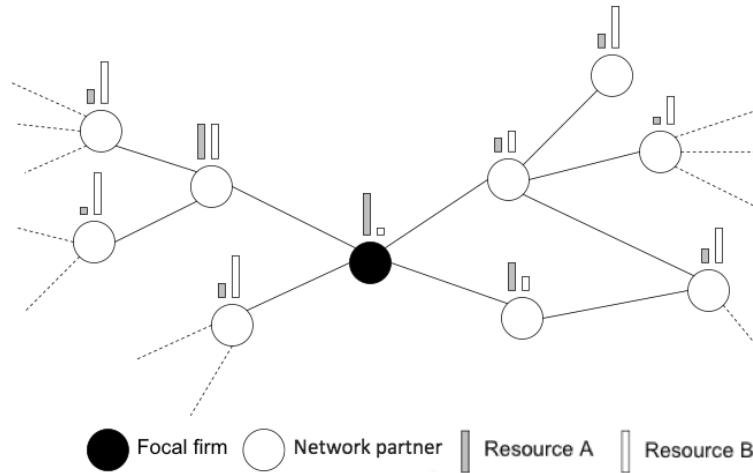


Figure 2: An example of varying resource levels in an interfirm network (adapted from paper 2)

The concept enables the quantitative testing of theoretical arguments combining the structure of a strategic network with the information of the network positions and the levels of the resources in the network. Hence, the concept facilitates whole network microstructure level studies beyond the dyadic level, to which the existing literature is mostly limited. Further, the paper illustrates the generic nature of the proposed concept by exemplifying how previous empirical studies integrating network structure and resources can be deduced from the concept.

Taken together, the results of paper 1 and paper 2 indicate that the distributions of resources within strategic networks are related to firm performance and more generally that the interaction between the network structure and the resources is a potentially significant source of firm performance variance. These results contribute to the literature on interfirm alliances and strategic networks by extending the literature's microlevel resource arguments from the dyadic level to the whole network level and by providing tools to further advance the theory.

3.2 Interactions among resources within a network

The second sub-objective of this dissertation is to contribute to an improved understanding of how the resources in a strategic network interact with one another to affect the performance of the focal firm. This objective is empirically addressed in paper 3.

Paper 3 investigates how the interaction between two knowledge resources in a firm's alliance portfolio affects the performance of the focal firm. The alliance portfolio is composed of the direct network partners of a firm (Lee et al., 2017; Subramanian and Soh, 2017; Wassmer, 2010). Paper 3 focuses on analyzing the interaction effect between technological knowledge and customer knowledge. It first finds that these types of knowledge have a separate positive effects on the performance of the focal firm. Then, the paper further finds these resources have a significant interaction effect on the performance of the

focal firm. The higher the level of technological knowledge in the alliance portfolio is, the greater impact the level of customer knowledge has on the performance of the focal firm, and vice versa.

Interestingly, this result extends paper 1's knowledge distribution result, illustrated in Figure 1, by suggesting that the higher the levels of *both* types of knowledge in the alliance portfolio are, the better the focal firm's performance. This is a logical result, because higher levels of technological knowledge and customer knowledge support end-to-end communication while also ensuring that the communication adds significant value through new information. In effect, these results suggest that the optimal knowledge distributions—the decreasing levels of technological knowledge and the increasing levels of customer knowledge when viewed as a function of network distance from the focal firm to its customers—are not linear but rather curvilinear.

These results also corroborate and extend previous alliance portfolio level arguments that customer knowledge serves as a strategically important complement to the focal firm's technological knowledge (Teece, 1986; Fjeldstad and Sasson, 2010; Von Hippel, 2007; Yli-Renko et al., 2001) and that alliances portfolios serve as important enablers of ambidexterity (Wassmer and Madhok, 2017).

In addition, by focusing on a sample of small private firms, the results of paper 3 provide additional evidence on the impact of technological distance on learning provided through strategic interfirm alliances in the context of small firms. The existing literature has mostly focused on investigating the effects of technological distance on learning facilitated through interfirm alliances in the context of large established firms and has given small firms less attention (Subramanian and Kah-Hin, 2018; Hoehn-Weiss and Karim, 2014; Gronum, Verreyne, and Kastle, 2012), even though small firms are more reliant on external sources of knowledge because of their resource limitations (Almeida, Dokko, and Rosenkopf, 2003; Almeida and Kogut, 1997).

