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A systematic literature review on managing open innovation projects

International business
Master's thesis

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Innovation is a requisite in today's dynamic business environment. Particularly open innovation, which refers to utilizing external knowledge flows in the innovation activities, is a current topic for researchers, policymakers and business practitioners. To contribute to this research stream, the thesis examines the management of open innovation projects through a systematic literature review. The theoretical basis for the review consists of literature on innovation and open innovation. The review was conducted as a convergent qualitative synthesis of 98 scientific articles. The results revealed 11 key issues and considerations for managing the key issues, which were synthesized into a novel framework. Through these findings, the thesis contributes to research on open innovation and open innovation projects.

Key words: open innovation, open innovation project

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Innovaatio ovat välttämätöntä nykypäivän dynaamisessa liiketoimintaympäristössä. Erityisesti avoin innovaatio, joka viittaa ulkoisten tietovirtojen hyödyntämiseen innovaatiotoiminnassa, on ajankohtainen aihe tutkijoille, päättäjille ja liiketoiminnan harjoittajille. Tämän aiheen tutkimuksen edistämiseksi tutkielmassa tarkastellaan avointen innovaatioprojektien johtamista systemaattisen kirjallisuuskatsauksen kautta. Kirjallisuuskatsauksen teoreettinen tausta koostuu innovaatiota ja avointa innovaatiota käsittelevästä kirjallisuudesta. Kirjallisuuskatsaus toteutettiin 98 tieteellisen artikkelin kvalitatiivisena synteesinä. Tuloksista nousi 11 avainkysymystä ja niiden johtamisessa huomioon otettavia asioita, joista luotiin uusi viitekehys. Näiden tulosten kautta tutkielma edistää avoimen innovaation ja avointen innovaatioprojektien tutkimusta.

Avainsanat: avoin innovaatio, avoin innovaatioprojekti

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1 Introduction

1.1 Contemporary innovation arena

The business landscape is more complex, rapidly changing and unpredictable than ever before (Michaels & Murpy 2021, 65; Reeves et al. 2016, 48). To survive in such a dynamic business environment, innovation is needed (Dereli 2015, 1366; Urbancova 2013, 93–94). Companies must introduce new products and services and ways to produce them (Dereli 2014, 1366). Innovation is a key factor determining an organization's competitive advantage over its rivals (Dereli 2014, 1365; Urbancova 2013, 93–94) and based on over 20 years of research, there is a clear relationship between innovation and financial performance (Rousseau et al. 2016, 11, 14). Innovation can provide a solution for the dilemmatic challenge of combining both business and societal goals (McGahan et al. 2021, 50). The present century has been said to be "based on knowledge, information and innovative economy" (Urbancova 2013, 82), making innovation and creativity "the main capital of companies" (Dereli 2015, 1366).

Nonetheless, innovation does not occur automatically. The activities required for innovation must be managed effectively (Bessant & Tidd 2015, 21; Dereli 2015, 1370). A successful innovation process requires leadership, a clear direction and a shared vision. Sufficient resources must be committed, and there is a need for an organizational climate and structure that encourages and enables the process to occur, balancing flexibility and control. Communication is another key factor in innovation management. Moreover, it is not enough to consider issues within an organization – linkages to external parties are increasingly important in today's innovation arena. (Bessant & Tidd 2015, 2324.)

While each of these factors is critical, the role of external parties in the innovation process has attracted much attention in academia, practice and policy in recent years (Bogers et al. 2018, 5). Utilizing external sources of innovation has clear benefits – it implies accessing innovations or capabilities required for innovations that do not exist within the focal company (West & Bogers 2014, 815). At the core of innovation is knowledge as innovations are essentially recombinations of it. Such knowledge can be searched within the company borders but combining internal and external search efforts has been evidenced to be beneficial. Utilizing the knowledge of for example suppliers, customers, competitors and research institutions has been found to positively contribute to the rate

of developing new products, quality of new products, problem solving, and the likelihood of breakthrough innovations. (Ehls et al. 2021, 405–406). This allows the innovation process to become distributed and not to be restricted to occur within the boundaries of one company (Bogers & West 2012, 61).

Given the crucial yet so challenging nature of interorganizational knowledge flows and innovation, several research streams have emerged to study the topic (Ehls et al. 2021, 406). Examples of such research streams include knowledge management (see, for example, Nonaka 1994), crowdsourcing (see, for example, Brabham 2008) and open innovation (see, for example, Chesbrough 2003). Common to all the approaches is the emphasis on managing the ever-important external contributions to innovation (Ehls et al. 2021, 406).

Taking a more detailed view of open innovation, the concept has become popular over the past 20 years. It was first discussed by Chesbrough in his book "Open Innovation: The new imperative for creating and profiting from technology" in 2003 (Chesbrough 2003, xxiv; Bigliardi et al. 2021, 1130; Bogers et al. 2018, 4). According to the original definition, open innovation refers to "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough 2003, xxiv). Since the introduction of the initial definition, open innovation has gained attention in an increasing manner and become much cited (Bigliardi et al. 2021, 1130–1131; Bogers et al. 2018, 6). Today, the development path of open innovation is leading towards a concept that is increasingly far-reaching, collaborative and involving a diverse set of players. The concept was initially emphasizing knowledge flows between two companies, but now it encompasses the collaboration of various participants throughout the innovation process. (Chesbrough 2017, 37–38.)

Despite the popularity of open innovation, there is room for further research. Most open innovation research has addressed the topic on the firm-level (Bagherzadeh et al. 2021, 301; Bogers et al. 2017, 11; Hossain et al. 2016, 9; Markovic et al. 2021, 159). However, open innovation is a multilevel concept, and it is thus critical to analyze the different levels to truly understand the phenomenon (Bogers et al. 2017, 10). One level which requires further research on open innovation is the project-level (Bagherzadeh et al. 2021, 301; Markovic et al. 2021, 159). In addition to the relative lack of research on open

innovation projects, there are a multitude of reasons for its importance. The innovation activities undertaken in organizations are often conducted in the form of projects, making them critical for an organization's innovation performance. (Markovic et al. 2021, 159–160.) Innovation projects may have very differing attributes in terms of complexity, uncertainty, and knowledge requirements (Bagherzadeh et al. 2021, 301; Markovic et al. 2021, 160). Various critical decisions that relate to open innovation are therefore made at the level of projects. Aggregating project level data to the level of the firm may lead to losing essential evidence. Accordingly, it is necessary to examine open innovation projects to truly understand the management of open innovation. (Markovic et al. 2021, 159–160). Having now established the value of researching open innovation projects, Section 1.2 discusses the research question of the thesis in detail.

1.2 Research question and contribution

To contribute to fulfilling the above-mentioned research gap, this thesis focuses on examining the management of open innovation projects. Therefore, the research question of the thesis is: *How are open innovation projects managed?*

To be able to address this question, it is divided into two sub-research questions:

1. What are the key issues in open innovation projects?
2. What considerations are there for managing the key issues in open innovation projects?

The first sub-question concentrates on identifying the key issues in open innovation projects. In this thesis the term *key issues* is utilized to refer to the issues, matters and aspects that are significant in such settings. Based on the findings on the first question, the second research question emphasizes what considerations exist to address and manage the identified key issues. To truly examine how open innovation projects are managed, it is not enough to understand what must be considered – instead, it is essential to also discuss how to consider.

The main research question and its sub-questions are answered through a systematic literature review. A systematic literature review establishes the knowledge frontiers of a specific topic (Fisch & Block 2018, 103), in this case open innovation project management. It is a suitable approach since the outcomes of the review contribute to both

theory and practice. There is a need to better understand open innovation projects in addition to the more commonly researched organizational level of open innovation. A systematic literature review is apt for advancing the research frontier for several reasons. The goal of a systematic review is to locate existing research on a topic in a systematic way, and then analyze and synthesize the findings (Denyer & Tranfield 2009, 671; Fisch & Block 2018, 103–104). Hence, it can be established what is already known and what requires further inquiry (Denyer & Tranfield 2009, 671), making a systematic review appropriate for developing theory and advancing understanding about open innovation project management (cf. Webster & Watson 2002, xiii)

Regarding the practical contribution, the thesis highlights considerations that are important for the management of open innovation projects based on years of research in different contexts. Without a systematic literature review, it would be challenging to obtain such an extensive understanding on the phenomenon. Consequently, the findings and conclusions of the thesis have managerial implications. Innovation management – and particularly open innovation management – is a cornerstone of successful business in today's fast-changing business landscape.

To conclude Chapter 1, this thesis reviews existing knowledge on open innovation project management. Chapter 2 presents a concise literature review that sets the stage for the research.

2 Innovation, innovation projects and their management

Innovation is a key ingredient in organizational survival. However, the benefits derived from innovation depend on the ability of organizations to manage openness to external knowledge. To examine the current knowledge on this topic, the theoretical basis of the thesis encompasses literature related to innovation and open innovation. A short section on projects as a setting for innovation is also included. These research streams are examined to construct a basis for conducting the systematic literature review on open innovation project management.

2.1 Defining innovation

One of the first and most influential definitions of innovation was suggested by Schumpeter in his book "Theory of Economic Development: An inquiry into profits, capital, credit, interest rate and the economic cycle" in 1934. According to Schumpeter's definition, an innovation is a new combination of resources. It can consist of launching a new product, creating a new process, exploring a new market, obtaining a new input source, or constructing a new organization. (Lazzarotti et al. 2011, 123[1].)

Although the definition proposed by Schumpeter has had a significant influence on terminology, the definition of innovation has evolved over the years and various versions exist today (Hidalgo & Albors, 2008, 114–115). Some scholars view innovation as an outcome, some consider it as a process, and others perceive it as both (Dogson 2018, 8; Gupta et al. 2007, Kahn 2018, 457; Quintane et al. 2011, 929). Figure 1 summarizes the outcome and process views on innovation.

[1] Schumpeter, Joseph A. (1934) *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Harvard University Press, Cambridge, Massachusetts.

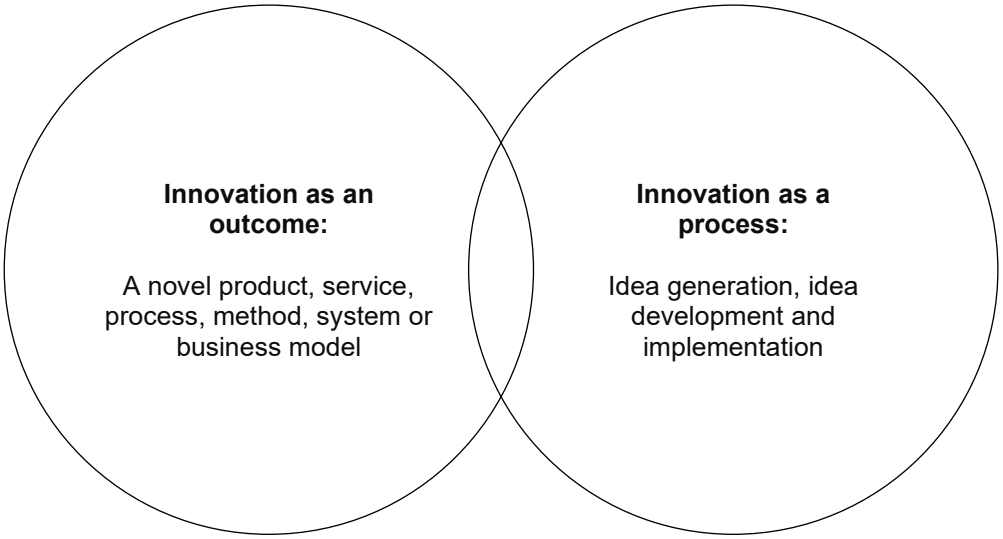

Figure 1 Two views on the definition of innovation

From the outcome perspective innovation has been defined as, for example, "an invention which has reached market introduction in the case of a new product, or first use in a production process, in the case of a process innovation" (Utterback 1971, 77) and "new products or services, new process technologies, new organizational structures or administrative systems, or new plans or programs" (Damanpour 1996, 694). As these definitions imply, innovation as an outcome is inclusive. It can be about products, services, processes, methods, systems or business models, among other possibilities (see, for example, Baregheh et al. 2009, 1331; Quintane et al. 2009, 931; Kahn 2018, 454).

In terms of a process or activities, innovation can be viewed as "the generation, acceptance and implementation of new ideas, processes, products or services" (Thompson 1965, 2) or, as remarked more recently, "the multi-stage process whereby organizations transform ideas into new/improved products, service or processes" (Baregheh et al. 2009, 1334). These definitions contain the numerous types of innovation outcomes specified above. Nevertheless, the definitions also hold the notion of a process. The process, in turn, can be classified in several ways. To demonstrate some examples found in the innovation management literature, the innovation process can be viewed as consisting of:

- invention, development and implementation (Garud et al. 2013, 775)
- idea generation, conversion (consisting of selection and development) and diffusion (Hansen & Birkinshaw 2007, 3)

- generation and adoption (Gupta 2018, 406).

Despite some divergence, the views of the innovation process are similar and involve the key steps of idea generation, idea development, and implementation.

Since the research approach utilized in this thesis is a systematic literature review, all these reviewed definitions are acknowledged. The nature of a systematic review implies that a variety of views on innovation are incorporated and synthesized. There is, however, one central criterion that is respected: novelty. Novelty or newness has been found to be at the core of the various definitions of innovation (Quintane et al. 2009, 931; Singh & Aggarwal 2021, 12). Innovation must be something new or leading to something new. It does not have to be new to the humankind but instead new according to the involved individuals' perceptions (Quintane et al. 2009, 931, 934). Additionally, the novelty aspect does not need to imply radical newness – incremental innovations are similarly important (Kahn 2018, 453). Therefore, the definition of innovation utilized in the thesis covers all the interpretations discussed in this section as long as novelty is present.

2.2 From closed to open innovation

While the above-described innovation activities have traditionally been seen as occurring within the borders of a single organization, that is no longer the case. Instead, external sources of knowledge are crucial for the innovation process. This raises the need to examine the theoretical lens of opening the innovation process to external parties. To complement the first part of this literature review, a discussion on the concept of open innovation is presented here.

Open innovation was first discussed by Chesbrough (Bigliardi et al. 2021, 1130; Bogers et al. 2018, 4). There are, however, even earlier references to similar matters in the innovation arena, although the concept open innovation was coined first in 2003 (Bigliardi et al. 2021, 1130–1131). Since the introduction of the initial definition, open innovation has gained attention in an increasing manner and became much cited (Bigliardi et al. 2021, 1130–1131; Bogers et al. 2018, 6). Its influence has extended from academia to practice and policy (Bogers et al. 2018, 5).

In essence, the concept of open innovation implies that all the knowledge that can be utilized for innovation is not necessarily present within the boundaries of one organization. Instead, such knowledge is dispersed across the economy. (Chesbrough &

Bogers 2014, 16.) While innovation can be thought as the outcome or process of internal innovation activities to generate and develop ideas – and viewed as closed innovation – open innovation accentuates the importance of opening the borders of the company to obtain and exploit external knowledge flows (Chesbrough 2017, 36). Moreover, open innovation is not only about the inflow of knowledge, but also about the outflow. The emphasis is on managing these flows of knowledge throughout the various innovation activities. (Chesbrough & Bogers 2014, 17.)

Another way to contrast closed and open innovation is to consider them as the opposite extremes of a continuum rather than as mutually exclusive alternatives. According to this model, two criteria for open innovation consist of the involvement of knowledge exchange and business model. There should be knowledge sharing as a part of the business model to distinguish open innovation from closed innovation. The continuum is determined by three variables: the number of partners, the diversity of partners, and the diversity of the phases during the innovation process. The more partners there are, the more diverse the partners are, and the more they are involved in different phases of the innovation process, the more open the innovation is. (Tynnhammar 2017, 5–7.) Consequently, the concept of open innovation accommodates a variety of approaches to innovation but there are also some fundamental criteria to be fulfilled.

Another central issue in open innovation is dividing it into separate processes. The general divide has been done between outside-in (inbound) and inside-out (outbound) process (Dahlander & Gann 2010, 700; Enkel et al. 2009, 312–313). The first process type refers to knowledge flows that come from the outside. Consequently, the focal company's internal knowledge base is amended with externally sourced knowledge. (Enkel et al. 2009, 312.) The inbound process can be further divided into two: sourcing and acquiring. Sourcing knowledge and ideas from a variety of potential parties does not involve money but instead indirect benefits, while acquiring means that the exchange of knowledge includes money. (Dahlander & Gann 2010, 706.) The inside-out (outbound) process is the opposite of outside-in (inbound) open innovation. The former entails selling or letting knowledge flows go beyond the borders of the focal company. (Enkel et al. 2009, 312–313.) Its two sub-processes are called revealing and selling. As the concepts imply, revealing knowledge occurs without money; rather, indirect benefits are searched for. Selling is about selling or out-licensing technology or inventions. (Dahlander & Gann 2010, 706.) All in all, the distinctions between inbound and outbound as well as pecuniary

and non-pecuniary create four distinctive types of open innovation. Nevertheless, research has also recognized the concept of a coupled process. It incorporates both inbound and outbound processes. External knowledge is obtained, and internal knowledge is allowed to flow outside (Enkel et al. 2009, 312–313.)

Research on the coupled process has refined and extended the concept of open innovation towards a potentially more interactive approach. From this perspective, coupled open innovation has various facets. Firstly, the external actors may be about firms, other organizations or individuals. Secondly, coupled open innovation can be dyadic (two partners), within a network (various partners) or within a community (a new entity). Thirdly, it can stem from the strategic or employee level. Fourthly and lastly, coupled open innovation can be bidirectional or interactive. The former and the more traditional view is about knowledge sharing to create innovations within a single organization, while the latter is about creating innovations jointly outside any specific organization, implying that the knowledge sharing does not merely supplement internal innovation processes. (Piller & West 2014, 37–39.)

As has now been emphasized, open innovation focuses on the inflows and outflows of knowledge with a variety of partners. According to the taxonomy compiled by Recalde et al. (2022), open innovation stakeholders can be divided into "[b]usiness partners", "[s]cientific partners and knowledge agents" and "[i]nstitutions and civil society partners". The first category contains, for example, competitors, suppliers, consultants, clients and users. Stakeholders such as universities, incubators and innovation and research centers are included in the second category. Lastly, the third category comprises of foundations, associations and governmental agencies, among others. (Recalde et al. 2022, 72.)

What can be concluded from this discussion is the growing role of external knowledge in innovation. It has firstly attracted attention from a rather unsystematized perspective, then been accepted as a proper concept, and finally developed from a flow of knowledge between two organizations to the wider view of a coupled innovation process in which a variety of parties participate in. While open innovation may appear distinct from projects at this stage, there are linkages that tie the two topics together.

2.3 Projects as a setting for innovation

A project can be defined as "a temporary endeavor undertaken to create a unique product, service or result" (Project Management Institute 2021, 4), and this definition has been widely utilized (see, for example, Boscherini et al. 2010, 1071; Yordanova 2017, 297). Although project management and innovation management are two separate research streams, the definition of a project has similarities with the various definitions of innovation. This indicates that a relationship exists between the two concepts and their management. The links and divergence between innovation management and project management are exemplified in Figure 2 and explained next.

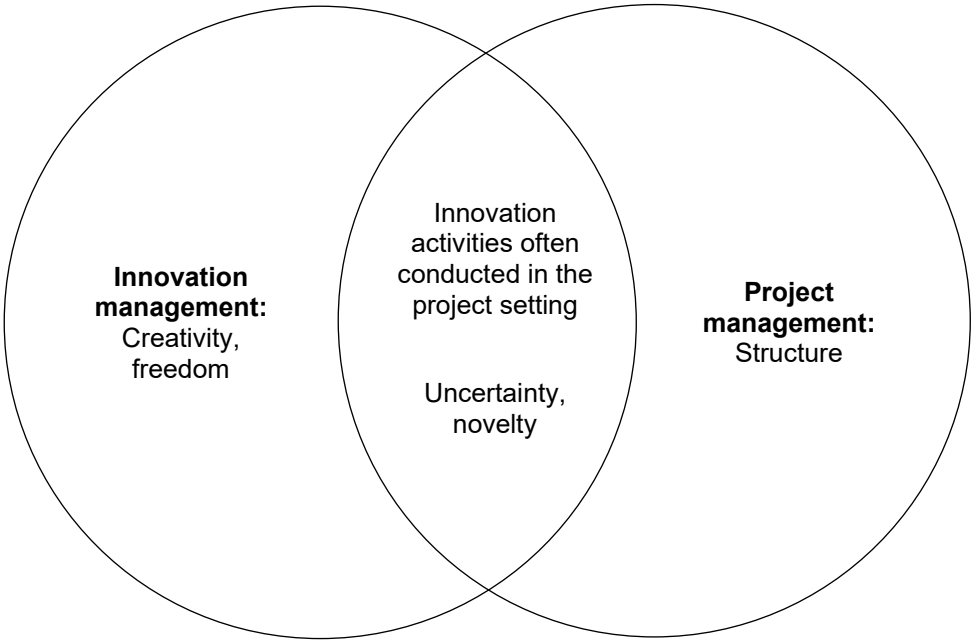

Figure 2 Linking innovation management and project management

To return to the definition of a project, its central features are temporariness and uniqueness. These two features indicate the suitability of projects for conducting innovation activities and, indeed, it has been recognized that projects are a much-used setting for innovation (Midler et al. 2016, 3). To go through the innovation process from idea to a product, service, process or other outcome, projects are needed (Kerzner 2019, 2). There are also commonalities in the management of projects and innovation:

uncertainty and newness (Davies et al. 2018, 966). All in all, a link between projects and innovation exists.

