It is evident that innovations are needed for advancing the ecological and social sustainability, as well as improving the productivity of the industry. However, the fragmentation of the industry, the dominant business logic of the industry, and the linear operational mode impede flexibility and adaptation of urban structures and related development processes. This dissertation set out to create a better understanding of the factors that either promote or hamper the creation of innovations in the built environment. Specifically, it examines the dynamics of value creation and capture as the key motivational factors for firms to innovate in inter-firm collaboration in the built environment sector. This dissertation also explores conceptualisations of networked innovation; particularly, the benefits of business ecosystem and business models’ concepts as an analytical lens and consequently in managing innovations is explored. The results demonstrate the central role of aligned value creation and capture logics in the formation of network governance systems and their influence on value creation at multiple levels of analysis. The ecosystem concept provides a novel framework for analysing networked value creation in the built environment and allowing the incorporation of project development and use phases into the analysis. The dissertation also adds to the general management literature on business models by introducing risk as a potential new value driver. For practitioners, the findings provide tangible recommendations on how to increase the success of inter-firm collaboration in capital-intensive industries.
Are we really into it?

The role of the dynamics of value creation and capture in inter-firm collaboration in the built environment

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Abstract

This dissertation set out to create a better understanding of the factors that either promote or hamper the creation of innovations in the built environment. Specifically, it examines the dynamics of value creation and capture as the key motivational factors for firms to innovate in inter-firm collaboration in the built environment sector. The dissertation also explores conceptualisations of networked innovation; focusing on the benefits of business ecosystem and business models' concepts as an analytical lens and consequently in managing innovations.

The scope of the research includes both construction and use phases of the built environment life cycle. Concepts of ecosystem and business model as an activity system are used to analyse the value creation and subsequent value capture in built environment sector networks. A mixed methods design is employed. The qualitative component consists of studies that follow a multiple, single and comparative case study designs. The quantitative component consists of a study using survey data. The analysis of the survey is explorative in nature and all inferences are based on descriptive statistics.

Based on the findings of three studies, this dissertation argues that the complementary or similar value creation and capturing dynamics of participants, i.e. shared logic, have the key role in determining the quality of collaboration of built environment sector networks. They improve governance and reduce complexity related to innovations. However, the environment in which the network firms operate, at the permanent network level, set the boundary conditions on how these incentives may be formed. Of these, legitimacy and perceptions on risk and risk management capabilities are the most notable. The public sector authorities specifically seem to be ill equipped to promote shared logic in the built environment networks. The dissertation also concludes that when managing innovations in the built environment sector, the current project-based conceptualisations of value creation and capture could be complemented with an ecosystem and business model approach.

The results contribute to the current network management theories on how the different motivations of parties may have different impact on the choices made in the networks. It also demonstrates how the value creation and capturing processes are separated at different network levels, and temporally. For the industry specific literature, the ecosystem and business model concepts provide a novel framework for analysing networked value creation and capture and managing collaboration in the built environment. For practitioners, the dissertation provides guidance on the key success factors of project networks and demonstrates the importance of public actors as active participants in constraining, steering and participating to value creation in the built environment.

Keywords  Innovation, Built Environment, Network, Ecosystem, Business model

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Väitöskirjan tavoitteena on lisätä ymmärrystä tekijöistä, jotka tukevat tai heikentävät innovaatioiden syntymistä rakennetussa ympäristössä. Erityisesti se tarkastelee arvon luonnin ja arvon ansainnan välisen dynamiikan keskeisenä innovaatiosin vaikuttavana motivaatiokäskijänä yritysten välisessä yhteistyössä rakennetun ympäristön toimialalla. Lisäksi tutkimuksessa arvioidaan liiketoimintaekosysteemi- ja liiketoimintamallien etuja rakennetun ympäristön innovaatioiden analysoinnissa ja johtamisessa.


Avainsanat
Innovaatio, Rakennettu ympäristö, Verkosto, Ekosysteemi, Liiketoimintamalli