More generally, these results suggest that the interaction among resources in a strategic network is a potentially significant source of firm performance variance. These results contribute to the literature on interfirm alliance and networks by shedding more light on how the resources jointly affect firm performance.

3.3 Individuals as sources of valuable resources

The third sub-objective of this dissertation is to contribute to an improved understanding of how the resources endowed by individuals in strategic networks affect the performance of the focal firm. This objective is empirically addressed in paper 4 and paper 5.

Paper 4 investigates how the utilization of production resources furnished by individuals affects the performance of the focal firm in the context of physical goods production. The paper builds upon notions that the recent advances in information and communication technologies (Kaplan and Haenlein, 2010; Kietzmann et al., 2011) have enabled new business models that emphasize col-

laboration between firms and individuals (Belk, 2014; Kuppaswamy and Bayus, 2018; Cheng, 2016; Arsel and Dobscha, 2011). Such business models have already revolutionized service production (Zervas et al., 2017) and digital content production (Bruns, 2008; Benkler, 2006). The paper finds that compared to using production resources furnished by firms, the use of production resources endowed by individuals provides the focal firm with multiple benefits, including fresher ideas, broader design support, and quicker delivery times. Further, the paper finds that the persistence of individual agents is explained by their participation being merely a hobby that provides significant non-monetary benefits, such as learning. These results suggest that individuals can provide production networks with production resources that yield benefits in excess of and beyond of those yielded by firms.

Paper 5 investigates the role of the design resources provided by individuals in the co-creation (Prahalad and Ramaswamy, 2004; Sanders and Stappers, 2008) of consumer apparel designs in social media (Hamalainen and Karjalainen, 2017; Kaplan and Haenlein, 2010; Kietzmann et al., 2011). Paper 5 continues the theme of paper 4 and finds that firms utilize design resources furnished by individuals to better ensure that their designs are aligned with market needs. Firms utilize such design resources by accessing them through social media. Oftentimes, the individuals providing these resources are following these firms in social media and thereby the individuals represent potential customers of the firms. Such individuals are hence in a prime position to tell the firms what the market needs and to co-create new designs with them. These results indicate that the design resources furnished by individuals can provide a firm with benefits not easily matched by those provided by the design resources rendered by firms.

Taken together, the results of paper 4 and paper 5 suggest that whether the resources in strategic networks are endowed by firms or by individuals matters for the performance of the focal firm. In particular, sourcing resources from individuals tends to be more flexible and yields more affordable resources than those from collective entities, such as firms, because individuals tend to put more weight on learning and less weight on the consumption of time than do more business-oriented collectives. In addition, individuals might have a better understanding of the market needs than firms do in some cases, especially in business-to-consumer markets. These results add to the literature on inter-firm alliances and strategic networks by contributing to an improved understanding of how the organizational form of a network node affects the value the focal firm can derive from accessing the resources localized at that network node.

3.4 Synthesis

The results of the analyses related to the individual research questions all contribute towards addressing the objective of this dissertation—to contribute to an improved understanding of how the resources of a strategic network affect the performance of the focal firm.

Taken together, the results of this dissertation suggest that the structure and resources of strategic networks are more tightly intertwined than known before. Thus, the results emphasize that the firm performance implications of resources in a strategic network should not be analyzed without a refined understanding of the larger context in which the resources are embedded. In particular, the results suggest that the relationship between a resource and the performance of the focal firm is affected (1) by the interaction between the structure and the resources (i.e., the microstructure) of the strategic network, (2) by the interaction effect the resource has with other resources in the strategic network, and (3) by the organizational forms encapsulating the resources in the strategic network. In summary, the results of this dissertation contribute to the literature on interfirm alliances and strategic networks by highlighting new sources of firm performance variance.