Nevertheless, not every project is concerned with innovation. This leads to the argument to distinguish conventional projects from projects aimed for innovation. Project management is generally characterized with structure and coordination, but innovation demands creative chaos and freedom (Kerzner 2019, 2). It could be assumed that these features must be balanced in innovation projects, whereas in more traditional projects with less of an innovation focus they may be a smaller issue.

While this contemplation has focused on innovation and innovation management as a general phenomenon, it arguably applies to open innovation. Regardless of whether the innovative activities are conducted in a closed manner within a single organization or in an open manner across organizational borders, projects function as a setting for them.

Having emphasized the importance of projects for both closed and open innovation as well as the differences between traditional projects and innovation projects, two additional definitions shall be presented to provide clarity. First of them is the definition of an innovation project, which may be expressed as "a temporary entity comprising a set of interrelated innovation-oriented tasks purposefully planned to solve a particular innovation problem" (Barbic et al. 2021, 175[2]). This definition has been later built on by combining it with the concept of open innovation, and the result is a definition for an open innovation project: "a temporary entity comprising a set of purposively planned and managed knowledge flows between organizational representatives to solve a particular innovation problem" (Barbic et al. 2021, 175). These two definitions contribute to understanding the attributes and elements of innovation projects and open innovation projects.

2.4 Theoretical framework

To create a connected whole of the preceding elements and form the basis of the systematic review, it is necessary to synthesize the theoretical discussion into a single framework. Figure 3 presents this framework.

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[2] Markovic, Stefa – Bagherzadeh, Mehdi – Vanhaverbeke, Wim – Bogers, Marcel (2019) Managing open innovation in business-to-business relationships: A project-level approach. *Industrial Marketing Management*. A call for papers.

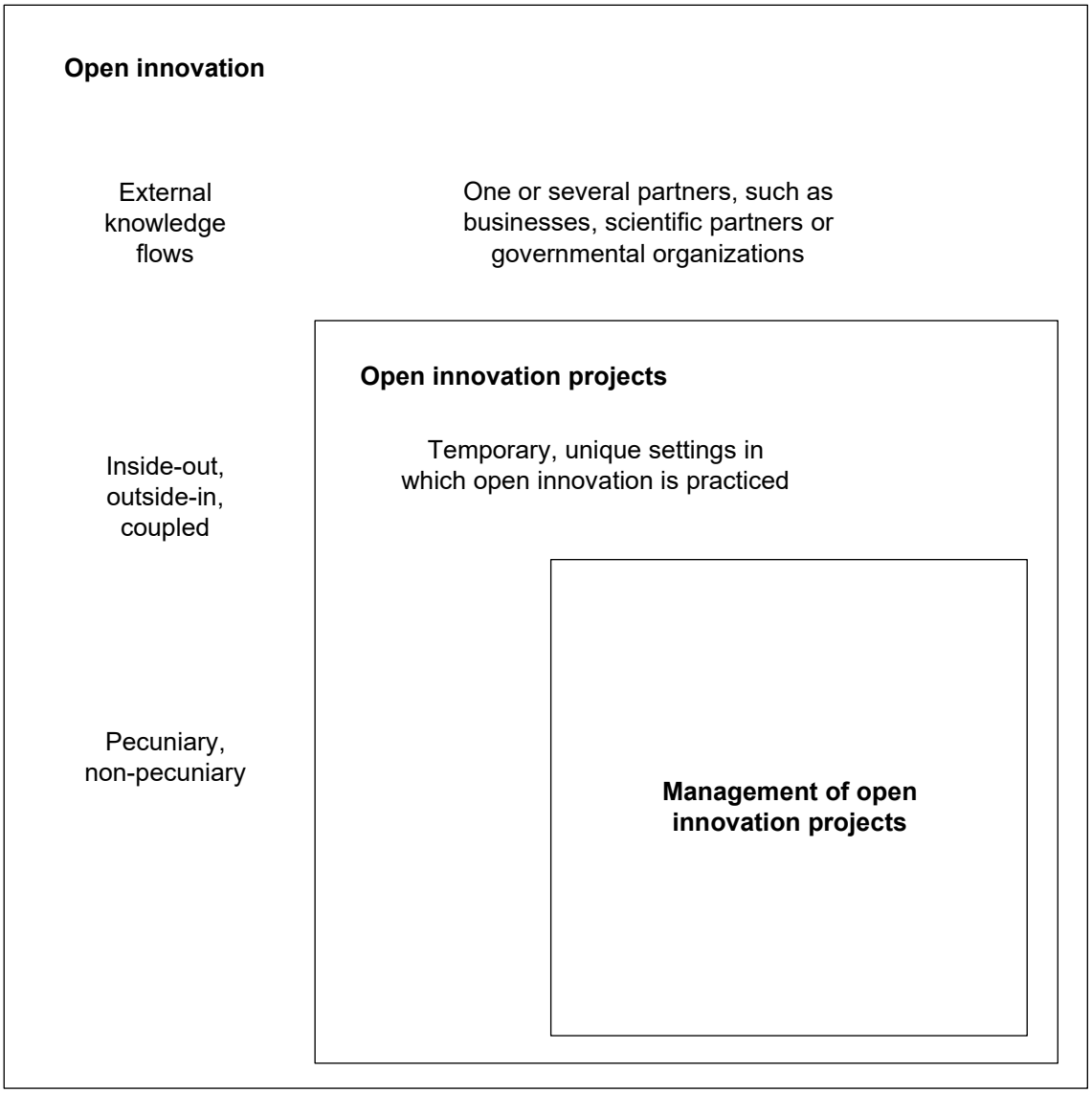

Figure 3 Initial theoretical framework enabling data collection and analysis

The outermost element of the framework is open innovation. It refers to utilizing external knowledge flows in one or several stages of the innovation process. Open innovation and, hence, the knowledge flows can be outside-in or inside-out. Open innovation can also be a coupled process in which knowledge flows move both ways. These knowledge flows can occur in a pecuniary or non-pecuniary way, between one or several partners. The partners may comprise of businesses, scientific partners, institutions, and the government. Open innovation is a continuum: the number and diversity of partners as well as the diversity of innovation process stages determine openness.

The middle element of the framework is open innovation projects. Projects can function as the setting for open innovation and most innovation activities occur within projects, making the two highly interconnected. However, there is a distinction between traditional projects and (open) innovation projects due to the creativity-structure juxtaposition.

This leads to the third and innermost element of the framework, which is the core of the thesis. Innovation projects must be managed, but how? Traditional project management approaches may not work in the context of innovation. Since today's innovation arena is all about open innovation, an even more central question concerns the management of open innovation projects and not any type of innovation project. Examining that topic through a systematic literature review is the core of the thesis. Management can be defined in several ways, but the perspective adopted in this research emerges from the findings of the review.

The theoretical framework comprising of these three explained elements functions as the basis for conducting the systematic literature review on open innovation project management. Having examined the background for the phenomenon, it is possible to scrutinize and synthesize the knowledge that exists on open innovation project management. Chapter 3 presents the methodological choices made to achieve that.

3 Research design

The research approach chosen for the thesis is a systematic literature review. This chapter begins by discussing the general features of such approach, why it is suitable for the research problem of this thesis and how the approach is utilized. Next, the data collection and analysis procedures from creating the research question to synthesizing and introducing the findings are explained and justified in detail. Lastly, the quality of the research is evaluated from the perspective of trustworthiness.

3.1 Research approach

A systematic literature review is fundamentally a map of knowledge about literature that exists on a specific topic (Fisch & Block 2018, 103). Since the management of open innovation projects requires further scholarly attention, a systematic literature review has a crucial role in advancing the research stream. It can be utilized to summarize and interpret a significant amount of information to arrive at conclusions about what is known and what requires further research (Fisch & Block 2018, 103–105; Pittaway 2008, 216). Thus, by conducting a systematic literature review on the management of open innovation projects, it is made more easily available for common knowledge what has already been investigated and what topics should the attention be directed towards next. The goal is not only to descriptively explain what topics and studies exist, but instead analyze and synthesize that information. Implications, research gaps and future research avenues must be outlined to facilitate further academic advancement on the topic of open innovation projects. A key question to answer is: "What do we learn from this summary?" (Fisch & Block 2018, 105.) A systematic review should not be confused with a literature review in the concept's traditional meaning (Denyer & Tranfield 2009, 671). Rather, a systematic review can be viewed as "a self-contained research project" (Denyer & Tranfield 2009, 671) that is an integral part or the sole ingredient of a research (Booth et al. 2012, 4). What distinguishes a systematic review from any literature review is the explicit, systematic principles implemented in the research process (Denyer & Tranfield 2009, 671). This thesis is an example of these features since the systematic literature review is the main ingredient and it was conducted in a systematic, transparent manner.

Such systematic approach to reviewing existing knowledge is a great way to advance a research field as implied, and it is also suitable for developing practical recommendations

and informing future policies (Denyer & Tranfield 2009, 673; Pittaway 2008, 216). The current state of living is characterized by the overload of information, for which a systematic review may provide a solution (Snyder 2019, 333). A systematic literature review can be utilized to place individual works into a larger context to come to a deeper understanding on a specific topic. That enables solving conflicts, preventing duplication and demonstrating the way forward. (Booth et al. 2012, 6–7.) While the importance of this research has been emphasized in the light of the academic field, it has implications for practice, too. The results of the thesis may provide a way for the managers and participants of open innovation projects to advance and facilitate the projects. The thesis outlines what the key issues are – what issues and matters the focus should be directed towards – and how to address and manage them. The results are based on a large amount of evidence, making this research a synthesis of what is currently known.

Given these considerations, the decision to conduct the systematic literature review as a mixed studies review was made. A mixed studies review encompasses research conducted in a qualitative, quantitative and mixed-methods manner (Efron & Ravid 2019, 195). It allows for a better understanding of the complexities of a phenomenon (Pluye & Hong 2014, 36) and contributes to the usefulness of the results (Sandelowski et al. 2006, 36). It was considered important for the thesis to achieve these outcomes, which made a mixed studies review a compelling choice. A mixed studies review can be conducted in several ways, depending on the choices related to, for example, emphasis as well as type and degree of integration. In this thesis the convergent synthesis method was adopted, more specifically convergent qualitative synthesis (cf. Efron & Ravid 2019, 196, 200). The features of convergent qualitative synthesis are displayed in Figure 4.

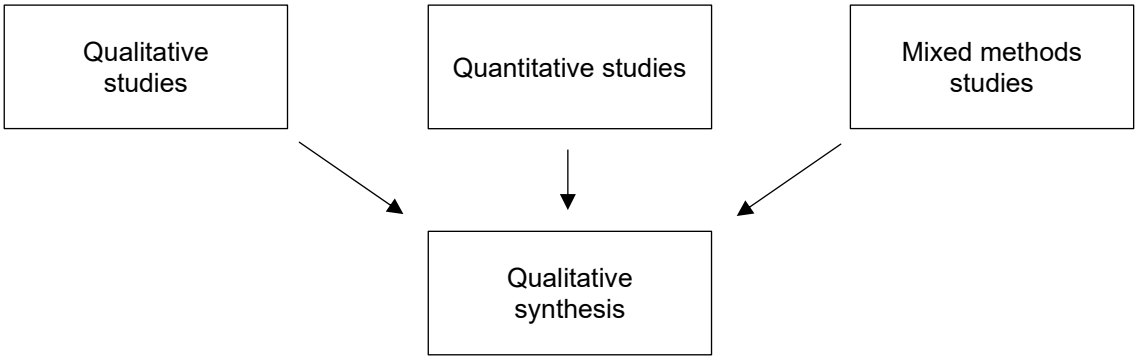

Figure 4 Convergent qualitative synthesis (cf. Efron & Ravid 2019, 199)

In convergent qualitative synthesis, the studies included in the review are not discriminated based on the method. Instead, the emphasis is on the findings. (Efron & Ravid 2019, 196, 200.) This signifies that the findings of qualitative, quantitative and mixed method studies are synthesized in a qualitative way with a focus on "themes, configurations, theories, concepts, and patterns" (Pluye & Hong 2006, 38). Since the main research question begins with "how" and the sub-questions with "what", a convergent qualitative synthesis is appropriate for answering them (cf. Pluye & Hong 2006, 38).

To achieve all that has been emphasized in this section, the various principles characterizing a well-executed systematic review were respected. There must be *focus* on a specific research topic. That topic should be approached through an extensive *coverage* of the theme, even across research fields. No discrimination between publication types should be practiced, implying *equality*. The principles of *transparency* about the research methods and *clarity* about the steps in the research process are to be followed and explained to the reader of the review. In the end, the goal is *integration* of research to bring together scholars, policymakers and practitioners. *Accessibility*, making knowledge more easily available, and *synthesis*, comparing and contrasting evidence to arrive at conclusions, enable that to happen. (Pittaway 2008, 217.) These principles were followed during the research process and are therefore discussed throughout the chapter when the different methodological choices are explained.

The systematic review process can be viewed as consisting of various separate steps. According to Denyer and Tranfield (2009, 681–686), the steps comprise of

- developing the research question

- identifying research
- choosing and appraising studies
- analyzing and synthesizing the studies
- presenting and utilizing the results.

These five steps were taken as part of the thesis research. They are reviewed in greater detail in the next Sections 3.2 and 3.3 to ensure that the principles of *clarity* and *transparency* are followed (cf. Pittaway 2008, 217).

3.2 Data collection

Data collection for the thesis encompassed the three first steps of the review process: developing the research question, identifying research, and choosing and appraising studies (Denyer & Tranfield 2009, 681–685). While framing the research question is not part of data collection as such, it was required for data collection to be possible and much interlinked with locating appropriate research. An overview of the data collection process is illustrated in Figure 5.

Figure 5 Data collection process

The first step was to develop an appropriate research question to secure *focus* (cf. Denyer & Tranfield 2009, 681; Pittaway 2008, 217). Having a clear focus for the systematic review is important since it defines the whole research process that follows (Booth et al. 2012, 54; Fisch & Block 2018, 104). To establish a focus, an answerable and well-defined research question must be framed (Denyer & Tranfield 2009, 681). In addition to a specific focus area, the research question must have explicit motivations for its significance (Fisch & Block 2018, 104). A scoping review may be conducted to ensure the suitability of the question and refine it if needed (Booth et al. 2012, 73; Denyer & Tranfield 2009, 682).

Initially, the research process began with the following question: How do external parties' ideas evolve into implemented innovations in cooperative projects? Nonetheless, the scoping review revealed that little information exists on the topic, making the question impossible to answer with a systematic review. It would have not been feasible to conduct a review on the basis of the original question. This led to multiple modifications in the question framing, and in the end the research question changed to the one presented in Section 1.2. The motivations for the importance of the question have already been considered – a better understanding of managing open innovation projects is required, and a systematic review can advance the field by mapping and synthesizing existing knowledge.

Interlinked with the development of the research question was the second step, identifying research. The connections between the two stages are mainly explained by the influence of the scoping review on both of them. Research can be identified in many ways, for example through databases, manual search, or bibliographies (Denyer & Tranfield 2009, 683). Given that systematic reviews aim to include all relevant studies (Denyer & Tranfield 2009, 684), a database search was deemed suitable to enable finding as much of the existing evidence as possible. This contributes to practicing the principle of *coverage* (cf. Pittaway 2008, 617). The database utilized was EBSCO Business Source Complete. The database is appreciated and includes over 1,400 active full-text journals with business content (Business Source Complete 2022), which made it appropriate for the research question of the thesis.

Having defined the database, it is necessary to identify the search terms (Booth et al. 2012, 72). The search terms must align with the research question and considerable time and attention should be devoted to defining them (Denyer & Tranfield 2009, 684). Outlining the search string began with the key concept, namely "innovation project". When brainstorming for synonyms, the scoping review revealed that "research and development project" and "new product development project" as well as their abbreviations "R&D project" and "NPD project" are often utilized in scientific articles to refer to innovation projects. This observation led to the inclusion of these four additional search terms. The second key concept identified was the word "open", indicating some degree of openness and utilization of external contributions to innovation. To complement "open", the following list of synonyms was developed: cooperative, collaborative, interorganizational, interfirm, and joint. It was acknowledged that different spelling

possibilities had to be considered (co-operative, inter-organizational, interorganisational, inter-organisational, and inter-firm).

It was much reflected upon how the two key concepts should be connected. In the end, the decision to form exact search phrases by formulating all the potential concept combinations was made. At this point yet another search phrase, “co-innovation project”, was added to the search string based on the scoping review. The limitations of this approach are recognized. Nonetheless, the scoping review demonstrated that combining the two concepts with the operator AND would have led to a large number of document results, many of them being irrelevant. This limitation was addressed by adding “open innovation” AND “project” to the search string to complement the exact search phrases. The scoping review proved that this was a necessary adjustment to enable finding documents that discuss the topic with a wording such as “open innovation at the project-level”. The complete search string is introduced in Appendix 1.

At this stage two additional procedures were taken. Firstly, the search string was presented to one of the supervisors of the thesis – who is an experienced researcher – to minimize the impact of the novice researcher status of the author (cf. Booth et al. 2012, 28). Secondly, a search was performed on EBSCO Business Source Complete to investigate whether a systematic review on the research question already exists. The earlier-defined search string with title, abstract and keywords as search fields was complemented with another search string that was not directed towards any specific search field but instead considered all potential sections of the record. The additional search string was connected with the operator AND and defined as ((“systematic*” AND “review*”) OR (“critical*” AND “review*”) OR “integrative review*” OR “meta-analysis” OR “bibliometric*” OR “state-of-the-art” OR “state of the art”). The document results were examined to determine if literature on open innovation projects had already been reviewed. Only one publication seemed relevant. A meta-analysis has been done on the antecedents of interorganizational new product development project performance. The results of the analysis were published in a conference in 2013, and the conference paper is not available in full length, only its abstract. However, given the distinct natures of a meta-analysis and a systematic review as well as the nine years between the conference paper and this thesis, the meta-analysis was not deemed to diminish the importance of the research. These outcomes strengthen the theoretical contribution of the thesis.

Having located the research, the third step was to choose and appraise the studies (cf. Denyer & Tranfield 2009, 684). A systematic review must have a clear inclusion or exclusion criteria for choosing relevant documents among potentially hundreds or thousands of results (Denyer & Tranfield 2009, 684; Pittaway 2008, 217). In the research process of the thesis some criteria were included in the early stage to the search function of EBSCO:

- search term located in title, abstract or keyword field
- peer-reviewed
- written in English.

The first criterion can be justified by the consideration that if an article concentrates on the phenomenon of open innovation projects, the topic is most likely mentioned in the title, abstract or keywords. Secondly, the document had to be peer-reviewed. It is acknowledged that this restricted following the principle of *equality* between different forms of publication (cf. Pittaway 2008, 217) since peer-review is mainly associated with articles in academic journals. Nonetheless, this requirement was deemed essential as it excludes document results that may have questionable quality. Lastly, the third criterion requiring that the publication has been written in English was necessary to due to the language limitations of the author. Incorporating these criteria in the search together with the search string led to 348 document results on 13th April 2022. The results included some rather old studies, but the years were not restricted. This was done because the goal was to achieve a throughout overview of the knowledge on the topic. Furthermore, since open innovation has been practiced even before the concept was coined in 2003, the decision was regarded reasonable.

Once the search results were retrieved, the screening process began. Two additional criteria were utilized:

- relevant to the research question
- not solely a literature review.

While the first criterion is evident in light of the goal to answer the research question of the thesis, the second criterion enables avoiding the duplication of data. The screening

process followed the approach presented by Booth et al. (2012, 99) and is displayed in Figure 6.