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# Contents

1. Introduction ......................................................................................................................... 9  
   1.1 Motivation and background ............................................................................................ 9  
   1.2 Purpose of the study ....................................................................................................... 11  
   1.3 Scope of the study and key definitions .......................................................................... 13  
   1.4 Structure of the research ............................................................................................ 15  
2. Networks and management of innovations in the built environment – empirical evidence .............................................................................................................................. 17  
   2.1 Structure of built environment networks ...................................................................... 17  
   2.2 Opportunities and challenges of innovation ................................................................. 18  
3. Research perspectives ....................................................................................................... 23  
   3.1 Theoretical models of inter-firm value creation and innovation in the built environment ................................................................................................................ 24  
4. Methodology ...................................................................................................................... 32  
   4.1 Research approach and methodological fit .................................................................. 32  
   4.2 Research design and methods ....................................................................................... 33  
   4.3 Data ................................................................................................................................. 34  
   4.4 The qualitative component: case study ...................................................................... 36  
   4.5 The quantitative component: survey method ............................................................... 37  
   4.6 Analytical process of the dissertation ........................................................................... 39  
5. Summaries of the research papers ................................................................................... 41  
   5.1 Paper I: Applicability and benefits of the ecosystem concept in construction industry ................................................................................................................ 41  
   5.2 Paper II: Business model renewal in the context of integrated solutions delivery: a network perspective ........................................................................................................... 43  
   5.3 Paper III: Creating urban platforms – opportunities and challenges for innovation in commercial real estate development ...................................................................... 45  
6. Discussion and Conclusions .............................................................................................. 48  
   6.1 Summary of the results .................................................................................................. 48  
   6.2 Discussion ...................................................................................................................... 49  
   6.3 Contribution of the dissertation ................................................................................... 54
List of Publications

This doctoral dissertation consists of a summary and of the following three publications which are referred to in the text by their Roman numbers:


Author’s contribution to the papers

Publication I: Applicability and benefits of the ecosystem concept in the construction industry

The author shared responsibility for initiating the paper, data collection, data analysis and writing the paper with Lauri Pulkka and Miro Ristimäki. Seppo Junnila provided advice, comments and suggestions to improve the paper.

Publication II: Business model renewal in context of integrated solutions delivery: A network perspective

The author is responsible for initiating and writing the paper and executing the research with Miro Ristimäki. Mia Andelin participated to the data collection and analysis, and Seppo Junnila provided advice, comments and suggestions to improve the paper.

Publication III: Creating urban platforms – opportunities and challenges for innovation in commercial real estate development

The author is responsible for initiating and writing the paper; and for executing the research together with Lauri Pulkka and Richard Cuthbertson. Seppo Junnila provided advice, comments and suggestions to improve the paper.
1. Introduction

1.1 Motivation and background

The motivation for this dissertation arose through my personal experience in construction sector projects that aimed at improving the adoption of environmentally sustainable designs across the industry. These “green building” projects started well, with high interest among practitioners, as the local Ministry of Environment and Science funds provided financial support for pilot projects. However, as soon as the good results were reported and new practices were to be implemented in mainstream cases, these practices were abandoned. Why was this happening? It could not be due to their lack of importance or potential.

Built environment is central in creating our physical and social surroundings. By 2050, 7 out of 10 of the world’s population will live in cities, up from 2 out of 10 just a century ago. Moreover, the majority of our time is spent indoors (UN Habitat, 2016; Hussein et al., 2012). The economic impact of the built environment sector is also large. Driven by population growth and urbanisation, the building sector is estimated to be worth 10% of global GDP (Betts and Farrell 2009). Furthermore, the environmental burden of the sector is significant. Construction and use of buildings constitute approximately 40% of all primary energy and materials consumed, greenhouse gas emissions and waste produced globally (United Nations Environment Programme, 2011). In addition, due to digitalisation and subsequent change of business activities, the uncertainties related to built asset investments increase rapidly.

It is evident that innovations are needed to solve the global challenges caused by the built environment industry, to manage uncertainty related to its business operations and to improve its capabilities addressing the changing needs of its clients (Hodson & Marvin, 2010; Rydin, 2010; Säynäjoki, Inkeri, Heinonen, & Junnila, 2014). Yet, the built environment industry is often accused of being one of the least innovative sectors of the economy (Miozzo & Dewick, 2004; Nam & Tatum, 1988; Pries & Janszen, 1999; Gambatese and Hallowel, 2011). According to an opposing view, standard surveys of innovation take only a narrow view of the sector and conventional measures do not well represent the innovation that is taking place (Winch, 2003).

Indeed, it has been argued that the built environment sector has specific features that affect its innovation processes. First, one of the features of the built environment sector is the nature of its context, buildings and built environment, which provide a physical platform for all activities in the sector. Second, this platform is characterised by the long lifecycle of its assets, combined with high investment costs and high public interest. The built environment industry comprises several activities with different time perspectives such as continuous asset, property and facilities management, short-lived project management and on-site production activities, manufacturing and distribution (Carassus, 2004). Third, as in other capital intensive sectors of the economy, requirement to manage uncertainties and risk throughout the long life-time of the built assets characterises the business decisions in the sector (Davies, Frederiksen, &
Dewulf, 2010; Tee & Davies, 2012). Fourth, the industry is also highly fragmented, with multiple actors and specialities forming a complex network of multiple interactions (Aho, 2013; Bygballe & Jahre, 2009; Winch, 1998).

Therefore, in order to find solutions to improve the innovation capabilities of the built environment sector, general research on innovation management should be complemented with a built environment specific approach (Bygballe & Ingemansson, 2014). The research within this dissertation aims to contribute to the understanding of the factors that either promote or hamper the creation of innovations in the built environment sector. It examines particularly the incentives and motivations of innovations in the built environment industry and by addressing the specific features of the built environment; fragmentation, high risk and long life cycle, that have impact on the interaction patterns of the industry.