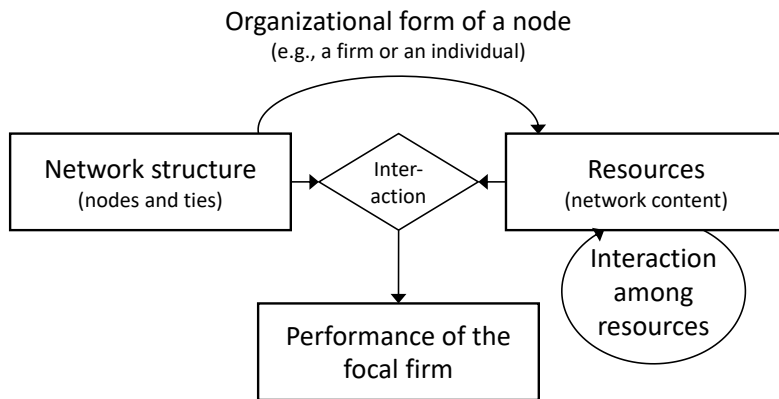


Figure 3. Integrative model of the interplay between the structure and the resources of a strategic network

The results of this dissertation can be synthesized into an integrative model of the interplay between the structure and the resources of a strategic network, as illustrated in Figure 3. In the model, the interaction between the network structure and the resources serves as the baseline case, which is the theme of the first sub-objective of this dissertation. This sub-objective is empirically addressed in paper 1 and subsequently theoretically elaborated and extended in paper 2. To more fully understand the intertwinedness of the network structure and resources, potential interactions among the resources need to be addressed. This is the topic of the second sub-objective of this dissertation. This sub-objective is empirically addressed in paper 3. Finally, in a similar vein, to even better understand the joint effect of the network structure and resources, an accounting needs to be made for the recent proliferation of individuals in strategic networks and the consequential shift from purely interfirm networks towards hybrid networks, whose nodes are not only traditional firms but also increasingly individuals. This is the topic of the third sub-objective of this dissertation. This sub-objective is empirically addressed in paper 4 and paper 5.

4. Discussion

4.1 Implications for the literature

The five papers presented in this dissertation emphasize that the firm performance implications of resources in a strategic network are affected by the intertwinedness of the structure and the resources of the network in more complicated ways than previously thought. Specifically, the results of this dissertation suggest that to more fully understand the firm performance implications of resources in a strategic network, a more refined understanding of the following three related aspects of strategic networks need to be developed through thorough analysis: (1) the interaction between the structure and the resources of the network, (2) the interactions among resources in the network, and (3) the organizational forms encapsulating resources at each node of the network.

First, the literature on interfirm alliances and strategic networks that has sought to combine the structure and the resources of strategic networks has mostly been limited to the dyadic level of analysis (as argued in detail in paper 2). These studies typically consider resource-heterogeneity of network actors only with respect to the focal firm and its immediate network partners (i.e., the focal firm's ego network) and treat the rest of the network as aggregated resources. Limited studies addressing this topic exist, but it has nevertheless been suggested that such treatment is not able to fully capture the potential performance implications arising from the resources of network partners beyond the immediate ones (Guan and Liu, 2016; Phelps et al., 2012; Gulati et al., 2011; Phelps, 2010). To shed more light on the issue, adding to the literature, the results of paper 1, paper 2, and paper 3 provide new evidence that the resources of network partners beyond the immediate ones matter for the focal firm performance. These results suggest that the overall structure and the resources within each node of a strategic network should be considered jointly when explaining the performance of an embedded firm (cf. Tasselli, Kilduff, and Menges, 2015).

Further, paper 1 and paper 2 advocate that this type of interaction between the structure and the resources of a network should be analyzed through network resource distributions, which arise when a network is viewed as consisting of interconnected nodes of resource bundles. Such a view emphasizes the resources and their levels at each node of the network and ultimately views the network as consisting of the resultant resource distributions. Paper 1 and pa-

per 3 provide empirical evidence that the shapes of these resource distributions are indeed related to firm performance, a finding that further advances the literature. While challenges related to collecting data on relationships among a large population of networks actors might have contributed to the scarcity of the studies accounting for the resource-level heterogeneity of firms and network structures beyond the dyadic level (Monaghan, Lavelle, and Gunnigle, 2017; Schilling, 2009), paper 2 argues that the shortage of studies is also due to the lack of appropriate conceptual tools for analyzing the impact of resources farther down in the network. Towards this end, the concept of *network resource distribution* is introduced in paper 2. The concept facilitates further inquiry by enabling researchers to account for the microstructure of a network. Such a network resource distribution perspective on strategic networks has the potential to open up many interesting research avenues in the future.