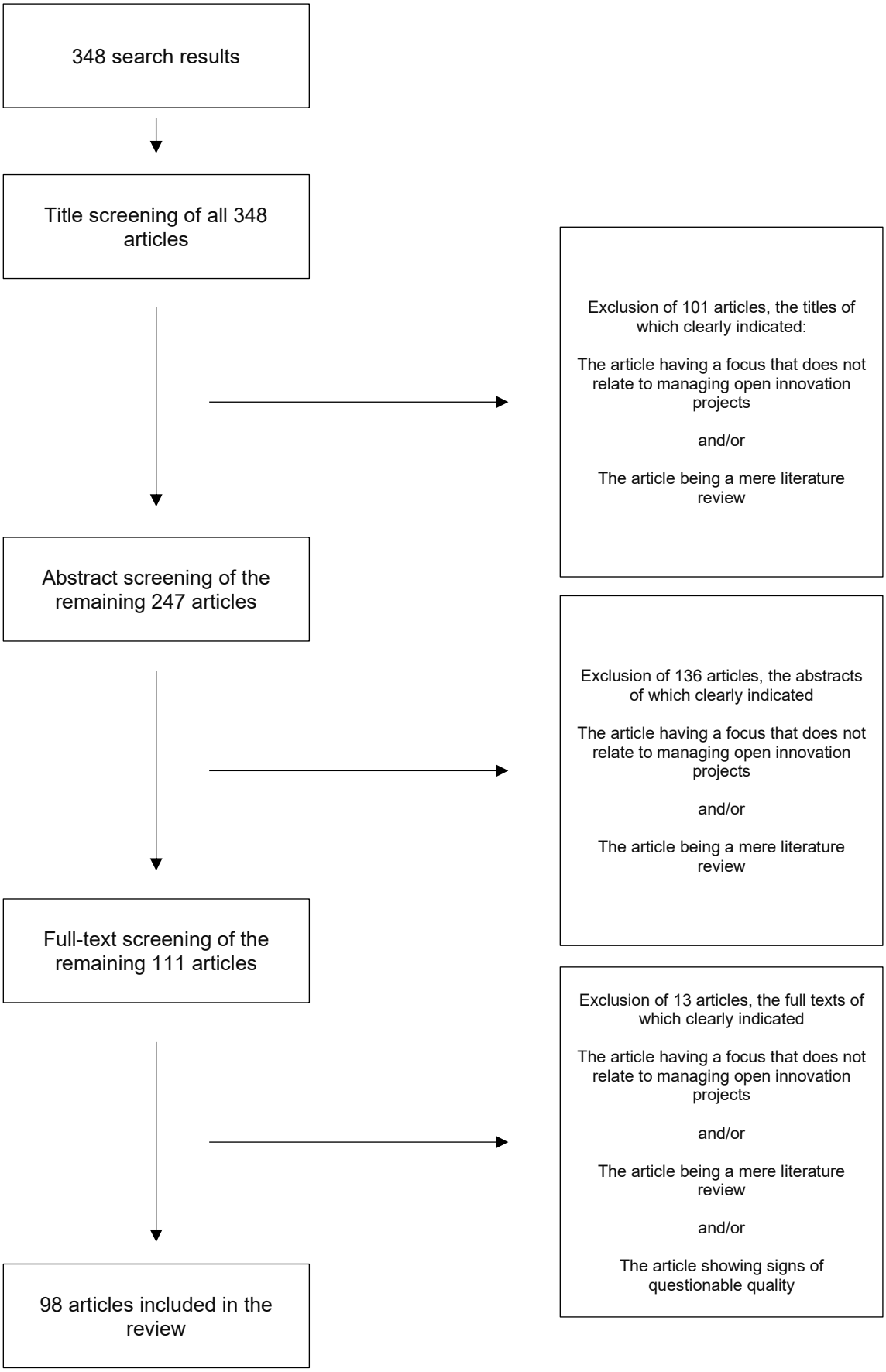

Figure 6 Article selection process (cf. Booth et al. 2012, 99)

Firstly, all the titles were examined for relevance (cf. Booth et al. 2012, 99). Careful judgement was practiced and unclear cases were not excluded at this stage due to the inexperienced novice status of the researcher. The title screening led to the exclusion of 101 studies, including the duplicate copies. Next, the abstracts of the remaining 247 articles were read carefully (cf. Booth et al. 2012, 99). Some abstracts had to be read multiple times to be able to decide between exclusion and inclusion. Consequently, 136 articles were excluded, leaving 111 articles for full-text screening (cf. Booth et al. 2012, 99). In addition to the two inclusion criteria, the question of quality was present in the full-text screening. Even at this stage some articles were read more than once. The last stage resulted in eliminating 13 articles. In these cases exclusion reasons included, for example, the abstract remarking projects but the full text not having a project focus, the abstract implying something about the management of projects but the full text concentrating on other issues, or the quality being highly questionable and evidenced by lack of methodology discussion.

In the end, 98 articles were included for the review. The final list of the titles of the included articles is presented in Appendix 2, together with the author(s), journal and publication year of each article. Once the process from developing the research question to locating and selecting studies had been finished and concretized into a list of articles, the analysis and synthesis step began.

3.3 Data analysis

Analysis and synthesis are characterized by examining the articles, distinguishing important components and relating the distinct findings to each other. It is not enough to merely describe – rather, the results must be synthesized in a way that cannot be obtained from reading the individual articles separately. (Denyer & Tranfield 2009, 685.) A synthesis is fundamentally a new whole (Booth et al. 2012, 125). Following the principles of *accessibility* – making knowledge available in an easier form – and *synthesis* is crucial at this stage (Pittaway 2008, 217).

The approach taken to analyze and synthesize the included studies combines elements of narrative and thematic synthesis. These two approaches were judged to support each other and provide deeper insights, which justified the decision to follow them. Narrative synthesis emphasizes summarizing the findings of the chosen documents with words and text. Different groupings may be utilized. In turn, thematic synthesis refers to bringing

the findings together into themes. It is also suitable for mixed methods reviews such as the thesis in question. Regardless of the approach, a synthesis strategy is essential for this step in the research process, implying that the activities and procedures must be planned and clearly established. (Booth et al. 2012, 133, 145–149.)

At first, an Excel sheet was prepared with all the included studies and their details in terms of title, author(s), journal and publication year. The Excel sheet also contained columns for main findings, research methods, key issues, considerations for managing the key issues, and other thoughts. It functioned as a structure for the data analysis. (Cf. Bodoliga & Spraggon 2018, 2480.) The articles were arranged and read from the oldest to the newest according to their publication years. Within each year, the articles were arranged and read in alphabetical order since it was infeasible to organize the articles based on their exact publication date. All the articles were read one-by-one and coded with the help of NVivo, utilizing highlights. As part of the coding, the most crucial aspects of the articles were distinguished and placed into categories (cf. Allard-Poesi et al. 2001, 355). The unit of analysis can be a word, a meaning of a word or phrase, a part of or a full sentence, or one or several paragraphs (Allard-Poesi et al. 2001, 355). The categories were descriptive data, key issues, and the management of key issues in line with the research questions (cf. Booth et al. 2012, 129; Snyder 2019, 337). In addition to the highlighting in NVivo, the main points were written on the Excel sheet (cf. Bodologica & Spraggon 2018, 2480).

While these steps resembled the features of narrative synthesis, the subsequent steps relied on thematic synthesis, too. Once all the articles were read and coded and the Excel sheet was filled with the main points, the structuring of the findings and the identification of themes began. It was done mainly with the help of the Excel sheet that was relatively concise (cf. Bodologica & Spraggon 2018, 2480). Especially the categories ‘key issues’ and ‘management of key issues’ required deep reflection and analysis. Regarding the former, several issues were examined or discovered in the articles. While some issues where straightforward to identify and clearly distinguishable from the rest of the issues, others were tightly connected. Through the analysis process different patterns and themes were observed in the array of issues, which resulted in a limited number of higher-order key issues. The outcome was the following 11 key issues:

- communication
- control

- goals
- governance
- knowledge flows
- openness
- outcomes
- partners
- roles
- social relations
- tensions.

The various considerations for managing the key issues were then connected to this finalized list. Overall, careful contemplation and consideration were a necessity to enable the reasoning and structuring of the data. That was an important part of the research process since it was not sufficient to examine what the articles say. Not everything is explicit – instead, some interesting findings may be more hidden. One of the core ideas of a systematic literature review is to contemplate upon what the examined literature signifies (Booth et al. 2012, 170). Handling a significant amount of data as well as finding patterns and establishing connections in it are requisites from the researcher (Bodoliga & Spraggon 2018, 2481). It is not necessary to summarize all the studies descriptively – rather, breadth and depth must be balanced (Fisch & Block 2018, 104). The coding process allowed extracting numerous insights, which were then organized, analyzed and synthesized into a coherent whole that embodied the most crucial aspects. This enabled identifying the gaps and recommended future actions in terms of the topic (Booth et al. 179, 189–190).

The last step in conducting a systematic review is presenting and utilizing the results. Coherence and structure are essential (Bodoliga & Spraggon 2018, 2481) and the main themes that have emerged must be presented (Short 2009, 1316). Following this advice, Chapter 4 discusses the results in terms of descriptive data (journals, publication years and research approaches), key issues in open innovation projects, and managing the key

issues in open innovation projects. Chapter 5 considers the theoretical and practical implications of the findings, indicating how the results of the thesis could be utilized and enabling the *integration* of the research topic for scholars and practitioners (cf. Pittaway 2008, 217). However, this chapter is first closed with an evaluation of the research quality.

3.4 Evaluation of the research

An evaluation of quality is an integral part of research. To enhance the level of transparency, specific evaluation criteria may be utilized (Eriksson & Kovalainen 2008, 290). The criteria utilized in this thesis is that of trustworthiness by Lincoln and Guba (1985), which is regarded suitable for qualitative research.

The first of the criteria is "credibility", which implies that the findings and conclusions of a research should be consistent with reality (Lincoln & Guba 1985, 294, 296). There are several ways to contribute to credibility. The researcher may consider if they have sufficient knowledge about the topic, if there is an adequate amount of evidence to support the interpretations, if the observed aspects are rationally connected to the categories, and if another scholar could arrive to similar conclusions (Eriksson & Kovalainen 2008, 294). The author of this thesis aimed at considering these issues throughout the research process. Firstly, the topic was delved into before beginning the review. Secondly, one of the inclusion criteria for the articles presented in Section 3.2 was peer-review. Therefore, the articles are expected to have a certain level of quality, and this was also confirmed during the data analysis process. Thirdly, a large number of articles were included in the review to secure plausible interpretations, and carefulness was practiced in interpreting the single articles. Fourthly, a full disclosure on the methodological steps taken and choices made was the goal to ensure transparency. Notable time was devoted to arriving at the best possible results.

The second criterion of trustworthiness is "transferability". The key is to provide enough evidence so that the reader can assess the transferability of the findings to another context. (Lincoln & Guba 1985, 297–298.) To contribute to transferability, the articles forming the systematic review are referenced and listed in Appendix 2. Because of the inclusion criterion of peer-review and the careful screening process, all the included articles discuss contextual details. One reason for exclusion at the full-text screening stage was lack of methodological and contextual discussion. This makes it possible for the reader to return to the original source and examine what it says about the context. Moreover, the aim was

to provide some details about the original contexts in the systematic review whenever relevant.

The third criterion is “dependability” (Lincoln & Guba 1985, 299). Adequate information must be provided about the research to make the research process traceable (Eriksson & Kovalainen 2008, 194). The decisions made throughout the research process of this thesis are discussed in detail in this chapter to ensure a high level of dependability. Consequently, the reader can trace all the steps from formulating the research question to presenting the results. It is, however, acknowledged that an additional challenge emerges from the nature of thesis research since only one researcher was involved. The participation of more than one researcher could have enabled superior identification of inconsistencies and improved precision (cf. Bodoliga & Spraggon 2018, 2481).

The fourth and last criterion of trustworthiness is “conformability” (Lincoln & Guba 1985, 300). Essentially, the findings should be in line with the interpretations – the researcher should not invent them or their relationship (Eriksson & Kovalainen 2008, 294). Conformability is about objectivity and not opinion or imagination (Lincoln & Guba 1985, 300). Nonetheless, it is recognized that interpreting findings, particularly when they are about themes or perspectives in textual works, is challenging to do in a perfectly objective manner (Snyder 2019, 337) and the involvement of a single researcher adds to this challenge (cf. Bodoliga & Spraggon 2018, 2481). To achieve as high level of conformability as possible, reader-friendliness has been the aim when writing the steps, links and conclusions of the research. Additionally, Chapter 5 contains direct quotations to demonstrate the relationships between data and interpretations.

This evaluation of the research quality concludes Chapter 3. Chapter 4 presents the results of the systematic review.

4 Managing open innovation projects

Returning to the theoretical basis for the systematic review, the initial framework of this thesis consists of three elements: open innovation, open innovation projects, and the management of open innovation projects. While the first two elements are discussed in Chapter 2, the third element remains scantly addressed. The objective of this chapter is to complete the theoretical framework and answer the research question of the thesis by introducing and reflecting on existing knowledge on open innovation project management. The chapter begins by reviewing the descriptive results to contextualize the more profound findings. Then, the results of the convergent qualitative synthesis are discussed: the identified key issues in open innovation projects and considerations for managing the issues. This enables answering the research question of the thesis through the two sub-questions.

4.1 Descriptive results from the systematic literature review

The 98 articles included for the review were published in 45 different scientific journals. Table 1 presents the journals and the number of analyzed articles from each journal from most to least common.

Table 1 Journals of the reviewed articles

Journal name	Number of articles
International Journal of Project Management	11
Industrial Marketing Management	9
International Journal of Innovation Management	9
Journal of Product Innovation Management	6
Research Policy	6
Creativity & Innovation Management	3
International Journal of Technology Management	3
Journal of Knowledge Management	3
R&D Management	3
British Journal of Management	2
Business Process Management Journal	2
IEEE Transactions on Engineering Management	2
International Journal of Innovation & Technology Management	2
International Journal of Operations & Production Management	2

Table 1 Continued

Journal name	Number of articles
International Journal of Production Economics	2
Journal of Engineering & Technology Management	2
Knowledge & Process Management	2
Technovation	2
Engineering Management Journal	1
Asia Pacific Journal of Management	1
California Management Review	1
European Management Journal	1
Industrial Management & Data Systems	1
Industry & Innovation	1
Information & Management	1
Information Systems & e-Business Management	1
Innovation: Management, Policy & Practice	1
International Journal of Production Research	1
Journal of Business & Industrial Marketing	1
Journal of Cleaner Production	1
Journal of Management Information Systems	1
Journal of Marketing	1
Journal of Operations Management	1
Learning Organization	1
Long Range Planning	1
M@n@gement	1
Management Decision	1
Pacific Accounting Review	1
Project Management Journal	1
Revista de Management Comparat International	1
Revista de Administração	1
Revista de Administração e Inovação	1
Revista de Administração Mackenzie	1
Supply Chain Management	1
Technology Analysis & Strategic Management	1

As can be observed in Table 1, the three most common journals include *International Journal of Project Management* with 11 articles, *Industrial Marketing Management* with 9 articles and *International Journal of Innovation Management* with 9 articles. These

three and most of the other journals are related to innovation or management. The focus of the journals varies from technology and information systems to supply chains.

In addition to originating from a variety of journals, the reviewed articles were published across several years. The publication years of the articles are presented in Figure 7.

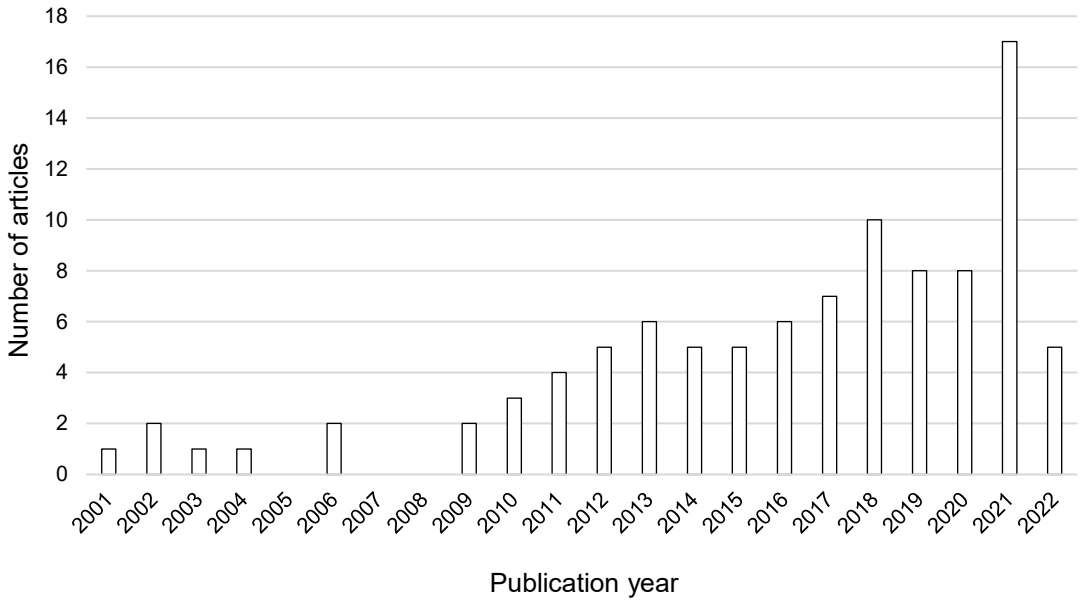

Figure 7 Yearly distribution of the reviewed articles

Figure 7 shows that the oldest article is from 2001, and the newest articles were published in 2022. Moreover, the topic has become more prevalent over the years. This finding strengthens the argument about the significance of open innovation projects in the increasingly dynamic business environment. Year 2022 is characterized by a low number of articles, but it is assumably due to the timing of the article selection process since that started in April 2022.

Regarding methodological choices, the articles adopt a range of different approaches. Some articles are conceptual, while others are characterized by empirical data. Within the latter, qualitative, quantitative and mixed methods articles were identified. Figure 8 displays the division between the research approaches.

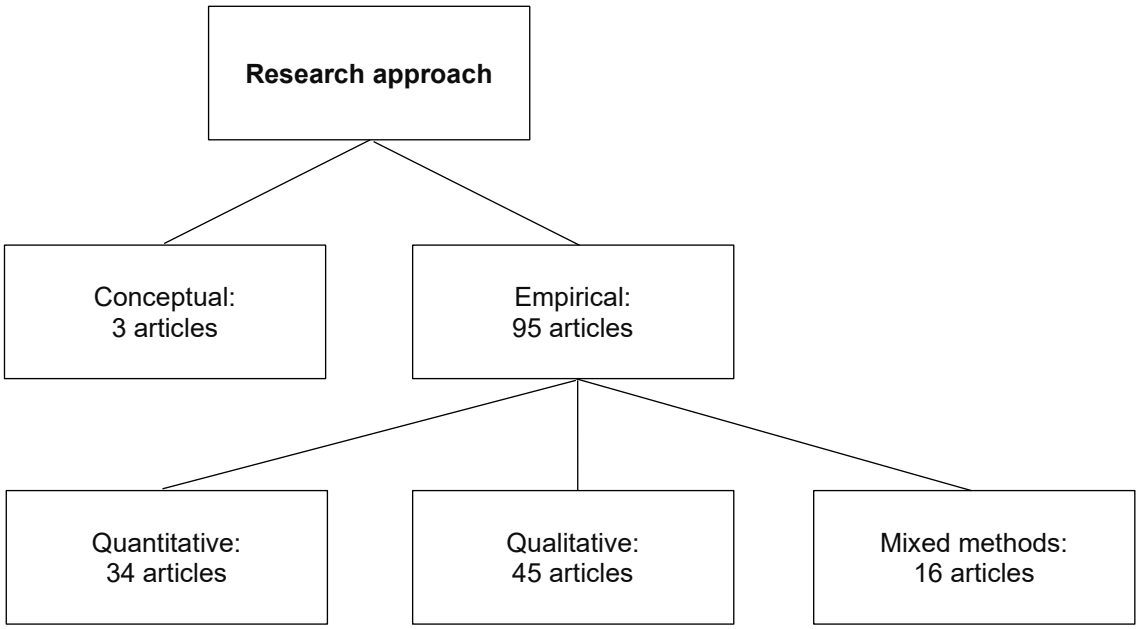

Figure 8 Research approaches of the reviewed articles

As Figure 8 demonstrates, conceptual articles form a minority. Out of the 98 articles, 3 are conceptual. In the empirical articles both qualitative and quantitative methods are represented (45 and 34 articles, respectively), and they are sometimes combined into mixed methods (16 articles). To give an example of mixed methods, some mainly quantitative articles utilize qualitative interviews to construct a quantitative questionnaire. Another example is conducting both a quantitative questionnaire and a qualitative case study. Questionnaires and interviews are common methods for pure qualitative or quantitative studies too, but for instance observations and documents have also been investigated in the empirical articles.

To reflect on the methodological choices of the empirical articles more closely, other aspects relate to the industries as well as types of open innovation partners and informants examined in the articles. The industries researched are diverse: for instance, there is manufacturing, high tech, telecommunications, automotive, aerospace, health care and logistics. Some articles scrutinize cross-industry matters while others focus on a specific industry. This contributes to the applicability and diversity of the findings. In a similar vein, there are several types of open innovation partners that the researched projects involve. Examples include companies, universities, users and public sector organizations. The number of different partners varies: some articles concentrate on dyadic or triadic

projects while in others the emphasis is on projects involving as many as ten different partners. The types of informants differ, too. For instance, project managers, purchasing managers, CEOs, technical experts, developers and engineers have been interviewed, surveyed or involved in other ways. It is, however, necessary to emphasize that all these remarks are merely examples and not every article discusses the methodological choices in such depth. This was observed with quantitative articles in which the number of projects is so large that it would not be feasible to deliberate on every feature of the data.

These discussed aspects are considered the most significant descriptive results. They provide context for the findings about open innovation project management. Consequently, the focus now shifts to the first sub-research question of the thesis.

4.2 Key issues in open innovation projects

A careful analysis of the data revealed several key issues that are prevalent for open innovation projects. In total, 11 key issues were identified. Figure 9 summarizes them, and the rest of this section is devoted to clarifying the meaning and content of each key issue.