Several theoretical approaches have been used to model and analyse innovation related interactions in the built environment, including economics, strategy, institutional and project management disciplines. This study will address innovation in the built environment from network management perspective. The network management perspective sees companies embedded in interconnected business relationships that form the basis for innovation processes (Håkansson & Waluszewski, 2002). Relationships with other actors make it possible to access and exploit the resources of other parties and to link the parties’ activities together (Håkansson & Snehota, 2006). Innovations are brought to the market through networks that enable the creation, capture and integration of different skills of actors (Calia et al., 2007, p. 427).

This dissertation studies incentives and motivations particularly through the role of value creation and capture dynamics in the built environment innovation networks. Innovations are ultimately a matter of value creation and capture. By definition, inventions become innovations only when they bring additional value to their users or are made into services or products for which clients are willing to pay for (Lepak, Smith, & Taylor, 2007; Teece, 2010). For business organisations, the possibility to capture value (or earnings) from their innovation efforts is a key motivational factor for entering the innovation process in the first place (Teece, 1986). In a highly networked business environment, actors may have differences in their earning logics and their preferred timing of value capture (Bygballe & Jahre, 2009). Unaligned cost and value drivers may cause tensions between actors and may impede the innovation process and its outcomes (MacDonald and Ryall, 2004; Corsaro & Snehota, 2012).

Even though the need to benefit from innovation seems to be self-evident, both academia and the practitioners of the built environment have paid only limited attention to the effect of the value creation and capture dynamics on network success. In addition, existing literature is currently lacking an integrated understanding of the dynamics of value creation and capture in the networked innovation context (Adegbesan & Higgins, 2010; Ritala, Agouridas, Assimakopoulos, & Gies, 2013). The existing research on built sector innovation networks has often focused only on the process of innovation – the creation of value – and used the term value creation referring both to the process within the innovating firm and the consumption of value by clients and other stakeholders (see Bygballe, Håkansson, & Ingemansson, 2015; Dorée & Holmen, 2004; Laursen & Svejvig, 2016; Rutten, Dorée, & Halman, 2009; Whyte & Sexton, 2011). In addition, network management studies typically focus on analysing the interactions between network members, whereas the quality of these interactions in terms of motivations is more rarely discussed (see Öberg et al, 2014). This approach by the current literature, dominant in network management and marketing-based research streams, fails to notice that the ultimate motivation for value creation in a business environment is the possibility to transform
it into value appropriation, or profit. Consequently, the approach lacks conceptualisations of value capture and incentives of the interaction at different levels. On the other hand, the strong literature stream based on transaction cost economics and strategy, has been focusing on the value capture of a firm through dyadic relationships and contractual mechanisms (Porter, 1980; Teece, 1986; Brandenburger and Nalebuff, 1996; Teece, 2006; Teece, 2010) while overlooking the role of wider network contexts and value co-creation. To fully capture the role of motivation; incentives and logics in the formation of the network couplings, the network approach on value creation should be complemented with a more specific view on different means of value capture. This dissertation aims at demonstrating the role of value creation and capture logics in the formation of network governance systems and their influence on value creation at multiple levels of analysis.

In addition, the existing literature has only limited number of studies that addresses innovation management across the construction and use phases of the built environment products. Large part of the existing built environment innovation research has focused on innovations that take place during the limited timeframe of design and construction phase of buildings; and these benefit only the contractor or the building project coalition. This scope excludes most of the improvement potential of the built environment industry that considers the performance of built products during their use phase, such as reduced energy use and greenhouse gas emissions, improved indoor air quality or reduced maintenance costs (Lizarralde, Bourgault, Drouin, & Viel, 2015; Whyte & Sexton, 2011). These sustainability benefits often accrue and are captured throughout the life-cycle of the buildings in 50 to 100 years. Therefore, in order to comprehensively understand hindrances and opportunities of built environment innovations, the analysis of value creation and capture should be extended beyond individual projects. Indeed, an increasing number of scholars have suggested extending the scope of construction innovation studies to a wider built environment perspective that accommodates the different temporal perspectives of value creation and capture across the whole built environment lifecycle of design, construction and use (Aho, 2013; Chang, Chih, Chew, & Pisarski, 2013; Lizarralde et al., 2015; Orstavik, 2015; Ozorhon, Abbott, Aouad, & Powell, 2010).

This dissertation aims at incorporating time into the conceptualizations of built environment sector networks. It also demonstrates how the value creation and capturing processes are separated at different network levels, and temporally. It also examines the challenges that temporally limited approaches have in modelling value creation and capture dynamics in the built environment sector networks.