Second, the existing literature on interfirm alliances and strategic networks is nonconclusive in terms of whether and how the interactions among resources in a network affect the performance of the focal firm (Phelps et al., 2012; Lee et al., 2017; Hagedoorn et al., 2018, Wassmer, 2010). Consequently, our understanding of the synergies and the conflicts of resources in a network and their effects on the performance of the focal firm is narrow. Paper 3 explores this topic in the context of alliance portfolios and knowledge resources, and it finds that the performance of the focal firm is indeed affected not only by individual knowledge resources in the portfolios but also by their interaction effects. The paper finds that synergistic but distinct resources can have a joint effect on the performance of the focal firm that goes above and beyond the effect that these resources could individually exert. In the context of alliance portfolios, empirical studies capturing such a portfolio effect are especially scarce, with only a few empirical accounts (e.g., Vassolo et al., 2004; Wassmer, 2010)—thus, this result adds to the literature as such. Furthermore, this result contributes to the stream of alliance portfolio literature investigating portfolio diversity (Lee et al., 2017; Hagedoorn et al., 2018; Wuyts and Dutta, 2014; Cui and O'Connor, 2012; Goerzen, 2007) by emphasizing that firm performance implications of portfolio diversity are not only contingent on the diversity itself in its absolute sense but also on the potential synergies and conflicts among the constituents of the portfolio. On a more general level, this result highlights that the firm performance implications of resources in a network are moderated not only by the network structure but also by the interactions among the very resources in the network, theoretically extending and empirically testing existing arguments in the literature (Guan and Liu, 2016; Phelps et al., 2012; Gulati et al., 2011).

Third, the literature on interfirm alliances and strategic networks is predominantly firm-centric and has not fully accounted for the recent proliferation of individuals as integral parts of the firms' strategic networks (Belk, 2014; Kuppuswamy and Bayus, 2018; Cheng, 2016; Arsel and Dobscha, 2011). Consequently, our understanding is limited in terms of how the firm performance implications of resources in strategic networks change when the resources are contributed by individuals rather than by firms (cf. Yan and Guan, 2018). To

this end, paper 4 and paper 5 provide empirical analyses of strategic networks to which individuals provide critical production resources. The analyses reveal that such resources can have firm performance implications in excess of those rendered by firms. On a general level, such excess benefits include increased production schedule flexibility and decreased asset-specificity. More specifically, production resources contributed by individuals enable the focal firm to have goods produced and delivered at a shorter notice. Moreover, the production resources endowed by individuals are less tied to a specific use case. Instead, the use cases of such resources span from goods production to broad design support and new idea generation. Furthermore, in business-to-consumer markets, such resources can help the focal firm to increase its market orientation, because the firm's production processes are then significantly steered by potential end-customers. These results suggest that individuals can serve as a source of valuable bottleneck resources and thus contribute to our improved understanding of where valuable resources come from, an aspect of the resource-based view of the firm that has received less attention than perhaps has been warranted. More generally, and possibly more interestingly, these results indicate that the organizational form encapsulating the resources at each node of a strategic network has a bearing on how much value the focal firm can ultimately capture from the resources. Organizational forms increase in size and complexity, from an individual form towards a form comprising larger collectives, such as groups and traditional firms. These results suggest that individuals, at least during the early stages of the technology adoption lifecycle, are driven primarily by other than nonmonetary motivations, such as learning, whereas traditional firms are mainly driven by monetary-based incentives. Such discrepancy explains at least partly the observed differences in benefits accrued by the focal firm from the resources contributed by individuals and firms. These results contribute to the literature on interfirm alliances and strategic networks by suggesting that the organizational form of a network node itself is a source of firm performance variance (Guan and Liu, 2016; Phelps et al., 2012; Gulati et al., 2011; Phelps, 2010).