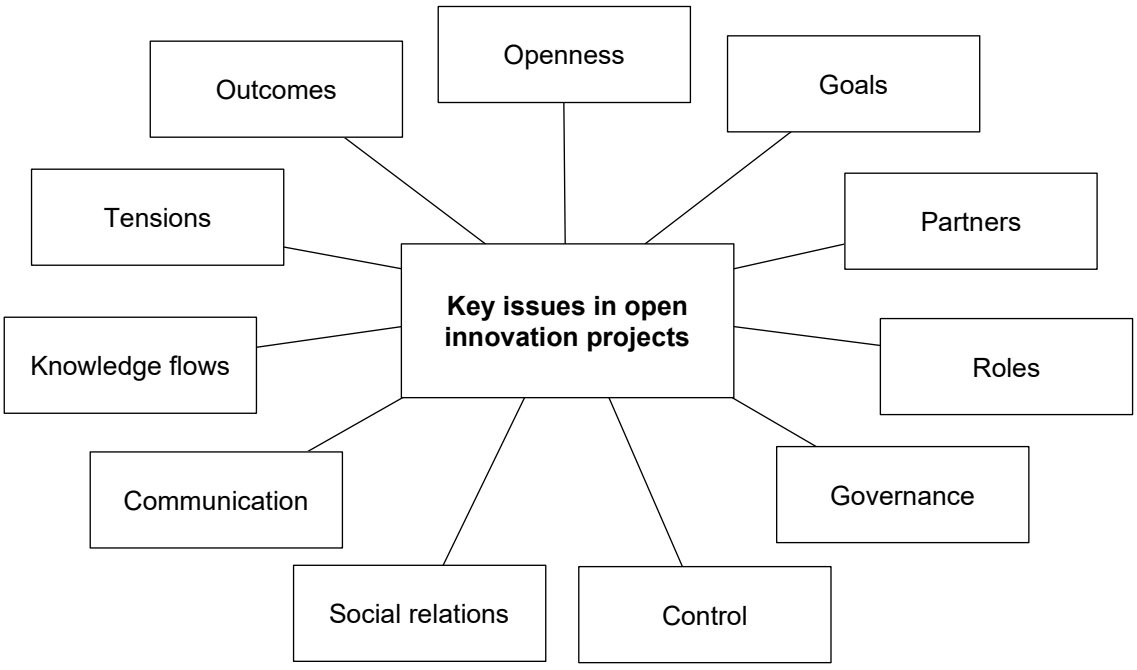

Figure 9 Key issues in open innovation projects

The first key issue to be introduced is *openness*. It could be argued to be the core of any open innovation project compared to closed innovation projects and traditional projects. *Openness* has been researched from several angels, but the two main perspectives are breadth and depth. The former is about the number of external partner types, while the latter refers to how deep the collaboration with the partners is (see, for example, Bahemia & Squire 2011, 609, 611; Kobarg et al. 2019, 2). Other aspects relating to *openness* include ambidexterity, meaning "balance between the exploitation of longstanding relationships and the exploration of new ones during an NPD project" (Bahemia & Squire 2011, 612) and form of openness, meaning inbound or outbound (Tang et al. 2021, 224). Sometimes the articles consider overall openness that is viewed in a broader way (Bürger & Moser 2017, 242; Mu et al. 2019, 1977).

Progressing to the second key issue, *goals* is among the most addressed key issues in terms of the number of studies. Content-wise the extent of information is relatively scant. Nonetheless, the continuous emergence of *goals* throughout the analyzed articles suggests that it is necessary to regard it a key issue. Although the term goals is utilized in this thesis, the articles refer to a variety of concepts such as goals (see, for example, Johnson & Johnston 2001, 23), objectives (see, for example, Barnes et al. 2002, 277; Polova & Thomas 2020, 23), management direction (Bstieler & Hemmert 2010) and purpose (Canhoto et al. 2016, 91). It is acknowledged that the definitions of these terms vary slightly depending on the article, but they nevertheless refer to the existence of a specified aim or desirable outcome. Grouping these concepts together enables retrieving meaningful conclusions as demonstrated in Section 4.3.2.

Closely related to the project goals is the key issue *partners*. Suitable partners for a project depend on the goals and other factors. The considerations for managing this key issue cover the partner selection process (see, for example, Guertler & Sick 2021, 109–110), desirable partner characteristics (see, for example, Barnes et al. 2002, 276, 279) and the optimal partner type (see, for example, Garcez et al. 2014, 258–259).

Particularly the last aspect about *partners* links to the fourth key issue, *roles*. Several themes at different levels emerged during the data analysis. On the level of an individual, examples of these themes include general characteristics such as clarity of roles and responsibilities (see, for example, Weck 2006, 258; Westergren 2011, 235), leadership and management (see, for example, Salge et al. 2013, 672) and so called "innovation

promoter" role (see, for example, Goduscheit 2015, 529–531). The latter two have been examined at the organizational level as well: for instance, Oberoi et al. (2014, 188) have discussed leadership distribution and Knudsen et al. (2019, 6, 18, 20–22) what they call "organizational knowledge integrators".

The fifth key issue that emerged from the articles is *governance.* Two main aspects were identified: the overall governance mode of an open innovation project and the lower-level governance mechanisms. The former refers to whether the project is organized through for example contracts or equity partnerships and has received limited attention (Bagherzadeh et al. 2019, 287; Bagherzadeh et al. 2021, 309–310). The latter covers the relational and transactional mechanisms to govern a project. According to the most common definitions, relational mechanisms include norms and trust (see, for example, Arranz & Arroyabe 2012, 580; Olander et al. 2010, 190; Parker 2012, 1623–1624) while transactional mechanisms cover contracts and IPR (see, for example, Melander & Lakemond 2015, 117; Olander et al. 2010, 190).

Linked to governance is *control*. The reasons for the interconnectedness are various. In some cases, scholars state that they research one of these key issues, but the presented definition or operationalization is more in line with the other key issue. In other cases, control seems to cover aspects related to governance. This review groups contract and trust-related concerns below *governance*, while *control* is viewed as a more general concept. This is how most of the reviewed articles perceive the distinction between the two concepts. Accordingly, considerations related to *control* include formal versus social control (see, for example, Dyball & Wang 2017, 20, 21, 23) and process versus outcome control (see, for example, Ahlfänger et al. 2022, 113–114; Wang, Brunswicker & Majchrzak 2021, 853, 861). The balance between autonomy and control is also central to this key issue (see, for example, Johnson 2002, 400, 404).

Connected to the previous two key issues and particularly their relational and social dimensions is *social relations*. It mainly consists of the embeddedness or closeness of relationships (Kim & Lee 2003, 72; Noordhoff et al. 2011, 47–48; Tranekjer & Søndergaard 2013, 220, 224). Another finding is the interaction between cognitive social capital and relational social capital. The former refers to the ability to collaborate and create shared understandings with the partner, while the latter is about the existence of trust that has been developed over time. (Steinmo & Rasmussen 2018, 1971–1973.)

The eighth key issue, *communication*, is acknowledged in the research in several ways. Some articles position it at the center of the study, while others reveal knowledge about it through other contexts. Themes such as communication intensity (see, for example, Yan & Dooley 2013, 532, 538), communication channels (see, for example, Thomas 2013, 896) and the balance between formal and informal communication (see, for example, Barbosa et al. 2020, 6, 9–10) emerge from the data. All this highlights the critical nature of communication.

This leads to the next key issue, *knowledge flows*. In general, knowledge flows are related to communication, and some analyzed articles do not distinguish the two concepts. Additionally, the role of knowledge flows in all the other key issues is prominent. This is logical since knowledge flows form the core of open innovation. Nevertheless, the existence of considerations that do not fall under any other key issue validates *knowledge flows* as a separate key issue. The emphasis is on the fundamentals of knowledge flows: how knowledge is exchanged (see, for example, Bosch-Sijtsema & Postma 2009, 65, 67–69), what knowledge-related capabilities are required (see, for example, Faccin et al. 2019, 440, 454–460) and how certain knowledge is protected (see, for example, Marullo et al. 2020, 217).

The second-last key issue is *tensions*. It covers strains, conflicts and other struggles. They can arise with regards to any of the other key issues, but here the focus is on a general level and the addressment of emerging tensions, not prevention. *Tensions* encompasses equivocality, meaning "multiple and conflicting interpretations of a goal, situation, or task" (Eriksson et al. 2016, 691–692; Marcandella & Guèye 2018, 249, 255), dissemination of uncertainty (Gomes et al. 2021, 164; Stefan et al. 2021, 148) and task-related conflicts (Mu et al. 2021, 244–245, Yan & Wagner 2017, 11–12).

The final, 11th key issue emerging from the review is *outcomes*. It covers the actual outcomes of an open innovation project, which explains its position as the last key issue. However, this key issue also covers perceived, potential outcomes. The outcomes discussed in literature include clearly defined outcomes such as profits (Wang, Cen, Sun & Ying 2021, 1) and more fuzzy outcomes such as value or benefits (see, for example, Barners et al. 2002; Barners et al. 2006, 400; Wagner & Sutter 2012, 955; Westergren 2011, 237–238).

In addition to these 11 key issues, various minor issues were identified. For instance, the review process revealed findings about internal environment (Bstieler & Hemmert 2010, 493; Canhoto et al. 2016, 90; Johnson & Johnston 2004, 104; Salge et al. 2013, 672), planning on a highly general level (Baggio et al. 2018, 18; Barbosa et al. 2021, 134; Barnes et al. 2006, 399; Couchman & Fulop 2009, 96; Chin et al. 2011, 909), the structure and organization of a project to integrate the various inputs (Gurca et al. 2021, 212; Klessova et al. 2020, 299), supplier development (Lawson, Krause & Potter 2015, 788), the role of design thinking (Loderer & Kock 2021, 13), the staging of negotiations (Pedersen et al. 2022, 314–316), the alignment and integration of the partners' routines and processes (Barbosa et al. 2021, 134; Maurer & Valkenburg 2014, 14), team and individual centered approaches for managing open innovation projects (Pellizzoni et al. 2019, 471–472) and the specificities of crowdsourcing (Pollok et al. 2019, 103-105). These issues are not discussed further due to the value of parsimony in research (cf. Cutcliffe & Harder 2009, 1402–1403, 1408–1409), but an interested reader may consult the original articles.

To conclude this section, the identified 11 key issues indicate what is significant and worthy of attention in open innovation projects. They are the answer to the first sub-research question of this thesis and, hence, contribute to responding to the main research question. The second sub-research question is addressed in Section 4.3.

4.3 Managing the key issues in open innovation projects

In addition to identifying the key issues in open innovation projects, the data analysis aimed at recognizing considerations that enable managing the key issues. To create a logical structure, this section is organized in the same order as the key issues have been introduced in Section 4.2. The considerations regarding some key issues are grouped due to their interconnectedness. Firstly, the focus is on openness.

4.3.1 Openness

To recall, the two main perspectives to *openness* are breadth and depth. Based on a conceptual proposition, breadth is positively related to new product performance (Bahemia & Squire 2010, 614). Empirical evidence, however, indicates that it has an inverted U-relationship with the creativity and success of new products at the ideation stage, the optimal number of different external partner types being six (Salge et al. 2013,

669–670). Indeed, logical reasoning suggests that the optimal number of partner types is not likely to approach infinity.

To go into further depths, there may be differences in the desirable level of breadth depending on the nature of the innovation project. For innovation that is new in an incremental way, there is no evidence of a positive impact of breadth (Kobarg et al. 2019, 5; Salge et al. 2013, 670–671). In contrast, projects aiming for more radical newness benefit from a relatively larger number of external partner types based on conceptual and empirical arguments (Bahemia & Squire 2010, 616; Salge et al. 2013, 670–671, respectively). Kobarg et al. (2019, 5) conclude the relationship between breadth and the achievement of radical innovation goals to be U-shaped, indicating an optimal breadth number to be 2.86.

Project complexity may also increase breadth (Bagherzadeh et al.2021, 306-307; Steils et al. 2021, 169–170) since there is demand for the expertise of different partners (Steils et al. 2021, 169–170). This relationship is strengthened by uncertainty (Bagherzadeh et al. 2021, 306–307). A conceptual proposition contradicts this evidence by arguing that higher complexity makes maintaining control important and breadth undesirable, and, thus, complexity is a moderator for the relationship between breadth and performance (Bahemia & Squire 2010, 617). A noteworthy addition to this discussion is that projects utilizing easily codifiable and transferable knowledge rely on a broad array of knowledge sources, but fewer sources are counted on when the focus is on tacit knowledge (Marullo et al. 2020, 216). This is not necessarily related to the complexity of the innovation, but it could be perceived as the complexity of knowledge flows. Combining all this evidence on complexity, on one hand it could be argued that complex innovation requires a considerable amount of knowledge specialization and thus broader openness breadth. On the other hand, complex innovation requires maintaining control, which may be challenging to achieve with broad openness. As a third remark, if the knowledge to be combined is complex to codify and transfer, openness breadth is not desirable.

Breadth seems to be dependent on other factors as well. One study finds openness to be broader in the idea selection phase compared to other phases (Steils et al. 2021, 169–170). Moreover, breadth is evidenced to not be affecting the innovativeness of novel goods and the speed to market if not combined with absorptive capacity enabled by information technologies (Cui et al. 2018, 583, 585). The relationship between breadth and product

creativity is strengthened by the project manager's experience, and the relationship between breadth and product success is strengthened by not only the project manager's experience but also the supportiveness of the team (Salge et al. 2013, 671). In case of weak patent protection, breadth is not desirable because knowledge is harder to guard (Bahemia & Squire 2010, 618–619).

As a last remark about breadth, the topic of "diversity of contributions" is addressed. Although it resembles breadth, it is not the exact same since

> the underlying hypothesis is that diverse contributors do not necessarily bring in diverse contributions. External actors with the same functional status might have different competencies and experiences, whereas external actors with different functional status might well have similar competencies. (Oberoi et al. 2014, 181.)

It has been proposed that contribution diversity is related to an organization's performance but through an inverted U shape. The reasoning is that there is a limit to how dissimilar contributions can be exploited. Moderators for this relationship include the difference between the organization's knowledge and the innovation problem, the modularity of the problem, the tacitness of the answer to the problem, and distributed control. If the knowledge of the organization is not sufficient to solve the problem, if the problem can be divided into components, and if control is distributed to project partners and the collective decision-making knowledge is thus increased, more dissimilar contributions are beneficial. If the solution is highly tacit, knowledge exchange becomes harder. (Oberoi et al. 2014, 186–188.) These findings support the findings about breadth although the distinction between the two concepts, contribution diversity and breadth, is acknowledged.

Considering the optimal level of depth, it has been proposed on conceptual grounds that increasing depth contributes to performance (Bahemia & Squire 2010, 615). For incremental innovation, the relationship is positive and curvilinear (Kobarg et al. 2019, 5). For radical innovation, some inconclusive evidence exists (Kobarg et al. 2019, 6). However, other concepts that resemble the definition of depth presented in Section 4.2 are associated especially with novel projects; namely interaction intensity (Hsieh & Tidd 2012, 606) and involvement (Ates et al. 2015, 1533). Uncertain and complex projects are also found to be characterized by a relatively high level of depth (Bagherzadeh et al. 2021, 306–307), and particularly the former could be assumed to be connected to radical

innovation. Another project typology that has similarities with the incremental-radical categorization classifies customer-supplier projects into three types. In the first type, the role of the customer is to participate as a tester and depth is not required. In the second type, the customer helps the supplier to develop a new product. Depth is possible but not a requirement. In the third project type, the customer and supplier explore and develop new knowledge – which resembles radical projects – and depth is needed. (Lehtimäki & Komulainen 2021, 20.) Indeed, a design focus increases the involvement of partners, including the design agency, compared to user focus (Ates et al. 2015, 1533). When these findings are combined, it could be argued that the importance of depth depends on the radicalness of a project. Moreover, if the project partner's role is minor, depth is not necessarily critical, but if the partner is a crucial addition to the project, the significance of depth increases. Depth seems to also be connected to the choice of governance mode, which is reviewed in Section 4.3.3.

Other dimensions of openness have attracted limited attention. Regarding ambidexterity, only conceptual propositions exist. Radical innovation and complexity may warrant and imply a stronger focus on the exploration of new relationships compared to exploiting existing connections. The opposite is predicted to happen in the case of an insubstantial patent protection because new relationships may be seen as risky. (Bahemia & Squire 2010, 617–619.) Considering the form of openness, the optimal configuration depends on the aim. Quantitative evidence from opensource software projects indicates that good performance marketwise is achieved by the combination of inbound openness being high and outbound openness being low. Good performance in technical terms is reached if both forms of openness are high. (Tang et al. 2021, 223–224.)

There are also other articles that have not been included in this discussion to prevent it from becoming too fragmented. An interested reader can find further insights in the studies by Bürger & Moser (2017) and Mu et al. (2019) that consider openness more generally. Nevertheless, the considerations presented so far are argued to form the core of the management of *openness*. The central findings are encapsulated in Figure 10.

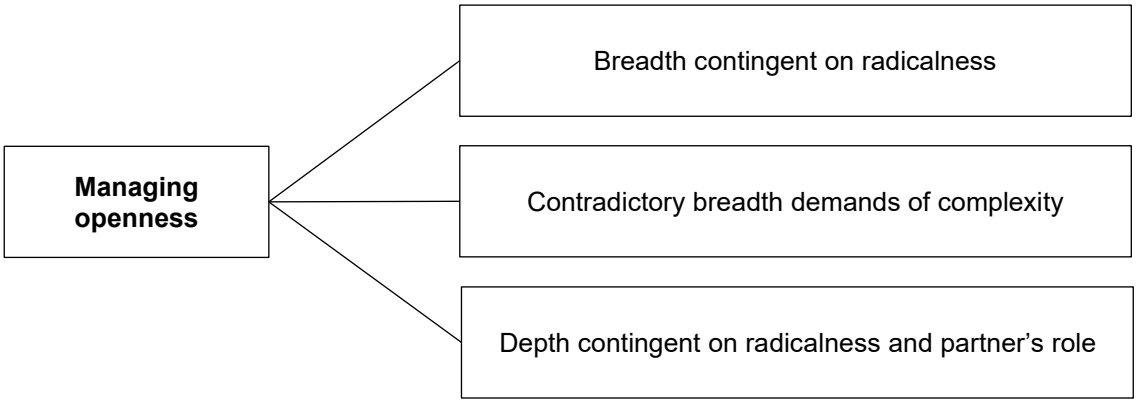

Figure 10 Central considerations for managing openness

Firstly, the theoretical and empirical discoveries indicate that breadth is contingent on innovation radicalness. Breadth is important for radical projects and not so much for incremental. Secondly, complexity implies contradictory demands for breadth. The evidence reviewed demonstrates that complexity may indicate relatively low or high level of breadth. Thirdly, depth with a project partner is contingent on innovation radicalness and the significance of the partner's role. The other dimensions of openness, such as the ambidexterity and inbound-outbound aspects, are not as strong themes as breadth and depth.

To conclude, this section has concentrated on *openness* – the central feature of any open innovation project. The following section continues with other key issues that are essential in the early phases of an open innovation project. Accordingly, *goals*, *partners* and *roles* are examined next.

4.3.2 Goals, partners and roles

Though seemingly distinct, the key issues of *goals*, *partners* and *roles* are closely linked. Not only are they all related to initializing an open innovation project, but there are also other linkages that are established in this section.

Beginning with *goals*, it is important that they are:

- developed early (Polova & Thomas 2020, 235; Sjödin et al. 2011, 231–232)
- clear (Barbosa et al. 2021, 133–134; Barnes et al. 2002, 277; Barnes et al. 2006, 399; Bstieler & Hemmert 2010, 493, 499; Sjödin et al. 2011, 231–232)

- specific (Bstieler & Hemmert 2010, 493, 499; Johnson 2002, 400; Polova & Thomas 2020, 235; Sjödin et al. 2011, 231–232)
- realistic (Johnson & Johnston 2001, 25)
- agreed together (Barnes et al. 2002, 277)
- beneficial for all project partners (Barnes et al. 2002, 277)
- shared (Canhoto et al. 2016, 91; Pinheiro et al. 2016, 1531; Polova & Thomas 2020, 235)
- communicated (Sjödin et al. 2011, 231–232).

Related to many of these remarks, the alignment of the project partners' separate goals is vital for a project (Johnson & Johnston 2001, 25–26; Yan & Dooley 2013, 523, 532). It has significant positive impacts on design aspects particularly in two cases. Firstly, if the project partners have limited relations prior to the project, the importance of goal alignment increases. Secondly, in projects where there is more certainty about the assignment, goals can be specified and aligned from the beginning compared to less certain projects in which goals are likely to change. (Yan & Dooley 2013, 523, 532, 538.) To ensure goal alignment, a process framework has been proposed. As the first step in the process, the compatibility of the partners' own goals is evaluated. If they are not compatible, it is reassessed whether the partnership is worthy. Secondly, the focus of evaluation is on the compatibility between the goals and the partners' competencies. If they are not compatible, it is again reassessed whether the partnership is worthy. If they are somewhat compatible, another partner is added to ensure full compatibility. Thirdly, it is appraised whether the required resources exist among the project partners. If they do not exist, another partner is added. Fourthly and lastly, the goals are addressed in necessary documents and communicated to project employees. (Johnson & Johnston 2001, 26.)

The process has implications for partner selection, too. This leads to the key issue *partners*. Little research exists on the steps to search and select partners for open innovation projects, but two studies were identified: the article by Guertler and Sick (2021) and its predecessor by Guertler and Lindemann (2015).