1.2 Purpose of the study

The purpose of the dissertation is to contribute to the understanding of the factors that either promote or hamper the creation of innovations in built environment networks. The research seeks to develop an integrated understanding of the dynamics of value creation and capture processes and their role as drivers of collaboration between the parties involved in the innovation process. The scope of the investigation is explicitly set to cover the whole built environment lifecycle, from design to construction to use. Specifically, the following research question is examined:

*RQ1: What is the role of value creation and capture dynamics in the built environment sector innovation networks?*
To study this research problem, with the given scope, we first need to choose an appropriate theoretical grounding for the study. As noted earlier, the existent literature has applied different theoretical approaches to model the value creation and value capture processes in the built environment networks. However, there is a lack of an integrated models of the dynamics of value creation and capture in the networked innovation context and across construction and use phases. Therefore, our first challenge is thus to identify a theoretical grounding for understanding and explaining value creation and capture dynamics in the built environment network context. In this sense, parallel to its pursuit of answers to its initial research question, this dissertation is partly about exploring conceptualisations of networked innovation and identifying suitable theory within management research to explain a phenomenon for which only scarce research currently exists (Whetten, 1989). In this dissertation, we have selected to explore particularly the applicability and benefits of ecosystem and business model concepts as an analytical lens and, consequently, in managing innovations in built environment networks.

The term ecosystem emerged in the research journals in the 1990s’ to describe the nature and implications of greater inter-linkages between multiple organizations (Autio & Thomas, 2014; Moore, 1993). Even though the definition of ecosystems is still evolving, most agree that business ecosystems are dynamic and purposive networks, organized around a focal firm or a platform, whose participants co-create value based on non-linear value creation and non-market governance mechanisms, as well as the co-evolution of participants (Adner & Kapoor, 2010; Autio & Thomas, 2014; Iansiti & Levien, 2004b; Jacobides et al., 2006; Moore, 1993; Ritala et al., 2013). The ecosystem construct differs from other network oriented models used to analyse networked value creation as it incorporates both production and uses side participants in the analysis; and includes both vertical and horizontal relationships between actors distinguishing it from value chains and industry networks (Normann & Ramirez, 1993). In addition, the ecosystem construct is able to incorporate both value creation and value appropriation, setting it apart from value nets and value constellations. (Autio & Thomas, 2014; Thomas & Autio, 2014). Previously, the ecosystem concept has been applied in hi-tech industries, such as telecommunications and e-commerce (see Adner & Kapoor, 2010; Iansiti & Levien, 2004b; Iansiti & Richards, 2006; Li, 2009). In this dissertation, the ecosystem theory is applied to describe and analyse value creation in the built environment context to gain an understanding of the factors affecting the dynamics of networked value creation in the industry.

The business model concept is used to examine the logic of value capture at the firm level and its relation value created through inter-firm collaboration in a network. During the past 20 years, the business model concept has been used increasingly by researchers, particularly in the fields of technology and innovation management, strategy and sustainability (Massa, Tucci, & Afuah, 2017; Zott & Amit, 2013; Zott, Amit, & Massa, 2011). There are multiple definitions of a business model (c.f. Chesbrough & Rosenbloom, 2002; Osterwalder & Pigneur, 2005; Teece, 2010; Zott, Amit, & Massa, 2011). The interpretation followed in this dissertation is a business model as the conceptual representation describing the activities of a firm. This approach is summarised in the definition of business models by Teece (2010), who states that “a business model articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers. It also outlines the architecture of revenues, costs, and profits associated with the business enterprise delivering that value”. Like ecosystems, business models enable the analysis of networked value creation. However, while the unit of analysis in the ecosystem approach is the network, the unit of analysis for a business model is the focal firm. However, business models acknowledge that the factors contributing
to the creation of value can be identified in the firm’s wider network, as well as from outside its immediate suppliers (Sheehan & Foss, 2007; Zott & Amit, 2008). As the built environment sector is highly networked and characterized by the interdependence of its actors (Nam & Tatum, 1988), a business model is a potentially suitable construct for analysing the strategic, organizational and economic drivers in the sectors’ value systems (Christoph Zott & Amit, 2008). Particularly, the second research question is formulated as follows:

**RQ2: What are the benefits of ecosystem and business model concepts in managing innovations in built environment networks?**

By combining the analysis of value creation and capture in built environment networks the study contributes to the network-based perspectives on innovation. The results of this dissertation elaborate on some of the factors contributing to the formation of motivations of interactions in innovation networks. In addition, it adds the perspective of timing into the conceptualizations of built environment sector networks. Also, it tests the applicability of existing organizational theories in a specific empirical context and provides a novel framework for analysing value creation and capture and managing collaboration in the built environment. It adds to the existing research on built environment network characteristics and allows analysing them at multiple levels of networks.