In addition to the primary contributions to the literature on interfirm alliances and strategic networks, the results of this dissertation have implications to the literature on co-creation (e.g., Prahalad and Ramaswamy, 2004; Sanders and Stappers, 2008) and to the emerging literatures on co-engaging production (e.g., Poesche and Kauranen, 2017; Poesche et al., 2017) and social manufacturing (e.g., Hamalainen and Karjalainen, 2017). Despite the increasingly prevalent role of social media as a connecting medium between firms and individuals, the literature on co-creation includes limited empirical studies on how firms use social media to co-create with individuals (Kietzmann et al., 2011; Kaplan and Haenlein, 2010; Cheng, 2016). Paper 5 contributes towards closing this gap in the literature by highlighting how some firms use social media to access design resources endowed by individuals to co-create products that are better aligned with market needs than they would be if the designs were in-house only. The emerging literatures on co-engaging production and social manufacturing are building a body of literature on the firm-individual

collaboration, that is—on the involvement of individuals in the firm’s production or manufacturing processes. Paper 4 and paper 5 contribute to this body of literature by showcasing how individuals can collaborate with firms in production and design processes, respectively.

Finally, adding to these theoretical contributions, the results of this dissertation provide a methodological contribution. To facilitate studying strategic networks through resource distributions—for example, by analyzing the distributions’ shapes and correlating them with the focal firm performance—paper 2 proposes a novel concept of *network research distribution* that enables the operationalization and subsequent quantitative testing of the firm performance implications of such distributions. The proposed concept is general in the sense that existing empirical studies combining the structure and the content of strategic networks can be deduced from it, as illustrated in detail in paper 2.

4.2 Implications for the practice

The results of this dissertation suggest that managers should focus not only on the immediate partners but also on the partners beyond the immediate ones, because the implications of the partner resources scattered throughout the network, along with the structure of the network, will have a ripple effect on the focal firm. Thus, managers are prompted to expand their thinking from dyadic partnerships to sequential partnering in which firms accrue value not only from the immediate partners but also from the partners farther down in the network through network synergies (cf. Hernandez and Shaver, 2019). Additionally, managers are prompted to consider the organizational forms of the network partners. Especially, the choice between whether to source resources from traditional firms or individuals seems to have significant firm performance implications (cf. Van de Vrande, 2013). In particular, the results of this dissertation suggest that individuals collaborating with firms with regards to new technologies are mainly driven by nonmonetary motivations, such as learning, which opens significant opportunities for firms to increase their performance.

5. Limitations

As is the case with all studies, this dissertation is subject to several limitations.

First, the empirical analyses investigating the firm performance effects of resources use a rather narrow scope of resources. The empirical analyses addressing the interaction between the network structure and resources only consider knowledge resources, omitting other types of resources. Similarly, the empirical analyses investigating the interaction among resources exclusively focus on knowledge resources. On the other hand, the empirical analyses examining the resources provided by individuals only scrutinize production resources, leaving out other possible resource endowments of individuals. Such a narrow resource type coverage throughout the empirical analyses might limit the generalizability of the results and introduce omitted variable bias. To address these concerns, further research should seek to replicate the results of this dissertation with a wider set of resources.

Second, the empirical analyses build upon cross-sectional and limitedly longitudinal data sets. At best, the study subjects were followed for a maximum of two years. Panel data covering a longer period of time, and more subjects, would alleviate concerns related to reverse-causality and unobserved heterogeneity and be conducive to more accurate and generalizable estimates. In particular, this is a potential concern with the analyses focusing on the firm performance implications of resources contributed by individuals. These studies are conducted in the context of emerging technologies. The samples might consequently be biased by self-selection; that is, individuals who want to learn new technologies are overrepresented in the sample. Further, to increase the generalizability of the results, research should replicate the analyses in industries with more mature technologies.

Despite these potential shortcomings, nevertheless, the results of this dissertation highlight interesting new sources of firm performance variance that are likely to be at least valid in sample correlates with the considered factors and thus hopefully serve as an impetus for further research on this important topic.

6. Further research

This dissertation paves the way for interesting new research avenues.

First, this dissertation calls for more research investigating the microstructure and resource distributions of interfirm networks. Future research on networks is encouraged to consider what resources there are in a network, where these resources are positioned in the network, and what the levels of these resources are at each node of the network. After constructing such a view, the resource distributions cutting across the networks can be established and their shapes investigated—and correlated—with various firm performance measures. How do the shapes of network resource distributions affect the focal firm performance? How do relational factors, such as competitive tensions and cooperative arrangements among partners (Asgari et al., 2018), tie longevity (Baum, McEvily, and Rowley, 2012), trust (Moldoveanu and Baum 2011; Chiambaretto, Masse, and Mirc, 2019), and resource-level fit among partners (Baum, Cowan, and Jonard, 2010) affect the optimal resource distribution shapes? This dissertation provides only limited evidence on the relationship between the shapes of such distributions and the focal firm performance. A more comprehensive investigation of the topic and surrounding factors that potentially affect the optimal shapes of resource distributions are left for future research.