The process framework explicitly developed for partner selection consists of six stages. The first stage is "[a]nalysis of problem, context and stakeholders". Scrutinizing the problem and context of the project enables identifying required partner characteristics. Sometimes existing stakeholders may prove to be valuable for the project and are thus mapped at this stage. The next stage is characterized by "[i]nitial assessment and structuring of stakeholders", referring to judging whether the needed partners can be found among the existing stakeholders and what kind of partners must still be searched for. Thirdly, it is time to organize "[s]earching for new potential OI partners". (Guertler & Sick 2021, 109–110.) Organizations have been found to search open innovation project partners by utilizing, for example, their network (Guertler & Sick 2021, 105; Maurer & Valkenburg 2014, 9), public databases and search engines (Guertler & Sick 2021, 105). After the search comes the fourth stage, "[a]ssessing potential OI partners". It is linked to the first stage. Fifthly is "[r]anking and selection of OI partners" which may be done by, for example, ranking the potential partners based on their strategic and operational significance. Sixthly and lastly, "[d]eveloping cooperation strategies" is practiced. (Guertler & Sick 2021, 110.)

Contrary to the partner selection process, desirable partner characteristics have been considered by several scholars – either explicitly or implicitly. One of the most prominent findings is the significance of complementarities. A partner is a desirable addition to a project if it complements the focal organization and the other potential project partners with its competences and capabilities (Bahemia et al. 2018, 2071–2072; Barnes et al. 2002, 276; Barnes et al. 2006, 399; Bosch-Sijtsema & Postma 2009, 65; Canhoto et al. 2016, 91; Garcez et al. 2014, 258; Marullo et al. 2020, 215; Maurer & Valkenburg 2014, 7; Patrucco et al. 2022, 214; Polova & Thomas 2020, 236; Weck 2006, 258; Zhang et al. 2022, 12). Dissimilar knowledge is also important for the protection of intellectual property since it decreases the risk of knowledge loss (Stefan et al. 2021, 145). Although project partners should have different areas of expertise, reaching too far has negative consequences. Open innovation project collaboration spanning across industries has been found to have an inverted U relationship with project output (Zhang et al. 2022, 12). Similarities in knowledge with the key partner or a supplier is related to higher performance in the market – although in the latter case also to higher costs. In turn, similarities in knowledge with customers has negative performance effects but positive cost effects. (Tranekjer & Søndergaard 2013, 220, 226.) In addition to the complementary

but related nature of partner competencies, the quality of the competencies matters (Lawson, Tyler & Potter 2015, 764, 796; Weck 2006, 258, 260).

Additional themes arose from the data analysis. The ability to trust the partner is crucial as remarked by, for example, Barnes et al. (2002, 279), Garcez et al. (2014, 259) and Maurer and Valkenburg (2014) and discussed further in Section 4.3.3, indicating the significance of trustworthiness. Some guarantee of good outcomes is provided by prior experience with the project partners (Barnes et al. 2006, 399; Garcez et al. 2014, 260; Pinheiro et al. 2016, 1531) or even the general collaboration experience of the partners (Barnes et al. 2002, 276; Dominguez-Blanco et al. 2021, 8, 20), particularly if the reputation of the partners can be confirmed based on their previous collaborations (Stefan et al. 2021, 147). Suitable project partners share expectations (Barnes et al. 2002, 276; Barnes et al. 2006; 399; Garcez et al. 2014, 260), have matching organizational cultures (Garcez et al. 2014, 260; Stefan et al. 2021, 147), are committed to the project (Pinheiro et al. 2016, 1531) and find the project valuable (Barnes et al. 2002, 276). Other positive partner features include, for example, comparable size to prevent power imbalances (Maurer & Valkenburg 2014, 8), stability in the parent organization (Barnes et al. 2002, 280; Barnes et al. 2006, 399), geographic closeness (Gurca et al. 2021, 210), the existence of a collaboration champion (Barnes et al. 2006, 399) and network centrality (Arranz et al. 2020, 428, 432–433).

Besides these partner characteristics, the partner types and their contributions have been researched. Given that the matters reflected on in the following paragraphs can be perceived as related to both *partners* – which types of partners for which projects – and *roles and responsibilities* – what kind of roles for different partner types – this part functions as a bridge between the two key issues.

Suppliers contribute to open innovation projects with technological knowledge (Garcez et al. 2014, 259) but their extensive involvement has been evidenced to lead to lower levels of innovation newness (Lassen & Laugen 2017, 1136). Customers can provide market expertise (Garcez et al. 2014, 259) particularly in demand-pull projects (Kim & Lee 2003, 72) but the relationship with the customer impacts their suitability for a project. For a customer-supplier project that is aimed at the exploration of new knowledge, a customer with whom the supplier has an integrated, trustful and long-term relationship is the ideal option. Exploration of knowledge, open communication and working closely

together become hence possible with the customers. Such deep relationship is not needed for a project in which the customer helps the supplier to develop a new product, but the customer chosen should have a somewhat integrated relationship with the supplier. For projects in which the customer is only participating in the testing phase, a transactional relationship suffices. (Lehtimäki & Komulainen 2021, 22.)

Involving competitors reduces risks and enables resource sharing (Garcez et al. 2014, 259). However, when competitors are participating in an open innovation project, an additional type of project partner is a necessity. The reason is to enable balancing knowledge sharing and protection between competitors. The non-competitive partner functions as a coordinator who receives and integrates knowledge from the different competitors so that the competitors do not need to have direct knowledge flows between each other. This minimizes knowledge leakages and allows an open innovation project to progress. (Rouyre & Fernandez 2019, 110–113; Smiljic 2020, 11, 14.)

An innovation intermediary can be a beneficial partner for a project. Innovation intermediaries positively impact the relationship between knowledge sharing and transfer and project performance (Dietsch & Khemiri 2018, 24). They assist with "identifying collaboration partners, matchmaking, innovation process management and making innovation valuations visible in deals between innovation suppliers and customers" (Katzy et al. 2013, 306).

Considering science-based partners, universities' strength is scientific knowledge (Garcez et al. 2014, 258; Steils et al. 2021, 168) and they are advantageous for projects requiring high levels of newness (Garcez et al. 2014, 258; Lassen & Laugen 2017, 1136). Contributions related to more applied science are received from research institutes (Garcez et al. 2014, 258). Both partner types are thus important in technology push projects (Kim & Lee 2003, 72).

All this indicates that both market and science partners have their benefits. Nonetheless, market partners are related to higher costs and science partners to longer projects. One solution is involving both partner types as there is an association between combining market and science partners and lower project costs. (Tranekjer & Søndergaard 2013, 225.) The optimal partner type may also depend on complexity and uncertainty. Firms are likely to opt for vertical partners at low levels of complexity, while high levels of

complexity and uncertainty are associated with the use of horizontal partners (Bagherzadeh et al. 2021, 308–309).

As a final note, end users can also be involved. They provide insights related to the use of the innovation (see, for example, Sjödin et al. 2011, 232; Steils et al. 2021, 168).

Continuing with *roles* at the organizational level, the role of a knowledge integrator is valuable for project success. An "organizational knowledge integrator" is

> a firm or an organisation, who has a specific interest, due to its position in the innovation value chain and the technology stage, in pulling knowledge from earlier development phases and from other actors closer to its own knowledge and expertise domain, to ensure that findings are integrated with its own efforts pushing towards the commercialisation stage of the technology. (Knudsen et al. 2019, 6, 22.)

Quantitative evidence demonstrates that the role of a knowledge integrator is likely to be present in case of long projects and with universities, competitors or international partners (Knudsen et al. 2019, 20–22).

Similar roles but at the level of an individual are also recognized in the articles. This type of person that is crucial for project success has been called an "innovation promoter" (Goduscheit 2015, 529–531), "innovation champion" (Hamari et al. 2018, 12), "collaboration champion" (Barnes et al. 2006, 403) and "knowledge broker" (Terhorst et al. 2018, 14). Different promoter or champion roles matter in different phases of a project. Combining the qualitative and quantitative findings of two studies, power and relationship champions are needed in the starting phase of an open innovation project. (Goduscheit 2015, 531; Hamari et al. 2018, 9, 12.) Power champions contribute with legitimacy and support (Hamari et al. 2018, 7, 9) and relationship champions facilitate initiating and developing relationships (Goduscheit 2015, 530–531; Hamari et al. 2018, 7, 9, 11). As Goduscheit (2015, 531) discovers through interviews:

> the bottleneck in the initial stages of the project is not the technical limitations but rather to find the right persons to come up with the good ideas for future solutions.

In the performance phase, process and expert champions matter. Process champions facilitate the innovation processes and related interactions (Goduscheit 2015, 529, 531; Hamari et al. 2018, 7, 11). The expert champion has notable expertise about the innovation in question (Goduscheit 2015, 529, 531; Hamari et al. 2018, 7, 11) and

contributes to the development and finetuning of the initial ideas (Goduscheit 2015, 531). These roles are significant after the relationship champion has facilitated the formation of relationships. Finally, process champions are also needed when the innovation project is close to being finished (Hamari et al. 2018, 11–12).

In addition to the roles of different partner types and innovation champions, leadership and management roles are considered in the analyzed articles. Based on empirical findings, an ideal project leader and manager has prior experience in leadership and innovation (Salge et al. 2013, 672), technical knowledge, diplomatic traits, ability to harmonize (Barnes et al. 2006, 399) and the role of an "architect" and "coordinator" (Polova & Thomas 2020, 236). Furthermore, their leadership behavior is not focused on the tasks but rather on relationships (Mu et al. 2019, 1978). In projects involving science partners, a lead researcher accompanying the project manager helps to keep the researchers on the right path (Barnes et al. 2002, 278; Barnes et al. 2006, 399). Turning to senior-level management, their commitment is vital (Barnes et al. 2002, 279; Goduscheit 2015, 529) but too extensive involvement is harmful due to the lack of practical understanding and the prominent concerns about intellectual property and competition that may prevent knowledge sharing (Goduscheit 2015, 529).

Leadership and management have also been examined at the organizational level. According to a conceptual proposition, dividing control with the project partners has a moderating role in the relationship between the contribution diversity and the innovation performance of an organization. Dissimilar contributions may be better exploited by control distributed to the partners since the collective knowledge is broader than the knowledge of any single organization, and it improves the motivation of project participants. (Oberoi et al. 2014, 188.) In buyer-designer partnerships, control has been evidenced to be exercised by the buying firm in projects with a user focus. When the innovation is incremental and driven by design, control shifts to the designer due to the significant role of expertise. Yet, in radical projects with a design focus, the buying firm maintains control, possibly because of the high level of newness. (Ates et al. 2015, 1532–1533.)

These findings are somewhat supported and somewhat contradicted by another study. In customer-supplier projects in which the customer's role is a tester, the supplier has the leading role (Lehtimäki & Komulainen 2021, 23). If this observation is combined with

the findings of Ates et al. (2015), it could be argued that the partner having a more significant role in the project is the leader. Turning to customer-supplier projects in which the customer is helping the supplier to develop a specific innovation, the customer can be the leader at least in the early stages (Lehtimäki & Komulainen 2021, 23). This finding could also be seen to support the conclusions of Ates et al. (2015). However, a divergence in the findings of the two articles concerns projects in which the designer or buyer role is significant and the focus is on exploration: Lehtimäki and Komulainen (2021, 23) find that suppliers do not necessarily have any leading role. This finding is not elaborated on further, but it is relevant for the discussion here. The focal organization can assumably manage and lead a radical project to secure some relevance, but on the other hand it might not be the leader to enable true exploration in further knowledge areas. Other findings demonstrate that in complex projects the leadership is ideally distributed among the partners unless one partner has a greater ability to lead (Wang, Cen, Sun & Ying 2021, 10).

There is also more general evidence on roles and responsibilities. If managed well, they are clear (see, for example, Barnes et al. 2006, 399; Barbosa et al. 2021, 133–134; Weck 2006, 258; Westergren 2011, 235), understood within the project team (Faccin et al. 2016, 97; Weck 2006, 258; Westergren 2011, 235) and unambiguously divided (Polova & Thomas 2020, 236). Furthermore, the ideal pattern for achieving good technical performance is high levels of inbound and outbound openness combined with a low level of variety in roles to ease the coordination challenges. If the aim is good performance marketwise, the superior configuration is a high level of inbound openness, a low level of outbound openness and a high variety in roles. In this case, the coordination challenges are smaller and specialized knowledge is taken advantage of through the various distinct roles. (Tang et al. 2021, 223–225.)

To sum up this section, much is known about *goals*, *partners* and *roles*. The various findings can be synthesized into a limited number of central considerations, which are presented in Figures 11, 12 and 13.

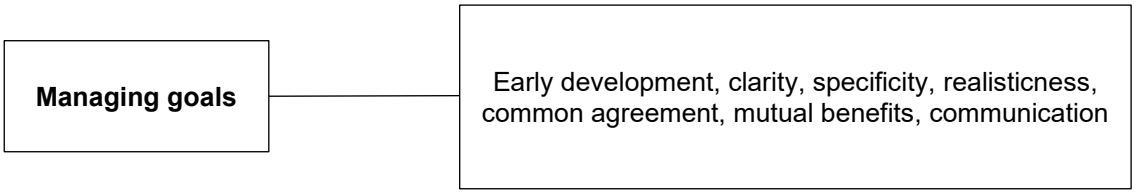

Figure 11 Central considerations for managing goals

As recapitulated in Figure 11, different features characterize well-managed goals. The preceding discussion confirms the importance of goals that are developed early, clear, specific, realistic, agreed together, beneficial for all project partners, shared and communicated. However, existing research examines on a superficial level how these characteristics are achieved and how goals are managed as a process.

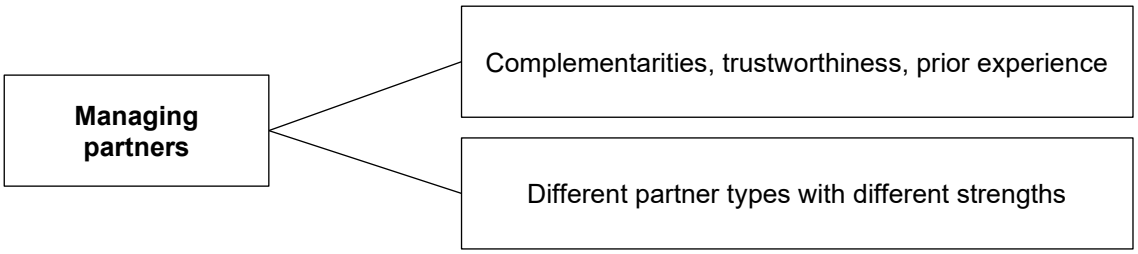

Figure 12 Central considerations for managing partners

Figure 12 shows that a major consideration about the key issue *partners* is the importance of complementarities, trustworthiness and prior partner-specific or general experience. Other features of desirable partners are reviewed in this section, too, but these three features could be argued to be the prominent themes. A second central consideration is the finding that different partner types have different competences, attributes and strengths. Hence, certain partner types are fitting for certain situations. While these two aspects have attracted scholarly attention, the partner selection process has been researched in a limited manner. Furthermore, the process framework reviewed is partly a theoretical construction and not how organizations necessarily select partners. Evidence indicates that the process framework may be burdensome to follow (Guertler & Lindemann 2016, 14). This entails fruitful opportunities for further research.

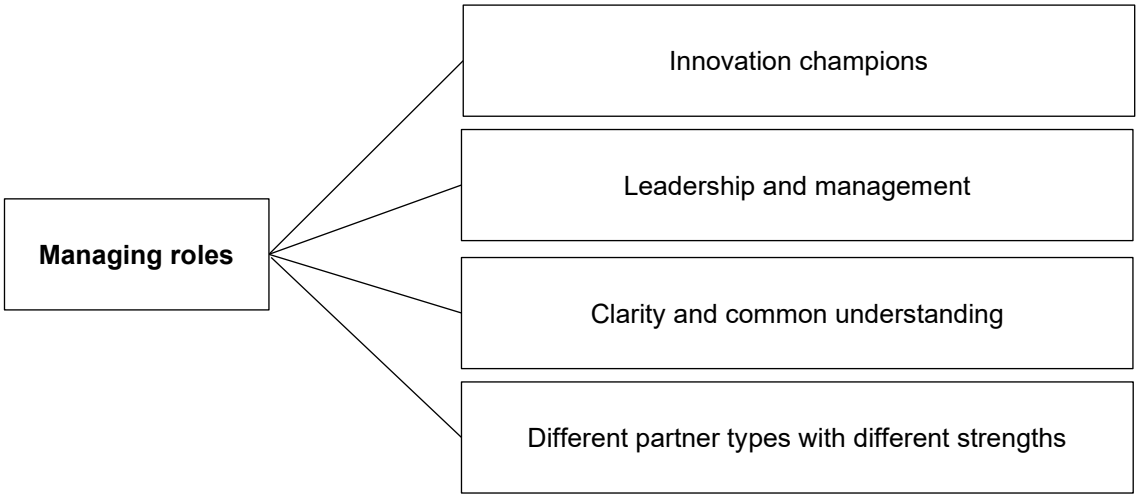

Figure 13 Central considerations for managing roles

Considering Figure 13 and *roles,* the central considerations can be captured in four remarks. First aspect is the innovation or knowledge champion role, which is crucial for an open innovation project. Secondly, leadership and management are vital. They extend from individual leadership characteristics to lead researcher roles and the commitment of senior management. However, it is challenging to make robust conclusions about the sharing of leadership and management. Thirdly, the articles remark that well-managed roles are characterized by clarity and common understanding. Lastly – and connected to *partners* – different partner types have different competences, attributes and strengths, implying differences in the ideal roles.

These findings conclude this section. Next, the emphasis is on the key issues *governance*, *control* and *social relationships.*

4.3.3 Governance, control and social relations

Governance and *control* are closely connected as indicated in Section 4.2. In turn, *social relations* links to both through relational governance and social control. Accordingly, the three key issues are considered here one after another, demonstrating the linkages.

To start with *governance*, the overall governance mode of an open innovation project can be roughly divided into contracts, open innovation platforms, non-equity partnerships and equity partnerships. The choice depends on several contingencies. When the innovation problem is simple and the sources or locations for needed knowledge are known, contracts work well due to the low requirements for communication and knowledge exchange. If

the required knowledge is more hidden, platforms are suitable. However, once the complexity of the innovation problem increases, partnerships become relevant. This occurs because of the interdependencies and high requirements for integration, which make communication and knowledge exchange vital. When the needed knowledge can be easily located, non-equity partnerships are the right option. Equity partnerships work better for hidden knowledge as in that case tasks cannot be decomposed with such ease and there are notable uncertainties. (Bagherzadeh et al. 2022, 287.) Nonetheless, there is also evidence that sometimes complexity and uncertainty can lead to increasing the number of utilized governance modes and reverting to rather modern modes, such innovation contests (Bagherzadeh et al. 2021, 309–310). All this links to openness depth that is explored in Section 4.3.1, because an equity partnership is assumably characterized by more depth than for example contracts.

In addition to these overall modes of governance, there are transactional and relational mechanisms that are utilized to govern a project of any mode. Several articles have concluded that both types of governance mechanisms are needed due to their complementary natures (Arranz & Arroyabe 2012, 584; Barbic et al. 2021, 181–182; Bosch-Sijtsema & Postma 2009, 67; Lehtimäki & Komulainen 2021, 22; Marullo et al. 2020, 217–219; Melander & Lakemond 2015, 124; Olander et al. 2010, 197; Parker 2012, 1628; Chin et al. 2011, 911). Relational mechanisms do not necessarily prevent opportunistic behavior and thus contractual mechanisms are also needed (Olander et al. 2010, 198–200). Inversely, relational mechanisms complement contractual mechanisms in situations that have not been anticipated in contracts (Olander et al. 2010, 198–200, Stefan et al. 2021, 147). If everything goes smoothly, contracts are viewed as a higher-level framework, but if the project begins to go wrong, contracts ensure some salvage value (Barbic et al. 2021, 181–182). Regarding the relationship with positive and negative knowledge flows, relational governance contributes to knowledge exchange (Parker 2012, 1626) and contractual mechanisms are negatively related with loss of knowledge (Ahlfänger et al. 2022, 110, 113; Parker 2012, 1627). Although equally important, sometimes these governance mechanisms require organizational separation to be effective due to their distinct characteristics. This is the case in uncertain projects where the demand for both mechanisms is higher. In these instances, the core project team is apt to devote themselves to relational governance and have the transactional questions taken

care of outside the development, for example by purchasing. (Melander & Lakemond 2015, 124.)

Despite this evidence on the benefits of combining both mechanisms, some contradictory findings exist, too. Empirical findings indicate that contractual mechanisms do not impact performance (Ahlfänger et al. 2022, 10, 13; Lu et al. 2017, 1634; Wu et al. 2017, 511), trust is not related to the sharing of resources (Pinheiro et al. 2016, 1531) and high trust is not necessarily needed for a successful innovation project while contracts and patent protection are (Bahemia et al. 2018, 2070, 2072–2073).

To go into further depths, the role of relational and contractual mechanisms may depend on certain factors. One example is the project stages. In the exploration phase knowledge sharing occurs more openly without the presence of detailed contracts, making relational governance more central. Contractual governance becomes more important in the development phase, alongside relational governance. Trust can be impaired by opportunistic behavior, which indicates the need for contractual mechanisms. Moreover, the relevance of intellectual property rights increases in the development phase. Trust is required in case of situations that have not been anticipated in the contracts. Considering the final phase of a project, the role of contractual governance increases and may even substitute relational mechanisms. The final phase is characterized by value capture which is enabled by contractual mechanisms. (Olander et al. 2010, 197–198.) Supporting evidence is remarked by other scholars (Faccin et al. 2016, 97; Sjödin et al. 2011, 231).