**1.3 Scope of the study and key definitions**

**1.3.1 Built environment**

The scope of investigation in this dissertation is the built environment. However, the terms “real estate and construction sector”, “built environment”, and “built environment sector” are all used throughout the dissertation; to some extent, interchangeably. These terms refer to business activities widely related to the whole life cycle of the development of the built environment, encompassing “all forms of building and civil engineering infrastructure, both above and below ground and includes the managed landscapes between and around buildings”, according to the definition by The British Construction Industry Council (2018).

As explained earlier, a broad definition related to the actors operating in built environment is needed, since the array of actors participating to the sector’s value creation is broad and not limited only to construction firms (Harty, 2008; Winch, 1998; Lizarralde et al, 2015). In this dissertation, therefore, the dynamics of value creation and capture in built environment are assessed not only within the original installation context of the built structures, but also during their use phase. As Lizarralde et al (2015, p. 48) writes: “...we argue that the notion of a built environment innovation is more appropriate; this implies a new delimitation that expands the boundaries of the construction industry by embracing also the stakeholders and practices that are directly and indirectly affecting and affected by construction projects”.

**1.3.2 Innovation**

Innovation in the built environment is an emergent, non-linear and highly complex, multi-level phenomenon. Consequently, scholars disagree as to how this phenomenon should be understood (Orstavik, 2015). Often the concept of innovation in the built environment is interpreted to be any “nontrivial change and improvement in a process, product, or system that is
novel to the institution developing the change” (Freeman, 1989 in Slaughter, 1998), consisting of an innovative combination of materials, organizations or subsystems (Rutten et al., 2009).

This definition captures the nature of innovation in the highly fragmented built environment sector. However, it lacks the explicit linkage to the use of novel ideas and the role of innovations as a means to create added value (Gambatese & Hallowell, 2011). Therefore, in this dissertation, innovations are defined further “as new solutions, new processes or technologies that create additional value to their users – either in form of use or as a product or service of which clients are willing to pay for” (Lepak et al., 2007, p. 184).

This means that new combinations are not innovations but become innovations as soon as they are perceived to be beneficial from the perspective of the users of the new combinations. In the built environment, which operates through projects, terms of value creation and innovations are often mixed. In discussions and theories about innovation, the term value creation is synonymous with the term production (Orstavik, Dainty, & Abbott, 2015). As the dissertation explores the relationships of added value creation though innovation and adaptation and the subsequent value capture, the terms added value, adaptation and innovations are used in the dissertation rather interchangeably.

1.3.3 Value creation and value capture

Value created through innovation is not an objectively given property of the change being realized, but a subjective perception of its benefits within a certain context and timeframe. The definition of value can be separated into two: as a use value and as an exchange value. According to Bowman & Ambrosini (2000, p. 2) use value refers to the “specific quality of a new job, task, product, or service as subjectively perceived by users in relation to their needs. These users can be individuals, organisations or society. The quality can be defined as “a generic utility of what is created that serves to satisfy human needs” (Orstavik et al., 2015, p. 18). This refers to monetary values, such as savings, but also to non-monetary values such as sustainability, social status or safety. In turn, exchange value can be defined as either the monetary amount realized at a certain point in time, when the exchange of the new task, good, service, or product takes place, or the amount paid by the user to the seller for the use value of the focal task, job, product, or service (Bowman & Ambrosini, 2000). Viewed together, these definitions suggest that: (a) value creation depends on the relative amount of value that is subjectively perceived by a target user who is the focus of value creation and (b) this subjective value realization must at least translate into the user’s willingness to exchange a monetary amount for the value received (Lepak et al., 2007).

Value creation addresses multiple levels of analysis, ranging from individuals to industries (Laursen & Svejvig, 2016; Lepak et al., 2007). In addition to customers, value is created for business owners and stakeholders (e.g. Porter 1985), individual employees and organizations (e.g. March & Simon, 1958), industry or societal levels (Lepak et al., 2007). The various stakeholders identified above may have several and, often competing, views on what is valuable. The differences may be regarded as temporal aspects of value, i.e. short term profits vs. long term values such as the minimum environmental burden (Pitelis, 2009). Value co-creation is a process by which the resources of at least two organisations are combined in order to achieve something that the parties could not achieve individually (Borys and Jemison, 1989). Value is co-created through the combined efforts of firms, employees, customers, stockholders, government agencies, and other entities related to any given exchange, but it is always determined by the target user (i.e., the customer) (Grönroos, 2012; Vargo, Maglio, & Akaka, 2008).
Value capture, referred to as “value appropriation” by some sources, is defined as the individual firm-level actualised profit-taking of the exchange value created through joint efforts of the network participants (Adegbesan & Higgins, 2010; Ritala et al., 2013). The process of value creation is often confused or confounded with the process of value capture. However, existing research (e.g. Lepak et al., 2007; Ritala et al., 2013; Ritala & Hurmelinna-laukkanen, 2009) has concluded that value creation and value capture are two distinct processes. In this dissertation, the term “dynamics” between value creation and capture refer to the mutual pattern of creation, development, change and interaction of these separate processes.