Second, one focus point of this dissertation was the interaction among resources in a network. Relatedly, future research could seek to address the resource interactions not only on the resource-level but also on the level of network resource distributions. How do network resource distributions interact with one another to affect the focal firm performance? Such research on network resource distributions has the potential to significantly increase our understanding of the firm performance implications of embeddedness by advancing the integration between the resource-based view and the social network perspective.

Third, recent research has started to investigate the firm's exploratory and exploitative innovation output on the inventor level (e.g., Yan and Guan, 2018; Grigoriou and Rothaermel, 2017). These studies suggest that unpacking firm-level aggregate measures into more fine-grained attributes expose strategically important nuances not observable otherwise. These notions further advance the argument that future studies should delve increasingly into the microstructure of strategic networks to more fully understand the firms performance implications of embeddedness in such a context (cf. Tasselli et al., 2015). The

network resource distribution concept proposed in this dissertation could also be applied at the employee-level to advance these recent efforts. Future studies could seek to utilize the concept in multilevel studies, investigating how resource distributions interact across levels (cf. Paruchuri, Goossen, and Phelps, 2019).

Fourth, further research could add a time-dimension into the study and investigate the results of this dissertation in the context of network evolution. For example, how do the optimal shapes of network resource distributions change as networks evolve (cf. Chiambaretto and Wassmer, 2019)?

Fifth, this dissertation indicated that the organizational form encapsulating the resources at network nodes has a bearing on the extent of value the focal firm can extract from the resources. Future research could expand this line of study by investing a plethora of other organizational forms and how they moderate the relationship between a valuable resource and the performance of the focal firm. In particular, extending from nonmonetary to monetary ones, the motivations of organizations to engage in strategic networks seem to vary across different organizational forms, thereby skewing traditional economic considerations.

Furthermore, future research could examine the impact of resources rendered by individuals in various collaborative contexts to unpack their synergies and differences. One interesting contextual dimension would be the capital intensity of production. The production of physical goods is typically more capital intensive than the production of open source software, for example. How does the capital intensity of production affect individual-firm collaboration and the value firms can derive from the resources endowed by individuals? As a point of similarity between these production contexts, paper 4 of this dissertation indicates that individuals receive significant nonmonetary private benefits from participating in the individual-firm collaborative production of physical goods—as is the case with the individual-firm collaborative production of open source software (von Hippel and von Krogh, 2003).

Finally, this dissertation chose to make its primary contributions to the discussion on interfirm alliances and strategic networks (Gulati, 1998; Dyer and Singh, 1998; Gulati et al., 2000; Wassmer, 2010). However, as pointed out earlier, there are other thematically related discussions that explore interfirm networks from a different perspective, including the discussions on ecosystems (Jacobides, Cennamo, and Gawer, 2018; Autio and Thomas, 2014; Adner and Kapoor, 2010; Kapor and Lee, 2013; Rajala et al., 2018; Tsujimoto et al., 2018) and supply chain networks (Lambert and Enz, 2017; Lambert and Cooper, 2000). Combining these perspectives into a comprehensive theory of strategic networks has the potential to unearth new insights into the firm performance implications of embeddedness in strategic networks. For example, drawing from the ecosystems literature, how do the tightly coupled interfirm linkages with resource-level non-generic complementaries (Jacobides et al., 2018) affect the optimal shapes of network resource distributions in strategic networks? The integration of these perspectives provides a fascinating avenue for further research.

7. Conclusion

This dissertation shows that the resources of a strategic network affect the performance of the focal firm in more complex ways than the previous research indicates and that neither the structure nor the resources of a strategic network should be examined in isolation of the other when the focal firm performance is analyzed. In particular, this dissertation posits that the firm performance implications of the resources in a strategic network are affected by the interaction between the structure and the resources (i.e., the microstructure) of the network, by the interactions among the resources, and by the organizational forms encapsulating the resources in the network. By elaborating on the intertwinedness of the network structure and resources, this dissertation contributes to the literature on interfirm alliances and strategic networks by theoretically extending and empirically testing its key concepts.

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