The optimal mechanism may also depend on project radicalness. Contractual governance is particularly effective for exploitation projects (Arranz & Arroyabe 2012, 584; Solís-Molina et al. 2020, 887), assumably because exploitation is characterized by low degree of ambiguity and unanticipated events (Solís-Molina et al. 2020, 889). For exploration projects the evidence if conflicting. Arranz and Arroyabe (2012, 584) find relational mechanisms more effective, but Solís-Molina et al. (2020, 887) conclude that specialization in either mechanism is the best approach. Other factors affecting the relative significance of the governance mechanisms are familiarity with partners and the importance of the partners' inputs. Contracts are not as crucial when the partner is familiar, but the more effort and input a partner invests in a project, the more important contracts become. (Lehtimäki & Komulainen 2021, 22.)

The focus now turns towards the question of how to create these governance mechanisms. Factors enabling the creation of trust include, for example, transparency (Stefan et al. 2021, 144–145; Westergren 2011, 239), clear roles and responsibilities, mutual value proposition (Westergren 2011, 239), equal treatment (Barnes et al. 2002, 279), common goal, avoiding exhaustive rules (Biswos & Akroyd 2016, 452–453), regular meetings (Canhoto et al. 2016, 90), open communication, becoming familiar through small projects (Barnes et al. 2002, 279; Canhoto et al. 2016, 90–91), geographic proximity (Gurca et al. 2021, 210) and time (Canhoto et al. 2016, 90; Polova & Thomas 2020, 236). Many of these factors are among the key issues discussed in this thesis.

Contract formulation has been researched more in depth but by fewer scholars: two articles with a contract-focus were identified. Some general findings are discussed here, but an interested reader should turn to the original articles for much more detailed information that is too extensive for the scope of this thesis. Firstly, empirical findings demonstrate that innovation projects are not effectively governed by traditional commercial contracts. For instance, such contracts do not consider one of the key issues of innovation, namely intellectual property – commercial contracts are often more focused on physical products. An appropriate contract for governing an innovation project is about "protecting IP, specifying product requirements, monitoring progress, describing deliverables". The superior contractual elements depend on the stage of the project, demand conditions, supplier dependency, consumer pressure and outsourcing level. (Preeker & Giovanni 2018, 1165, 1168–1169.) Supporting evidence indicates that emphasizing coordination in contracts together with intellectual property and contract breach safeguarding leads to high performance although the exact contractual configuration depends on whether the partners have collaborated before (Hofman et al. 2017, 752–753).

Similar to the relational and transactional governance mechanisms, the presence of control in its different forms characterizes open innovation projects (Ahlfänger et al. 2022, 113; Baggio et al. 2018, 11–16, 18; Couchman & Fulop 2009, 96; Bahemia et al. 2018, 2072; Dyball & Wang 2017, 23; Kim & Lee 2003, 72; Patrucco et al. 2022, 214–215; Chin et al. 2011, 912; Wang, Brunswicker & Majchrzak 2021, 861). Formal controls, such contracts, rules and reports, and social controls, such as culture, socialization, communication and traditions, both positively impact the outcomes of a project (Dyball & Wang 2017, 22–23). The relationship between complexity and overall project

performance is mediated by social and formal controls (Dyball & Wang 2017, 20–22), and organizations tend to opt for high formality in case of high complexity (Bagherzadeh et al. 2021, 310). Regarding uncertainty, formal controls mediate its relationship with performance (Dyball & Wang 2017, 20) and have been utilized relatively more in case of uncertain projects (Bagherzadeh et al. 2021, 310). In case of low uncertainty and non-crucial tasks the need for formal control diminishes somewhat (Bahemia et al. 2018, 2073). Outcome controls are positively related with performance, but with process control the relationship is shaped as an inverted U (Ahlfänger et al. 2022, 113–114). Another study finds that outcome and process control mechanisms mediate the relationship between openness and performance, although outcome control is not effective in highly complex projects. One explanation is that complexity challenges the effectiveness of standard control mechanisms. (Wang, Brunswicker & Majchrzak 2021, 853, 861.) In terms of the combination of intra and inter-organizational control, superior performance is achieved when both are practiced (Lu et al. 2017, 1634).

Despite the somewhat diverging findings, it could be concluded that different control mechanisms are beneficial. Yet, one study found that formal controlling and monitoring has no impact on performance (Barbosa et al. 2021, 134). Another article concludes that while formal planning, monitoring and controlling is suitable for market partners, it is not appropriate for science partners (Du et al. 2014, 837). It seems that too formal procedures and rules are not beneficial in innovation projects. Indeed, case study evidence shows that too close monitoring, excessive report requirements and detailed rules led to a lack of trust and low willingness to cooperate. The solution was focusing on relationship building and information sharing as well as adopting the stage-gate model in which activities are undertaken during the stages and outputs are assessed at the gates. The stage-gate model "allowed for a non-invasive check at pre-determined intervals" compared to the previously prominent continuous scrutiny. (Biswas & Akroyd 2016, 452–455.)

Supporting evidence is provided by research that addresses the balance between control and autonomy. Autonomy is beneficial for open innovation projects as long as it is moderated with the help of control and linked to the project goals (Johnson 2002, 400, 404). It contributes to knowledge creation (Johnson 2002, 400) and knowledge internalization since project employees prefer to have space for conducting innovative activities (Johnson & Johnston 2004, 105–106). The amount of autonomy warranted to a

person has been found to depend on their skill and experience level – the more skillful and experienced, the more autonomy a person can handle (Johnson 2002, 404).

These considerations are closely related to *social relations* towards which the attention is now directed. Central to this key issue is embeddedness or closeness with partners. On one hand, embedded relationships are considered beneficial (Kim & Lee 2003, 72), particularly with the most crucial project partner (Tranekjer & Søndergaard 2013, 220). On the other hand, embedded relationships can lead to decreased innovation novelty (Tranekjer & Søndergaard 2013, 224) or opportunistic behavior (Noordhoff et al. 2011, 45, 47–48). Thus, avoiding too close relationships functions "as an informal relational defense mechanism against the risk of the misappropriation of resources by external partners" (Bahemia et al. 2018, 2074). From here emerges the link between *social relationships*, *governance* and *control*: relationship formalization through transactional governance mechanisms and formal control as well as lengthier relationships contribute to positive outcomes in case of embedded relationships by decreasing opportunistic behavior (Noordhoff et al. 2011, 42–44; 47–48). Contradictory evidence exists about relationship-specific investments. One hand, they are found to reduce the negative influence of embedded relationships (Noordhoff et al. 2011, 45, 47–48). On the other hand, there is evidence that relationship-specific investments are not related to project performance (Dyball & Wang 2017, 21).

Another finding about social relationships is the usage of the different forms of social capital. While only one article explicitly addresses it, the finding is connected to several other key issues. When establishing an open innovation project, it is possible that only one dimension of social capital – cognitive or relational – is present. If the focal organization is an experienced collaborator, the cognitive dimension is strong and the organization has the ability to ensure shared language and consistent interpretations among the partners. If the focal organization has limited collaboration experience, it resorts to the relational dimension, mainly trust that is developed through long relationships. Yet, cognitive and relational social capital are both critical during the project. This indicates that a project built on cognitive social capital needs be complemented with relational social capital over time, and the opposite. (Steinmo & Rasmussen 2018, 1968-1973.) Although this finding is considered below *social relationships*, it is linked to *partners*, *governance* and *communication*.

While the discussion on the nature and interconnectedness of *governance*, *control* and *social relations* is extensive, it can be condensed into a limited number of considerations. Figures 14, 15 and 16 present them.

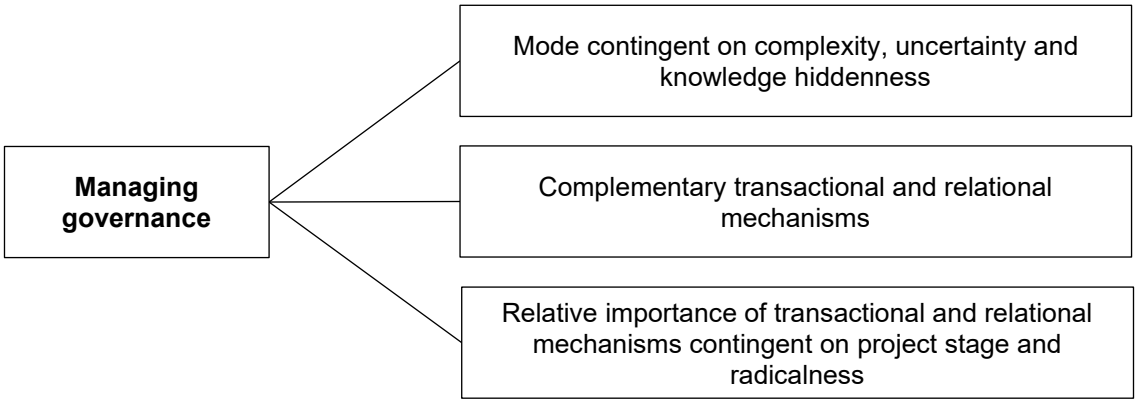

Figure 14 Central considerations for managing governance

Beginning with Figure 14 and *governance*, the overall governance mode has a contingent nature. Complexity, uncertainty and the hiddenness of knowledge all impact the optimal governance mode. Turning to governance mechanisms, relational and transactional methods complement each other. However, their relative importance differs depending on project stage and radicalness.

Figure 15 Central considerations for managing control

The considerations about *control* can arguably be consolidated into one principal as observed in Figure 15: the balance between control and autonomy. The analyzed studies highlight the significance of control in open innovation projects, but the conclusion is that excessive control harms rather than benefits projects. When balanced with autonomy, control fulfills the function it aims to have.

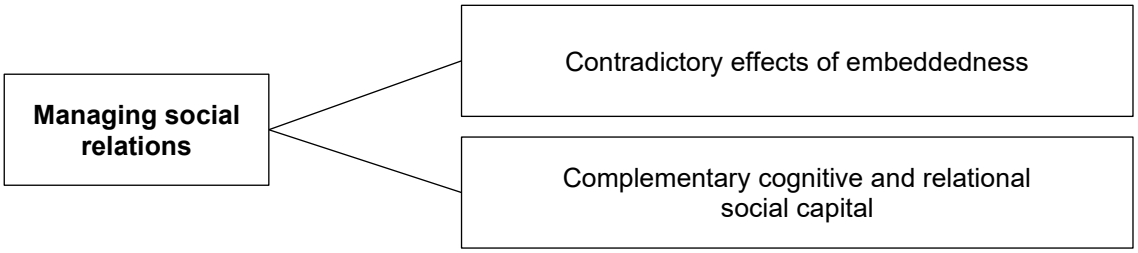

Figure 16 Central considerations for managing social relations

Lastly, Figure 16 presents the main considerations about *social relations.* The key issue is characterized by the contradictory effects of embeddedness. Embeddedness has potential positive and negative impacts, but there are also ways to mitigate the negative side. Moreover, cognitive and relational social capital are complementary. Both have their distinctive roles but at the same time they support each other. These two considerations conclude this section, and next, the key issues under analysis are *communication* and *knowledge flows*.

4.3.4 Communication and knowledge flows

A central consideration regarding *communication* is the balance between sufficient and excessive communication (Barnes et al. 2002, 278; Zanzouri & Francoigs 2013, 835). Different situations imply different levels of desirable communication. Frequent communication characterizes particularly the early days of a project (Baggio et al. 2018, 11, 13). Intensive communication has a positive impact on the outcomes of an open innovation project in case of high task uncertainty, high relational uncertainty (Yan & Dooley 2013, 532, 538), a radical innovation or a design-driven approach (Ates et al. 2015, 1528, 1533). Task uncertainty implies high complexity and novelty, and relational uncertainty refers to “a lack of prior coordination efforts”. If such uncertainty is not present in a project, intense communication is not needed but potentially a waste of resources. (Yan & Dooley 2013, 538.) Moreover, the characteristics of task uncertainty seem related to radical innovation, which strengthens the results of the individual studies.

A second observation is the importance of developing a shared language between the project participants (Canhoto et al. 2016, 90; Marullo et al. 2020, 216; Zanzouri & Francois 2013, 835–836). According to one study, participants from different

organizations and professions were not using the same concepts to describe the same things, making it crucial for the project to develop a common ground for terminology (Zanzouri & Francois 2013, 835–836).

Another stream of research has considered the choice of communication channel. Communication occurring face-to-face has been emphasized to be effective (Barnes et al. 2006, 399; Zanzouri & Francois 2013, 835; Terhorst et al. 2018, 14) although project novelty impacts the choice of channel. A comparative case study reveals that face-to-face interaction was prominent in a project characterized by a higher level of newness (Hsieh & Tidd 2012, 606). Email can also function as a good substitute for face-to-face communication as they have been found to similarly impact knowledge exchange (Thomas 2013, 896). While face-to-face is a rich way to communicate (Hsieh & Tidd 2012, 606; Thomas 2013, 896), email provides a straightforward, quick and cost-efficient way to communicate (Thomas 2013, 896). Rich communication not necessarily needed in every instance as simpler forms, such as documentation, have been adopted in case of lower innovation novelty (Hsieh & Tidd 2012, 606). Other information and communication technologies are not as clearly good as email. On one hand, video conferencing is found to have no impact on knowledge exchange, possibly because of the disadvantages related to missing cues and emotions and higher coordination requirements. Moreover, dependency on web-based tools, such as blogs, is found to be potentially harmful. (Thomas 2013, 896.) On the other hand, ICTs are praised (Steils et al. 2021, 170) and IT-enabled "social integration capability" – which moderates the relationship between knowledge distance and efficiency – is about email, conferencing tools and messaging tools (Cui et al. 2020, 237). Project partners are evidenced to actively resort to ICTs (Baggio et al. 2018, 11, 13, 15; Faccin et al. 2016, 97). Thus, there are mixed results about superior communication channels.

Design can be used to communicate, too. For example, storyboards, sketches and prototypes are more engaging and simpler to understand than written texts (Pedersen et al. 2022, 12–13, 15; Simeone et al. 2017, 1419, 1421). They can contribute to creating a shared language, be distributed through different communication channels, and vary from very accurate to more ambiguous (Simeone et al. 2017, 1419, 1421). To be specific, design is appropriate for representation, not documentation (Pedersen et al. 2022, 15).

These numerous critical considerations and decisions give credibility to the significance of a communications strategy which covers matters such as communication forms and meeting frequency (Barnes 2002, 278). More recent evidence provides additional insights. It is recognized that mechanistic, formal communication – which includes communication strategies – matters for project outcomes (Barbosa et al. 2020, 6, 9; Barnes et al. 2006, 400; Steils et al. 2021, 170). Yet, organic, informal communication is likewise critical (Barnes et al. 2006, 400; Steils et al. 2021, 170) or even more so than formal communication (Barbosa et al. 2020, 10; Barbosa et al. 2021, 134; Dietsch & Khemiri 2018, 21–22; Zanzouri & Francois 2013, 835). The benefits of informal communication include cost efficiency, speed, and effects on innovation quality (Dietsch & Khemiri 2018, 22). As Zanzouri and Francois (2013, 835) exemplify the contrast between formal and informal communication:

> Thus, finally, the meetings become a relatively sterile mechanism of coordination and communication in the exchange of information. To circumvent these problems, some actors opt for informal communication by creating their own mini-networks within the community of practice supposed to be formed of all actors involved in the project.

Because communication enables the flows of knowledge, the key issue *knowledge flows* is tightly connected. Knowledge flows are essential for open innovation projects. For instance, higher knowledge exchange leads to higher project effectiveness and efficiency (Thomas 2013, 896) and knowledge hiding and excessive protection are harmful (Sjödin et al. 2011, 234; Zhang & Min 2021, 20). Optimally, the knowledge flows come from all project partners evenly and not from certain partners. The ideal ratio of external knowledge inputs to the knowledge inputs of the focal organization is 40-50% since the relationship between the ratio and design quality is shaped as an inversed U. However, if the elements under development are not interdependent, evenly distributed knowledge flows and high knowledge ratio both hurt design quality. (Schmidt et al. 2021, 13–14.)

This indicates that knowledge flows must be enabled and nurtured. One central remark is that instead of acquiring the knowledge of project partners, it is beneficial to access (Bosch-Sijtsema & Postma 2009, 65, 67–69; Lawson & Potter 2012, 1239–1240; Steils et al. 2021, 167, 169) and combine (Bosch-Sijtsema & Postma 2009, 65, 67–69; Steils et al. 2021, 167, 169). Moreover, the different knowledge conversion processes – explicit-to-explicit, explicit-to-tacit, tacit-to-explicit and tacit-to-tacit – are more effective together than by their own (Johnson & Johnston 2004, 108). On a higher level, capacities

and capabilities are essential in enabling and exploiting knowledge flows (Cui et al. 2018, 583; Cui et al. 2020, 237; Faccin et al. 2019, 459; Lawson, Tyler & Potter 2015, 768, 770), and they result in concrete, lower-level practices (Faccin et al. 2019, 459; see also Faccin & Balestrin 2018, 40–41).

Although the past remarks concern the nurture and exploitation of knowledge flows, the balance between enabling and preventing these flows is crucial. Knowledge flows are not always desirable, and this makes "selective revealing" an effective approach (Bahemia et al. 2018, 2072; Marullo et al. 2020, 217; Stefan et al. 2021, 145). Retaining project employees and partners are other fundamental methods for preventing undesirable knowledge flows (Marullo et al. 2020, 217). If the project involves several competitors, one option is to include a different type of partner that functions as a mediator between the knowledge flows of the competitors (Rouyre & Fernandez 2019, 110–113; Smiljic 2020, 11, 14). This is considered in further depth in Section 4.3.2. Furthermore, distinguishing between what kinds of knowledge is worth protecting prevents wasting resources. Contrary to the widely shared understanding of the importance of protecting core knowledge, Frishammar et al. (2015, 84) describe:

> This means that, to have negative consequences rather than just being at the core, the knowledge must have either the ability to (1) decrease the focal firm's relative resource-produced value (effectiveness) or (2) increase its relative resource costs (efficiency) if used by an external party.

To conclude, both *communication* and *knowledge flows* can be encapsulated in a limited number of considerations. They are clarified in Figures 17 and 18.

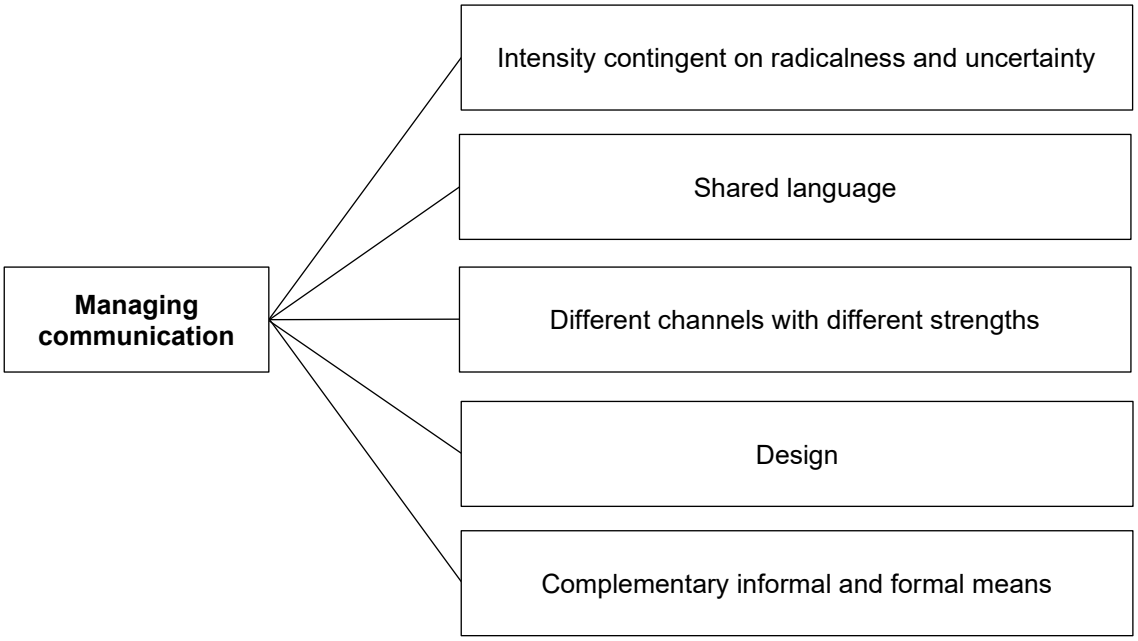

Figure 17 Central considerations for managing communication

Firstly, a central consideration about *communication* is its intensity. Based on the evidence presented in this section, intensity is contingent on radicalness and uncertainty. Additionally, shared language and design are essential, different communication channels have different strengths, and informal and formal communication complement each other.

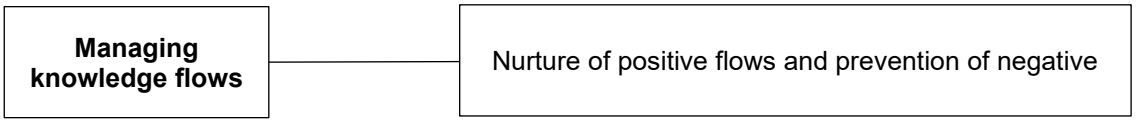

Figure 18 Central considerations for managing knowledge flows

In turn, managing *knowledge flows* can be condensed into one consideration: the nurture of positive flows and prevention of negative flows. Nurturing covers, for instance, inputs of knowledge, accessing and combining rather than acquiring, and capabilities. Prevention contains matters such as protecting certain knowledge and disclosing information selectively.