Value created by one organisation or at one level of analysis may be captured at another process by a different organisation in the long run (Della Corte & Del Gaudio, 2014; Lepak et al., 2007; Pitelis, 2009). In general, firms can capture less, equal or more value than the one created through their activities (Brandenburger and Nalebuff, 1995). The amount of value captured by a firm depends on factors, such as such as barriers to entry (Porter, 1980), firm-level “generic strategies” (cost leadership, differentiation and niche strategies) (Porter, 1985), integration co-operation and diversification strategies (Penrose, 1959; Teece, 1986; Williamson, 1981), and firm-wide differentiation strategies. Firms also rely on their resources, assets and capabilities to capture as much value as possible (Penrose, 1959). These are bundles of skills, competencies, innovation capabilities and other advantages that distinguish them from other firms and allow them to grow through diversification by building on their strengths (Pitelis, 2009).

In the built environment sector, industry architectures, system-integration capabilities and business model innovation (Jacobides, Knudsen, & Augier, 2006; Pitelis, 2009) as value appropriation vehicles are particularly interesting. Consequently, the value creation and capture processes need to be identified and managed appropriately to avoid “value slippage” (Della Corte & Del Gaudio, 2014; Lepak et al., 2007). Value slippage occurs when the party creating the value does not retain all the new value that is created. Slippage obviously provides little incentive for a source to continue creating value in the long term. (Lepak et al., 2007)

1.4 Structure of the research

This dissertation is built upon three articles, all of which have been peer-reviewed and published in academic journals. The compilation part of the dissertation links the research together and discusses its contribution, demonstrating how the individual papers each contribute to the research question of the dissertation and their mutual conclusion.

Paper I explores the relationship between ecosystem characteristics and value creation in construction networks. It concludes that real estate and construction (REC) sector networks can be analysed as ecosystems and identifies the key prerequisites of the governance model, shared logic and network of participants in creating value in these networks. Paper II further examines the detailed dynamics of value creation and capture in a real estate development projects through a comparative case study. It analyses the factors that promote value creation and, subsequently, the value capture of individual companies participating in a real estate development project, revealing their connection to the network’s performance. Paper III analyses the extent to which the value creation prerequisites are present in urban development projects from the perspective of key actors/institutions and identifies opportunities and barriers that promote continuous value creation in the commercial urban development process. The focus of Paper III is on the role of public authorities in the urban development process. It also applies
the findings of Papers I and II to the wider built environment context throughout the cycle; that is, from development to use.

The compilation is divided into six parts: Chapter One describes the motivation, aim and research question of the dissertation. Chapter Two presents a review of the current literature on networked innovation in the built environment. Chapter Three presents the key research perspectives of ecosystems and business models and positions them among other theoretical approaches used to describe and analyse networked innovation in the built environment context. Chapter Four details the research methods, data collection techniques and the overall analytical process of the dissertation. In Chapter Five, the key content of each paper is summarised to highlight their contribution to the dissertation. The compilation ends with a discussion and conclusions. The full papers are appended to this summary.
This chapter summarises the key findings of network management studies in the built environment context. Some explanation of why construction companies innovate in the way they do – the core of their innovation logic, may be found in the characteristics of their connections and interaction within their networks. In this chapter, the typified structure of built environment networks at different levels is described (see Figure 1). In addition, key empirical findings on the opportunities and challenges of innovation in the built environment sector are provided.

2.1 Structure of built environment networks

The production of buildings and infrastructure requires an interplay of different actors each with unique technological knowledge and capabilities (Dubois & Gadde, 2000, 2002b). The built environment products, such as bridges, houses, retail or industrial areas, are complex systems, consisting of a high number of interconnected technical parts and subsystems. Consequently, small changes in one part can lead to large changes in other parts and subsystems (Miller, Hobday, Leroux-Demers, & Olleros, 1995). The responsibility for the provision of design, construction and use phase services for the products is fragmented across multiple specialist organisations, each with their own qualification requirements to be met. In addition, the built environment products are subject to heavily institutionalized norms and regulations, making the public authorities and institutions an integral part of the built environment industry network (Dubois & Gadde, 2002a; Nam & Tatum, 1988).

Built environment products are typically designed and constructed as unique projects combining the resources of participating companies, with high levels of local adaptation and tailoring according to the needs of the clients. Dubois and Gadde (2000) have conceptualized these projects as temporary networks within the firms’ permanent networks. Temporary networks can be defined as collective endeavours of actors that “pursue ex ante agreed-upon task objectives within a predetermined time frame” (Bakker, Defillippi, & Schwab, 2016, p. 1705). A permanent network consists of the combination of firms that are part of the network of firms collaborating between and in several projects, such as suppliers, subcontractors or stakeholders. The composition of each temporary network may vary and consist of members of the permanent network taking different roles in each project. Each of these specialized companies have their permanent network of collaborators, established cultures, norms and routines, and competitive strategy and business model to manage their resources (Dubois & Gadde, 2000, 2002b). A project activates resources in the permanent network to perform the activities required for completion of the project. However, the permanent network also restricts the way
these resources can be activated in the project. The role a firm takes in a temporary network may also vary from project to project (Dubois & Gadde, 2000, 2002b).

Time also plays a central role in built environment sector networks. Having a life expectancy from 50 to 150 years, constructed facilities differ from manufactured products based on the longevity of their use. There are different ways to divide the lifecycle of built assets but, typically, distinctions are made between planning, design, construction, operation and reuse phases (Winch, 2003). The lifetime of each temporary network set up to deliver built assets and related services covers only a fraction of the total life cycle of the assets. Throughout the life-cycle of the built assets, the organizational structures, composition and size of active networks set up to create, deliver and capture value may change several times – even though, in some cases (e.g. in so called “megaprojects”), the temporary networks may have a lifetime of several decades (Wilkinson and Reed, 2008). Each of the participants in these networks, in turn, have their own temporalities so that the multiple networks and temporalities form an ecology of relative temporalities between organizational forms and actors (Brookes, Sage, Dainty, Locatelli, & Whyte, 2017). Consequently, implementing innovation in the built environment requires the management of interdependencies: (a) between the tasks, parts, units and firms involved in the projects, (b) within the firm, across different projects, (c) between firms beyond the scope of the individual projects and (d) between different phases of the system.

Figure 1. Permanent and temporary networks in the built environment (adapted from Dubois & Gadde, 2002a)

2.2 Opportunities and challenges of innovation

2.2.1 At the temporary network level

Due to the high complexity of the built environment products and the project-based and networked nature of their production process, quality and cost of the products have to be managed across several organisations, balancing different cultural, managerial and business approaches (Bygballe & Ingemansson, 2014; Bygballe & Jahre, 2009; Dubois & Gadde, 2002b; Miozzo,
Dewick, & Box, 2004; Nam & Tatum, 1992). Any changes in individual parts or processes concern the entire product, and innovation must always be negotiated with other actors within the project coalition (Winch, 1998). Consequently, innovation may be hampered by the different views and motives of the involved parties or by the distribution of power between the parties (Harty, 2008; Slaughter, 2000). However, existing management research has found several factors that support the success of a temporary network. These include the network structure, relationship type and coordinating mechanisms, and internal and external legitimacy (Ahuja, 2000; Autio & Thomas, 2014; Brady et al., 2005b; Gawer & Phillips, 2013; Overholm, 2014).

Low trust has been argued to dominate the culture in the construction industry (Green, Ferrie, & Weller, 2005). The high complexity of the projects and low trust adds up to uncertainty as to the extent to which firms can expect to experience economic gains from an innovation. This makes stakeholders more prone to stick with established methods and solutions in their work than they would have been if the level of complexity and opportunism were lower. This phenomenon is further strengthened by the capital intensity of the sector (Green et al., 2005; Orstavik, 2015).

The aim of project governance is to reduce the threat of opportunism of network participants and thus reduce the perceived risk level on innovating actions. For optimal joint value creation, participants of the network need to have both contractual and relational capabilities (Hartmann, et al., 2014). In addition to formal, contractual mechanisms, non-formal factors aim at enhancing the level of inter-firm trust in a project. Some of the most important of these are a partner’s perceived competence and openness in sharing information, long-term relationships between project members and objective reward criteria (Wong, et al. 2005; Maurer, 2010). In addition, close relationships and cooperation between the actors (Windahl & Lakemond, 2006), information sharing, no-blame culture, equality and fairness among network actors (Baiden, et al., 2006; Ankrath et al., 2009; Gajendran and Brewer, 2012; Brady et al., 2005a, 2005b) have been identified as enhancing the governance of projects and, thus, the joint value creation of the network.

However, the governance of the network is not sufficient if the actors in the network do not share an understanding of the context, function and purpose of the network. The firms embedded in a business network need to have a shared understanding of the value being created through the network and their customers’ needs (Blayse & Manley, 2004; Öberg & Shih, 2014; Windahl & Lakemond, 2006). However, in an in-built environment, the definition of a customer is often ambiguous. End users (e.g. residents and commercial tenants) and clients (e.g. investors) may have differing expectations. Agreement among the participants over whose demands and expectations are prioritized is, therefore, important (Lindahl and Ryd, 2007).