These remarks close this section on *communication* and *knowledge flows*. Next, the key issue *tensions* is the focus of attention.

4.3.5 Tensions

One of the *tensions* in collaborative projects is called equivocality (Eriksson et al. 2016, 691–692; Marcandella & Guèye 2018, 249, 255). Equivocality can harm perceived project performance (Eriksson et al. 2016, 700) but there are ways to manage it. Based on quantitative evidence, knowledge exploration mitigates equivocality. It is about reaching for more distant knowledge, requiring that differing perspectives are considered, and developing close relationships. Yet, knowledge exploration is not always optimal. When equivocality is not present, exploration leads to lower project performance. (Eriksson et al. 2016, 695, 700–701.) Something the research by Eriksson et al. (2016) does not consider is the question about the order of events in a project – the emergence of equivocality and the choice between exploration and exploitation.

The findings by Eriksson et al. (2016, 700–701) are somewhat supported by qualitative evidence. In one project equivocality was addressed by developing a questionnaire, the results of which clarified the conflicting interpretations. The results were discussed by the project team, differing viewpoints were reflected upon, and potential solutions were identified. This allowed turning the negative tensions into higher-level learning. (Marcandella & Guèye 2018, 255–256.) This equivocality resolution process resembles the benefits provided by knowledge exploration, which indicates that equivocality tensions are managed by considering the diverging perspectives and developing a common understanding as a project team.

A different kind of tension in an open innovation project is the dissemination of an uncertainty. It can be alleviated through evaluating and considering the causes, effects or protection. To be even more successful in mitigating the spreading of uncertainty, an open innovation project manager changes the assessment focus in a dynamic way, depending on each situation. (Gomes et al. 2021, 164–167.) A common cause for uncertainty dissemination is asymmetries (Gomes et al. 2021, 164; Stefan et al. 2021, 148). Such tensions can be caused by asymmetric information (Gomes et al. 2021, 164), resources, value capture or organizational cultures (Stefan et al. 2021, 148). Levelling the asymmetry in question has been found to be an effective solution (Stefan et al. 2021, 148).

Tensions are not always straightforward to tackle although the discussion so far may indicate so. Particularly hard tensions to solve are those that in essence are a bundle of

various tensions. In such cases, attempts of resolution may lead to new or persisting tensions. (Stefan et al. 2021, 149.)

Nonetheless, not every tension or strain has negative effects. According to one argument, task conflicts reduce the ambiguity and tacitness of knowledge (Mu et al. 244–245). A complete disregard of task conflicts may, however, have harmful consequences. Based on quantitative evidence, task conflicts have negative impacts on the creation of value through relationship conflicts (Yan & Wagner 2017, 11–12).

Viewing these distinct findings together enables deriving meaningful conclusions. They are presented in Figure 19.

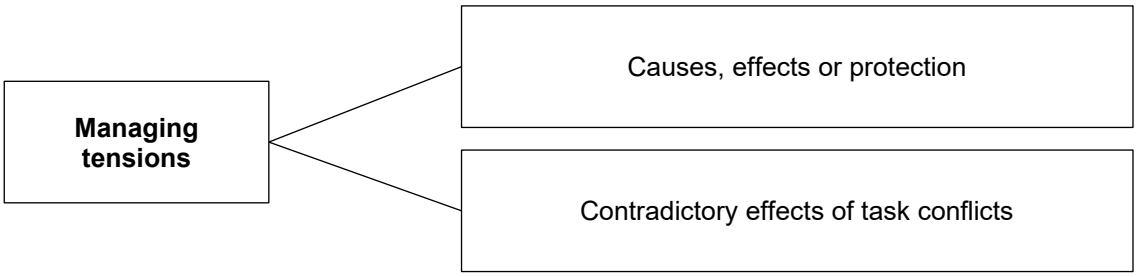

Figure 19 Central considerations for managing tensions

The first central consideration is the touchpoints between uncertainty and equivocality management. As the analysis reveals, examining causes and effects as well as developing protection against new or existing tensions is effective for both equivocality and uncertainty. The second consideration underlines the contradictory effects that task conflicts have. Nonetheless, this second finding is superficial, and little is known about the dynamics of the effects in open innovation projects.

Having contemplated on *tensions*, the next section considers the 11th and final key issue. Thus, the attention shifts to *outcomes*.

4.3.6 Outcomes

Many of the articles discussing *outcomes* share a common view: a well-managed open innovation project produces some value or benefits for all participants (Barnes et al. 2002, 281; Barnes et al. 2006, 400; Stefan et al. 2021, 144–145; Weck 2006, 260). Empirical evidence indicates that the lack of added value for a project partner contributed to the

failure of the project and that the partner would have appreciated a well-defined value proposition (Westergren 2011, 237–238). In addition to providing a distinct value proposition, one way to prove the project's value and keep the project partners content is achieving concrete results throughout the project (Barnes et al. 2002, 281):

> The importance placed on tangible outcomes stemmed predominantly from a need to demonstrate the value of a collaboration, and to justify the partners' investment in the project in terms of time and resources, to their board of directors or to the individual company representative's immediate superior.

Another empirical study shows that the question of outcomes was addressed in contracts. To formulate the contractual clauses, negotiations were needed. The goal was to evaluate the value and benefits of the new offering, including decreasing costs as well as increasing efficiency and customer satisfaction. Innovation-related expenses were calculated, too. Estimating these aspects led to an agreement about the price of the offering and the distribution of value, which were then defined in the contract. (Wagner & Sutter 2012, 955.)

The optimal distribution of realized value – in this case, profits – has been also examined If there is no clear leader, the distribution of profits for each partner should be associated with their relative significance for the project. Yet, the focal party might need to allow the profits to go the other partner to avoid holdups and secure good relations. If there is clear leadership and the project is not too complex, the profits should go to the leader. (Wang, Cen, Sun & Ying 2021, 1, 7, 10.)

Examining these findings collectively allows synthesizing and weaving them together. Figure 20 presents the central theme derived from managing *outcomes*: mutual value.

Figure 20 Central considerations for managing outcomes

Although the last finding about profit sharing could be viewed to conflict the remarks about mutual value, connections can also be observed. If an organization aims to encourage a partner to join a project that is assumably important to the focal organization,

it is essential that the partner perceives the project outcomes to be beneficial. One valuable outcome is a share of profits, which can be defined in contracts at the beginning of the project.

Concluding this section completes the discussion on the management of the 11 key issues. This implies that the answer to second sub-research question has been provided. Together with Section 4.2, the thesis's main research question can now be responded to.

5 Conclusions

To recall, this thesis examines open innovation project management through the research question *How are open innovation projects managed?* and its two sub-questions presented in Section 1.2. To provide an answer to this question, a systematic literature review was conducted, which led to the discovery of 11 key issues in open innovation projects and several considerations for managing the key issues. The findings have both theoretical contributions and practical implications.

5.1 Theoretical contribution

Although the findings contribute to theory as presented in Chapter 4, they remain loosely connected. A well-executed literature review is more than the sum of its parts and characterized by a coherent synthesis (Fisch & Block 2018, 105). Therefore, to advance the findings about the key issues and the considerations for managing the key issues towards a higher level of theoretical abstraction, it is necessary to synthesize them into a single framework. Figure 21 presents this framework.

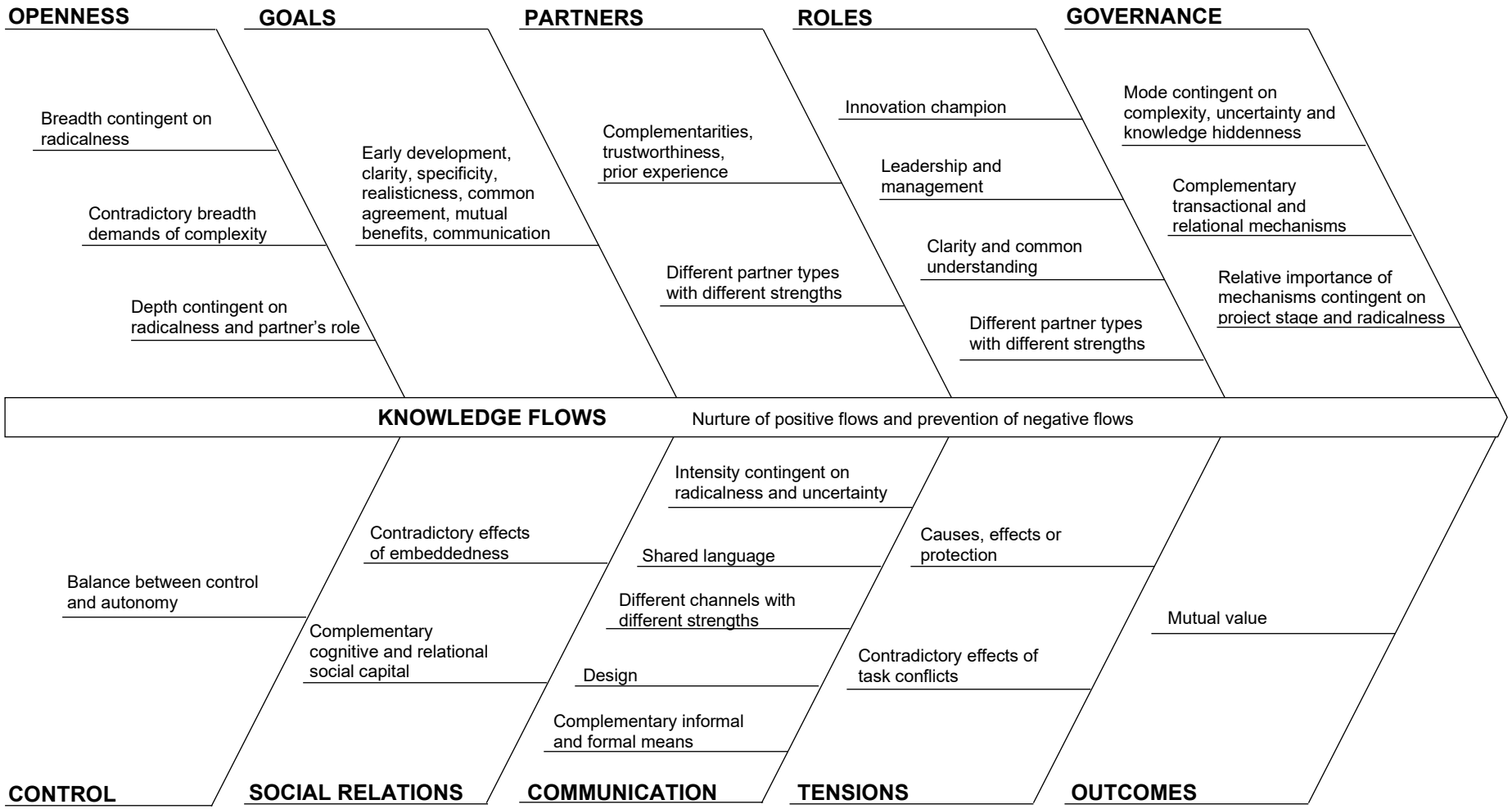

Figure 21 Synthesis on managing open innovation projects: Ten-to-one framework

The framework synthesizing the findings on open innovation project management, named as *Ten-to-one framework*, follows the structure of a fishbone diagram. The essence of the framework is one of the 11 key issues, *knowledge flows*, and the consideration about the nurture of positive flows and prevention of negative flows. As argued with the support of theory throughout the thesis, knowledge flows form the core of open innovation and, hence, open innovation projects. Without knowledge flows, open innovation does not occur. There are, however, ten other key issues and several considerations for managing the key issues. Based on the preceding analysis, it could be argued that the key issues *openness*, *goals*, *partners*, *roles*, *governance*, *control*, *social relations*, *communication*, *tensions* and *outcomes* as well as the related considerations are connected to each other and to *knowledge flows* as the framework illustrates. To exemplify this with some key issues, on one hand the presence of *tensions* and on the other hand their resolution impact *knowledge flows*. Inappropriate *governance* may at worst hinder and at best foster *knowledge flows*, and regarding *outcomes*, the lack of mutual value could stop *knowledge flows* fully. These are mere examples, and the connection to *knowledge flows* is arguably true for the other key issues, too.

Consequently, there are ten interlinked key issues in open innovation projects that connect to and support one additional key issue, the 11th, *knowledge flows*. Each key issue is linked to considerations for managing it. From this reasoning emerges the *Ten-to-one framework*, which is the final outcome of the thesis and the answer to the main research question.

The theoretical contribution of the thesis is twofold. Firstly, the findings contribute to scientific knowledge on open innovation. As stated in Section 1.1, open innovation spans across levels (Bogers et al. 2017, 10) but relatively little is known about open innovation at the level of projects (Bagherzadeh et al. 2021, 301; Markovic et al. 2021, 159). Project-level research on open innovation is regarded valuable because projects are a common setting for conducting innovation activities (Markovic et al. 2021, 159–160) but distinct projects have distinct characteristics (Bagherzadeh et al. 2021, 301; Markovic et al. 2021, 160). Accordingly, a better understanding on open innovation project management improves the understanding on open innovation (Markovic et al. 2021, 159–160). By examining open innovation project management and developing a coherent synthesis, this thesis contributes to a significant but relatively scantly researched phenomenon.

Secondly, the thesis contributes to knowledge on open innovation projects. The research was conducted as a systematic literature review, and as remarked in Section 3.1, the research approach has notable strengths. This systematic literature review on open innovation projects synthesizes existing knowledge on the topic, reveals avenues for further research, and, therefore, advances the knowledge frontiers of not only open innovation but also open innovation projects (cf. Fisch & Block 2018, 103–105; Pittaway 2008, 216). Furthermore, to the knowledge of the author no systematic literature review on open innovation project management has existed prior to this thesis. The methodological steps taken to arrive at this conclusion are explained in Section 3.2. That strengthens the importance of the thesis by proving its scientific novelty.

The contributions of the thesis can be highlighted by referring to the theoretical background and initial framework presented in Chapter 2. The findings complement the initial theoretical framework as demonstrated with italics in Figure 22.

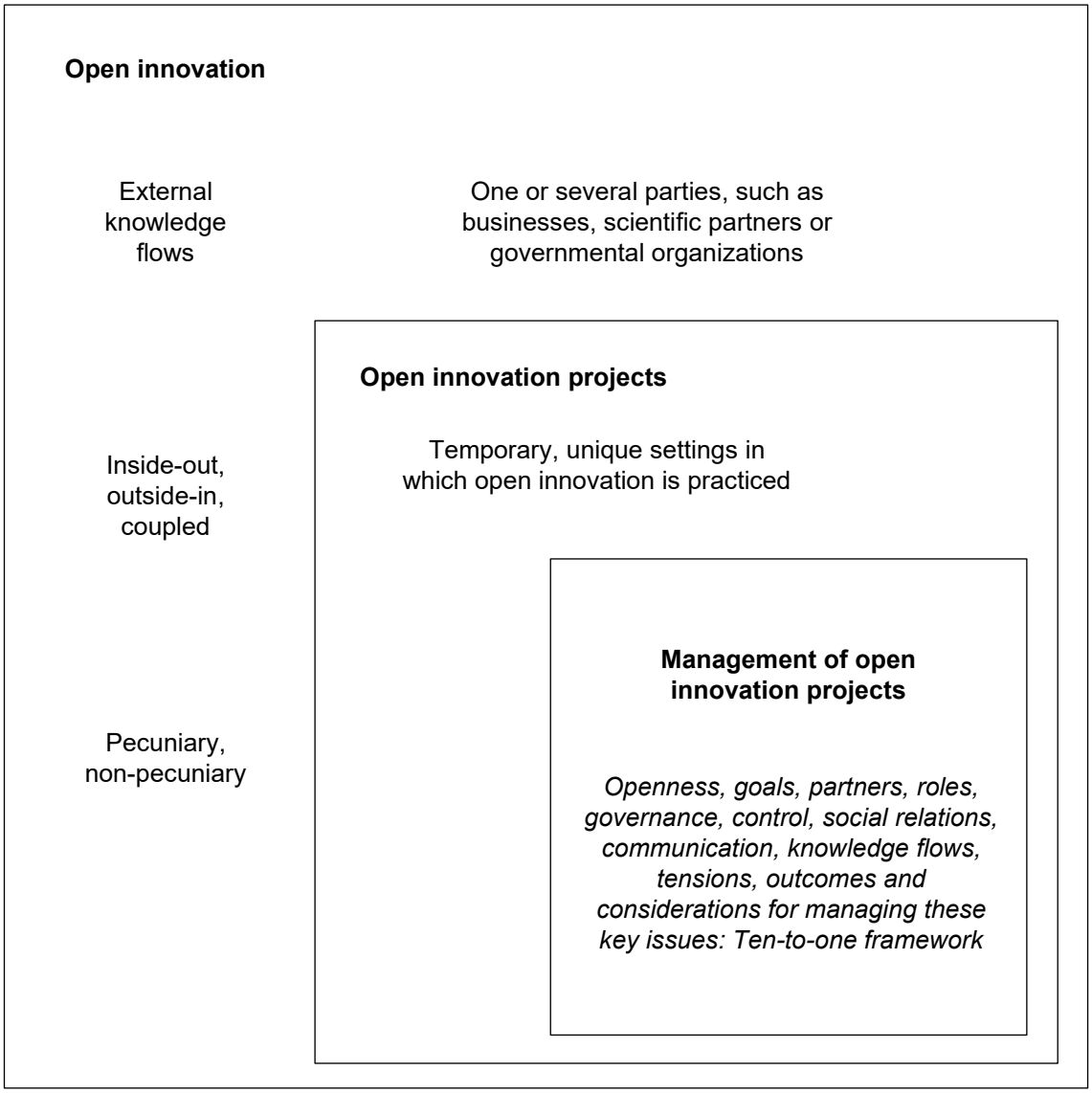

Figure 22 Revised theoretical framework

The initial and revised theoretical frameworks both have three elements: open innovation, open innovation projects, and management of open innovation projects. Starting with open innovation, Chapter 2 unveils its core features: external knowledge flows, cooperation with one or several external parties, conducted inside-out, outside-in or in a coupled mode, pecuniarily or non-pecuniarily. Regarding open innovation projects, Chapter 2 defines the term and emphasizes their role as temporary and unique settings for open innovation activities that are distinct from traditional projects.

Initially, the third element – management of open innovation projects – remained inexplicable and required further research. The synthesis of the research findings complements this third and innermost element. As illustrated in Figure 22, this element

about the management of open innovation projects resides within the research streams on open innovation projects and open innovation. Hence, examining the management of open innovation projects contributes to both streams.

Consequently, the findings of the review answer the research question of the thesis, complement the initial theoretical framework, and have contributions to theory in two significant ways. Nonetheless, the importance of the findings is not limited to theory. They also have implications for practice.

5.2 Practical implications

Because of its research question, the thesis has practical implications for the management of open innovation projects. Practitioners should pay specific attention to the identified key issues and respect the considerations for managing the key issues. Table 2 summarizes the key issues *openness*, *goals*, *partners*, *roles*, *governance*, *control*, *social relations*, *communication*, *knowledge flows*, *tensions* and *outcomes* as well as the practical implications connected to each key issue.

Table 2 Practical implications

Key issue	Practical implications
Openness	Radical projects benefit from a higher number of external partners types and deeper cooperation between partners compared to incremental projects. If a partner has a significant role in a project, deep cooperation with them is beneficial.
Goals	Goals should be developed early and agreed together, provide value for all partners, and be clear, specific, realistic and widely communicated.
Partners	Ideal partners have complementary competences, are trustworthy and have prior collaboration experience. Partner types should be determined by their strengths and the requirements of the project.

Table 2 Continued

Key issue	**Practical implications**
Roles	Roles should be clear and understood by all partners. The presence of innovation champions is beneficial. Leadership and management roles are crucial. Different partner types are suitable for different roles.
Governance	The appropriate mode depends on uncertainty, complexity and the hiddenness of required knowledge. Relational and transactional mechanisms are both required, but the emphasis should be determined by the project stage and radicalness.
Control	Control is required but should be balanced with autonomy.
Social relations	Embeddedness can be beneficial if its negative effects are mitigated. Cognitive and relational social capital are both required over the lifecycle of a project.
Communication	Projects which are characterized by high levels of radicalness and uncertainty benefit from intensive communication more than incremental, less uncertain projects. A shared language between partners is required. The appropriate channel depends on the communication demands of the project. Design facilitates communication. Informal and formal communication should both be present.
Knowledge flows	Positive knowledge flows should be nurtured and negative flows prevented.
Tensions	Tensions can be solved by evaluating causes, effects or protection.
Outcomes	The project should provide value for all participants.

While Table 2 presents the general implications, they can be specified to different audiences: project managers, project partners, investors and supporting bodies. Project managers should follow the practical implications when managing open innovation projects to achieve the best possible outcomes. Project partners often have some degree of power and possibilities to influence the project, and, therefore, they should from their part respect the practical implications in Table 2. In turn, investors may utilize the implications to evaluate and choose well-managed projects for investing and to potentially impact the management of the projects. Supporting bodies, such as government agencies, can foster open innovation projects by developing guidelines and identifying the aspects in which projects require specific support.

5.3 Limitations and future research avenues

Despite the theoretical contributions and practical implications of the research, some limitations can be recognized. Firstly, the choice of database and search string impact the findings. Nonetheless, it is believed that an appropriate database and search string were chosen as argued in Section 3.2. The database, EBSCO Business Source Complete, has a notable coverage of business-related journals and articles, and the search string was determined based on the scoping review. A second limitation is the number of scientific articles included in the review. Analyzing 98 studies inevitably implies some degree of superficiality. Nevertheless, the large number of articles has certain strengths: synthesizing the central themes over years of research becomes possible, and higher-level abstraction can be achieved.

There are also several avenues for further research. Some suggestions are presented in the form of research questions in Table 3.

Table 3 Future research avenues

Key issue	Future research avenues
Openness	How are the contradictory demands of complexity for openness breadth balanced in open innovation projects?
Goals	How are goals managed as a process in open innovation projects?
Partners	How do organizations approach the partner selection process in open innovation projects?
Roles	How is shared leadership and management implemented in open innovation projects?
Governance	What are the benefits and challenges of utilizing various governance modes in open innovation projects?
Control	How is the balance between control and autonomy achieved in open innovation projects?
Social relations	Which project attributes determine whether embedded relationships are beneficial?
Communication	How is shared language created in open innovation projects?
Knowledge flows	What actions mitigate the negative effects of knowledge loss in open innovation projects once occurred?
Tensions	How are the contradictory effects of task conflicts managed in open innovation projects?
Outcomes	What kind of value do partners capture in open innovation projects?

Regarding *openness*, the contradictory demands for breadth that project complexity has indicates the importance of examining how those demands are balanced. As for *goals,* only superficial knowledge exists about the goal setting process and future research could examine how goals are determined, aligned and communicated. More could be researched about the process to select *partners*, too. A process framework for partner selection exists but since evidence indicates that it may be burdensome to follow (Guertler & Lindemann 2016, 14), further research is warranted. Concerning *roles*, shared leadership and management is sometimes beneficial and practiced, but additional research could be conducted to investigate how the sharing is implemented.

Fruitful future research opportunities exist in terms of *governance*, *control* and *social relations*, too. Combining several governance modes is possible, but what are the benefits and challenges of such approach? The amount of control and autonomy granted may be determined case-by-case at the level of an individual or a partnering organization, but how are the control-autonomy configurations that differ between individuals or organizations balanced as a whole? Lastly, what project attributes determine whether embedded relationships are beneficial? Embeddedness has advantages and disadvantages, and some of the negative impacts can be mitigated. Nonetheless, future research could determine if embeddedness has positive impacts in all projects or whether there are some project attributes that impact the value of embedded relationships, and if so, what those project attributes are.

With regards to *communication*, the central considerations remark the importance of shared language, and the mechanisms or process to achieve that could deserve further attention. The two main considerations about *knowledge flows* are nurturing positive flows and preventing negative flows, but the actions to mitigate the negative impacts of knowledge loss once it has occurred is a novel avenue as remarked by Frishammar et al. (2015, 85). As to *tensions*, it could be explored how the contradictory effects of task conflicts are managed, since only quantitative evidence revealing the effects was identified in the review. Lastly about *outcomes*, while the significance of shared value is acknowledged, there is room for further research on the kinds of value project partners capture in addition to profits.

6 Summary

Innovation is a requisite in the dynamic business environment that today's world is characterized by. However, it is no longer sufficient to conduct innovation activities within the borders of a single organization. Opening the activities to external knowledge flows enables combining the strengths of different parties and achieving superior innovation outcomes. The research stream associated with this phenomenon is open innovation, which is the focus of this thesis. More specifically, since there is a need to further research open innovation at the level of projects, the research question of thesis is: *How are open innovation projects managed?* To answer this question, the key issues in open innovation projects as well as the considerations for managing the key issues are examined through a systematic literature review.

The theoretical framework that functions as the basis of the systematic review consists of three elements. The first and highest-level element is open innovation, which refers to utilizing the knowledge flows of external partners in innovation. The second element that falls below open innovation is open innovation projects. They are temporary and unique settings for conducting open innovation activities. The third element that is inner to the other two is open innovation project management, which is the focus of the thesis.

The utilized research approach, a systematic literature review, analyzes and synthesizes existing knowledge and future research avenues on the topic in a transparent and systematic manner. The review was conducted as a convergent qualitative synthesis, synthesizing both qualitative, quantitative and mixed method studies. The main steps in the research process included formulating the research question, locating 348 articles on EBSCO Business Source Complete, choosing and assessing the articles, analyzing and synthesizing 98 articles of the initial 348, and finally presenting the results.

The results of the systematic review revealed 11 key issues: *openness*, *goals*, *partners*, *roles*, *governance*, *control*, *social relations*, *communication*, *knowledge flows*, *tensions* and *outcomes*. Moreover, various considerations for managing these key issues were identified. These findings were combined into a novel framework that synthesizes existing knowledge on open innovation project management.

The thesis has both theoretical contributions and practical implications. Regarding the former, the findings contribute to research on open innovation since relatively less is

known about it at the project-level. The thesis also contributes to research on open innovation projects as the systematic review synthesizes existing knowledge and proposes future research avenues, thus advancing the research stream. In turn, the practical implications of the findings provide recommendations for project managers, project partners, investors, and supporting organizations.

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Appendices

Appendix 1 Search string for locating the articles

”open innovation project*” OR ”open R&D project*” OR “open research and development project*” OR “open NPD project*” OR “open new product development project*” OR ”collaborative innovation project*” OR ”collaborative R&D project*” OR “collaborative research and development project*” OR “collaborative NPD project*” OR “collaborative new product development project*” OR ”cooperative innovation project*” OR ”cooperative R&D project*” OR “cooperative research and development project*” OR “cooperative NPD project*” OR “cooperative new product development project*” OR ”co-operative innovation project*” OR ”co-operative R&D project*” OR “co-operative research and development project*” OR “co-operative NPD project*” OR “co-operative new product development project*” OR ”interorgani* innovation project*” OR ”interorgani* R&D project*” OR “interorgani* research and development project*” OR “interorgani* NPD project*” OR “interorgani* new product development project*” OR ”inter-organi* innovation project*” OR ”inter-organi* R&D project*” OR “inter-organi* research and development project*” OR “inter-organi* NPD project*” OR “inter-organi* new product development project*” OR ”interfirm innovation project*” OR ”interfirm R&D project*” OR “interfirm research and development project*” OR “interfirm NPD project*” OR “interfirm new product development project*” OR ”inter-firm innovation project*” OR ”inter-firm R&D project*” OR “inter-firm research and development project*” OR “inter-firm NPD project*” OR “inter-firm new product development project*” OR ”joint innovation project*” OR ”joint R&D project*” OR “joint research and development project*” OR “joint NPD project*” OR “joint new product development project*” OR “co-innovation project*” OR (“open innovation” AND “project*”)

Appendix 2 Articles included in the systematic literature review

Article title	Author(s)	Journal	Year
Aligning technical and business goals in industry-university collaborative R&D projects: A tale of two projects	Johnson & Johnston	Engineering Management Journal	2001
Assessing organizational knowledge creation theory in collaborative R&D projects	Johnson	International Journal of Innovation Management	2002

Article title	Author(s)	Journal	Year
Effective university-industry interaction: A multi-case evaluation of collaborative R&D projects	Barnes, Gibbons & Pashby	European Management Journal	2002
Technological collaboration in the Korean electronic parts industry: Patterns and key success factors	Kim & Lee	R&D Management	2003
Organisational knowledge creating processes and the performance of university-industry collaborative R&D projects	Johnson & Johnston	International Journal of Technology Management	2004
Knowledge creation and exploitation in collaborative R&D projects: Lessons learned on success factors	Weck	Knowledge & Process Management	2006
Managing collaborative R&D projects: Development of a practical management tool	Barnes, Pashby & Gibbons	International Journal of Project Management	2006
Cooperative innovation projects: Capabilities and governance mechanisms	Bosch-Sijtsema & Postma	Journal of Product Innovation Management	2009
Examining partner experience in cross-sector collaborative projects focused on the commercialization of R&D	Couchman & Fulop	Innovation: Management, Policy & Practice	2009
A contingent perspective of open innovation in new product development projects	Bahemia & Squire	International Journal of Innovation Management	2010
Increasing learning and time efficiency in interorganizational new product development teams	Bstieler & Hemmert	Journal of Product Innovation Management	2010
The dynamics of relational and contractual governance mechanisms in knowledge sharing of collaborative R&D projects	Olander, Hurmelinna-Laukkanen, Blomqvist & Ritala	Knowledge & Process Management	2010
Open innovation in process industries: A lifecycle perspective on development of process equipment	Sjödin, Eriksson & Frishammar	International Journal of Technology Management	2011
Opening up innovation: The impact of contextual factors on the co-creation of IT-enabled value adding services within the manufacturing industry	Westergren	Information Systems & e-Business Management	2011

Article title	Author(s)	Journal	Year
Project management methodology for university-industry collaborative projects	Chin, Yap & Spowage	Revista de Management Comparat International	2011
The bright side and dark side of embedded ties in business-to-business innovation	Noordhoff, Kyriakopoulos, Moorman, Pauwels & Dellaert	Journal of Marketing	2011
A qualitative investigation of innovation between third-party logistics providers and customers	Wagner & Sutter	International Journal of Production Economics	2012
Determinants of knowledge transfer in inter-firm new product development projects	Lawson & Potter	International Journal of Operations & Production Management	2012
Effect of formal contracts, relational norms and trust on performance of joint research and development projects	Arranz & Arroyabe	British Journal of Management	2012
Knowledge acquisition and leakage in inter-firm relationships involving new technology-based firms	Parker	Management Decision	2012
Open versus closed new service development: The influences of project novelty	Hsieh & Tidd	Technovation	2012
Communication intensity, goal congruence, and uncertainty in buyer–supplier new product development	Yan & Dooley	Journal of Operations Management	2013
Innovation intermediaries: A process view on open innovation coordination	Katzy, Turgut, Holzmann & Sailer	Technology Analysis & Strategic Management	2013
Knowledge management practices within a collaborative R&D project: Case study of a firm in a cluster of railway industry	Zanzouri & Francois	Business Process Management Journal	2013
Sources of innovation, their combinations and strengths: Benefits at the NPD project level	Tranekjer & Søndergaard	International Journal of Technology Management	2013
Supplier integration in new product development: Computer mediated communication, knowledge exchange and buyer performance	Thomas	Industrial Marketing Management	2013
When does search openness really matter? A contingency	Salge, Farchi, Barrett & Dopson	Journal of Product	2013

Article title	Author(s)	Journal	Year
study of health-care innovation projects		Innovation Management	
Approaches to networked innovation	Maurer & Valkenburg	International Journal of Innovation & Technology Management	2014
Factors for selecting partners in innovation projects: Evidences from alliances in the Brazilian petrochemical leader	Garcez, Sbragia & Kruglianskas	Revista de Administração e Inovação	2014
Innovation promoters: A multiple case study	Goduscheit	Industrial Marketing Management	2014
Managing open innovation projects with science-based and market-based partners	Du, Leten & Vanhaverbeke	Research Policy	2014
Organizing for open innovation: Incorporating the externality of control with diversity of contribution	Oberoi, Haon & Freitas	M@n@gement	2014
Governance of supplier collaboration in technologically uncertain NPD projects	Melander & Lakemond	Industrial Marketing Management	2015
Improving supplier new product development performance: The role of supplier development	Lawson, Krause & Potter	Journal of Product Innovation Management	2015
Inter-organizational coordination patterns in buyer-supplier-design agency triads in NPD projects	Ateş, Van Den Ende & Ianniello	International Journal of Operations & Production Management	2015
Strategic suppliers' technical contributions to new product advantage: Substitution and configuration options	Lawson, Tyler & Potter	Journal of Product Innovation Management	2015
The dark side of knowledge transfer: Exploring knowledge leakage in joint R&D projects	Frishammar, Ericsson & Patel	Technovation	2015
Identifying open innovation partners: A methodology for strategic partner selection	Guertler & Lindemann	International Journal of Innovation Management	2016
Managing interorganizational innovation projects: Mitigating the negative effects of equivocality through knowledge search strategies	Eriksson, Patel, Sjödin, Frishammar & Parida	Long Range Planning	2016

Article title	Author(s)	Journal	Year
The co-production of value in digital, university–industry R&D collaborative projects	Canhoto, Quinton, Jackson & Dibb	Industrial Marketing Management	2016
The governance of inter-firm co-development projects in an open innovation setting	Biswas & Akroyd	Pacific Accounting Review	2016
The joint R&D project: The case of the first Brazilian microcontroller chip	Faccin, Balestrin & Bortolaso	Revista de Administração	2016
The role of social capital towards resource sharing in collaborative R&D projects: Evidences from the 7th framework programme	Pinheiro, Serôdio, Pinho & Lucas	International Journal of Project Management	2016
Do what and with whom? Value creation and appropriation in inter-organizational new product development projects	Yan & Wagner	International Journal of Production Economics	2017
Governing collaborative new product development: Toward a configurational perspective on the role of contracts	Hofman, Faems & Schleimer	Journal of Product Innovation Management	2017
Impact of specific investments, governance mechanisms and behaviors on the performance of cooperative innovation projects	Wu, Wang & Chen	International Journal of Project Management	2017
Knowledge translation mechanisms in open innovation: The role of design in R&D projects	Simeone, Secundo & Schiuma	Journal of Knowledge Management	2017
Open innovation: On the influence of internal and external collaboration on degree of newness	Lassen & Laugen	Business Process Management Journal	2017
The interaction effect between intra-organizational and inter-organizational control on the project performance of new product development in open innovation	Lu, Yuan & Wu	International Journal of Project Management	2017
The links among characteristics, controls and performance of inter-firm innovation projects	Dyball & Wang	International Journal of Innovation Management	2017
Coordinating innovation projects with high tech suppliers through contracts	Preeker & Giovanni	Research Policy	2018
Coordination mechanisms of collaborative R&D projects in small and medium enterprises	Baggio, Wegner & Dalmarco	Revista de Administração Mackenzie	2018

Article title	Author(s)	Journal	Year
Emergence of innovation champions: Differences in the R&D collaboration process between science and industry	Hamadi, Leker & Meerholz	International Journal of Innovation Management	2018
Exploring ideation and implementation openness in open innovation projects: IT-enabled absorptive capacity perspective	Cui, Wu & Tong	Information & Management	2018
Impact of the use of knowledge obtained through informal exchanges on the performance of innovation projects: For the enrichment of inbound open innovation practices	Dietsch & Khemiri	International Journal of Innovation Management	2018
Tacit knowledge sharing in open innovation projects	Terhorst, Lusher, Bolton, Elsum & Wang	Project Management Journal	2018
Tensions in collaborative innovation projects and higher-level learning	Marcandella & Guèye	Learning Organization	2018
The dynamics of collaborative practices for knowledge creation in joint R&D projects	Faccin & Balestrin	Journal of Engineering & Technology Management	2018
The interplay of cognitive and relational social capital dimensions in university-industry collaboration: Overcoming the experience barrier	Steinmo &Rasmussen	Research Policy	2018
The timing of openness in a radical innovation project, a temporal and loose coupling perspective	Bahemia, Sillince & Vanhaverbeke	Research Policy	2018
Advancing large-scale R&D projects towards grand challenges through involvement of organizational knowledge integrators	Knudsen, Tranekjer & Bulathsinhala	Industry & Innovation	2019
Attracting solutions in crowdsourcing contests: The role of knowledge distance, identity disclosure, and seeker status	Pollok, Lüttgens & Piller	Research Policy	2019
Knowledge-based dynamic capabilities: A joint R&D project in the French semiconductor industry	Faccin, Balestrin, Martins & Bitencourt	Journal of Knowledge Management	2019
Managing knowledge sharing-protecting tensions in coupled	Rouyre & Fernandez	California Management Review	2019

Article title	Author(s)	Journal	Year
innovation projects among several competitors			
More is not always better: Effects of collaboration breadth and depth on radical and incremental innovation performance at the project level	Kobarg, Stumpf-Wollersheim & Welpe	Research Policy	2019
The role of online leadership in open collaborative innovation: Evidence from blockchain open source projects	Mu, Bian & Zhao	Industrial Management & Data Systems	2019
Toward an optimal degree of openness in IT innovation projects	Bürger & Moser	R&D Management	2019
When agility meets open innovation: Two approaches to manage inbound projects	Pellizzoni, Trabucchi & Buganza	Creativity & Innovation Management	2019
Beyond the dyad: Role of non-competitive partners in coopetitive R&D projects	Smiljic	International Journal of Innovation Management	2020
Coordination approaches to foster open innovation R&D projects performance	Barbosa, Salerno, Brasil & Nascimento	Journal of Engineering & Technology Management	2020
Governance and performance in co-exploitation and co-exploration projects	Solís-Molina, Hernández-Espallardo & Rodríguez-Orejuela	Journal of Business & Industrial Marketing	2020
How to perform collaborative servitization innovation projects: The role of servitization maturity	Polova & Thomas	Industrial Marketing Management	2020
Is open innovation always the best for SMEs? An exploratory analysis at the project level	Marullo, Minin, Marco & Piccaluga	Creativity & Innovation Management	2020
Managing knowledge distance: IT-enabled inter-firm knowledge capabilities in collaborative innovation	Cui, Tong, Teo & Li	Journal of Management Information Systems	2020
Network embeddedness in exploration and exploitation of joint R&D projects: A structural approach	Arranz, Arroyabe & Arroyabe	British Journal of Management	2020
Structuring inter-organizational R&D projects: Towards a better understanding of the project architecture as an interplay between activity coordination and knowledge integration	Klessova, Thomas & Engell	International Journal of Project Management	2020

Article title	Author(s)	Journal	Year
Antecedents of success in a research and development consortium	Dominguez-Blanco, Castro-Abancéns & Cepeda-Carrion	International Journal of Innovation Management	2021
Configurations of project management practices to enhance the performance of open innovation R&D projects	Barbosa, Salerno, Nascimento, Albala, Maranzato & Tamoschus	International Journal of Project Management	2021
Exploring the enabling effects of project management for SMEs in adopting open innovation: A framework for partner search and selection in open innovation projects	Guertler & Sick	International Journal of Project Management	2021
Knowledge search breadth and depth and OI projects performance: A moderated mediation model of control mechanism	Wang, Brunswicker & Majchrzak	Journal of Knowledge Management	2021
Managing open innovation: A project-level perspective	Bagherzadeh, Markovic & Bogers	IEEE Transactions on Engineering Management	2021
Managing the challenges of business-to-business open innovation in complex projects: A multi-stage process model	Gurca, Bagherzadeh, Markovic & Koporcic	Industrial Marketing Management	2021
Matching co-innovation project types to diverse customer relationships: Perspective of an industrial technology supplier	Lehtimäki & Komulainen	International Journal of Innovation & Technology Management	2021
Opening and closing open innovation projects: A contractual perspective	Barbic, Jolink, Niesten & Hidalgo	Industrial Marketing Management	2021
Optimal distribution of profit and leadership for sustainable collaborative R&D projects	Wang, Cen, Sun & Ying	Journal of Cleaner Production	2021
Performance implications of knowledge inputs in inter-organisational new product development projects: The moderating roles of technology interdependence	Schmidt, Yan, Wagner & Lucianetti	International Journal of Production Research	2021
Playing chess or playing poker? Assessment of uncertainty propagation in open innovation projects	Gomes, Lopez-Vega & Facin	International Journal of Project Management	2021

Article title	Author(s)	Journal	Year
Research on the NPD coordination, knowledge transfer process and innovation performance of interfirm projects in China	Zhang & Min	Asia Pacific Journal of Management	2021
The effects of inbound open innovation, outbound open innovation, and team role diversity on open source software project performance	Tang, Fisher & Qualls	Industrial Marketing Management	2021
The influence of design thinking on open innovation	Loderer & Kock	International Journal of Innovation Management	2021
The role of task conflict in cooperative innovation projects: An organizational learning theory perspective	Mu, Yang, Zhang, Lyu & Deng	International Journal of Project Management	2021
Trajectories towards balancing value creation and capture: Resolution paths and tension loops in open innovation projects	Stefan, Hurmelinna-Laukkanen & Vanhaverbeke	International Journal of Project Management	2021
Urban crowdsourcing: Stakeholder selection and dynamic knowledge flows in high and low complexity projects	Steils, Hanine, Rochdane & Hamdani	Industrial Marketing Management	2021
Balancing knowledge sharing with protecting: The efficacy of formal control in open innovation projects	Ahlfänger, Gemünden & Leker	International Journal of Project Management	2022
Characteristics of supplier performance measurement systems in collaborative innovation projects: The role of the purchasing department	Patrucco, Frattini & Di Benedetto	Supply Chain Management	2022
Navigating collaborative open innovation projects: Staging negotiations of actors' concerns	Pedersen, Bogers & Clausen	Creativity & Innovation Management	2022
Partner technological heterogeneity and innovation performance of R&D alliances	Zhang, Li & Li	R&D Management	2022
Problem types and open innovation governance modes: A project-level empirical exploration	Bagherzadeh, Gurca & Brunswicker	IEEE Transactions on Engineering Management	2022