The customers of construction can be active and influential participants, but their level of competence and previous experience of construction varies (Barlow, 2000; Hartmann et al., 2014). Due to the project focus and competitive tendering, the customer is often a new counterpart, which means that knowledge about the customer’s needs cannot be transferred across projects and that the goals of the project and consecutive network of actors need to be negotiated “from scratch” for each project. This increases the risk that the customer is not able to use the new product as anticipated and the value creation through the project is low (Orstavik, 2015). If, at the same time, due to competitive tendering, the actor constellations on the supplier side change as well, the experience gained in previous projects is difficult to transfer to future projects (Dubois & Gadde, 2000; Eccles, 1981).
In a successful network, each actor is required to develop an understanding of their respective role of the network in creating value and how they can benefit from interfirm collaboration. This motivates firms to reside in the network (Ehret, 2004; Normann & Ramirez, 1993). Each firm has their own perception on what is valuable. These benefits may vary and be directly linked to the business opportunities of the company, or indirectly related to efficiency, mitigating risks, learning, or relational rents (Dyer & Singh, 1998; Pitelis, 2009). Empirical studies have demonstrated how networking firms pursue their own interests and goals rather than those of the network. In their empirical study of pharmaceuticals, Öberg & Shih (2014) identified separate shared logic nets (a network of actors whose logic converges, in the sense that the parties have similar priorities and similar or complementary interests and interaction goals on innovation) between the manufacturers and users, and the policymakers and developers. A disparity between the innovation logics of these subgroups causes a barrier for the development of innovations. Therefore, each firm’s value creation and capture strategies needs to be aligned. Otherwise, the efficiency of activities and the development of trust within the network are affected negatively (Corsaro and Snehota, 2011; Ritala et al., 2012).

The networking actions should have also internal legitimacy. The temporary network is more likely to succeed (i.e. deliver more value) if the co-operation and management of the network is aligned with the firm’s internal routines and logic (Bygballe & Ingemansson, 2014; Windahl & Lakemond, 2006). The term logic refers to the interests, priorities, and interaction goals of firms (Öberg & Shih, 2014) or to the firms’ “philosophies” for how to conduct or understand business (e.g. Dequech, 2013; Dunn & Jones, 2010; Kor & Mesko, 2013). It also relates to the organization of the firm’s processes, how the parties relate to each other, and how interdependencies are handled (Kadefors, 1995). It is notable that in a company whose business is built around projects, the internal logic of the firm operates at two levels: within projects and at the firm level. The firm level comprises all projects being implemented and the joint functions (the administrative development and supply chain operations that are shared among the projects). In empirical studies of innovation networks in construction, Winch (2002) and Bygballe & Ingemansson (2014) found that in the construction sector, the role of the internal network of the firm is significant in innovation success. In their study of Swedish and Norwegian construction industries, Bygballe and Ingemansson (2014) found that firms tend to rely on tested solutions from within the company rather than exploring new solutions outside, indicating that firms perceive the alignment with their internal network even more important than the alignment with the external, permanent network.

2.2.2 At a permanent network level

Dubois and Gadde (2002) concluded that the built environment industry’s permanent networks are characterised by their “loose couplings”, i.e. they have little interaction and a weak influence on one another. Even though experimenting and adaptation frequently occurs in projects, new solutions invented in one project are difficult to transfer to other projects when the permanent networks are only loosely coupled (Dubois & Gadde, 2002b). The loose couplings at the permanent level of built environment sector networks are preferred due to the market approach, where project participants are assigned to other projects as soon as a project is finished and actors in projects change frequently (Grabher, 2002). Loose couplings are also preferred due to the high uncertainty related to complex projects and the fear of opportunism of the network actors (Pittaway et al., 2004). Contrarily, loose couplings in the permanent net-
work hinder innovation by encouraging short-term market exchanges over relational exchanges which, in turn, decreases commitment, collective adaptations and learning (Dubois & Gadde, 2002b; Håkansson and Ingemansson, 2013).

In their study on construction sector network structures, Dubois & Gadde (2002) argue that even though the inter-firm networks at the permanent level are typically loose, the communities of practice in the industry are strong, meaning that authorities, associations, regulators and educators in the industry have collectively created and developed a shared understanding of what is done and how it is to be done. This collective understanding creates a “template of how firms perceive the environment” (Dubois & Gadde, 2002b, p. 626). Consequently, changes in routines, established knowledge base and power structures may be resisted, hindering the transfer of knowledge to the wider organisation (Bresnen, Goussevskaia, and Swan, 2005). This has been empirically investigated in cases where new environmental practices were introduced into construction projects (Gluch, 2009; Gluch & Bosch-Sijtsema, 2016).

One reason for the particularly strong communities of practice are the prominent roles of regulations and public authorities in the development of a built environment. Also, the character of the regulations and the way these are influenced by different interest groups influence innovation (Blayse and Manley, 2004). Regulation encourages and maintains specialization through licensing systems and decrees that are supposed to guarantee the necessary competence of each actor (Nam and Tatum, 1988, 1992). This complicates the innovation process and, in many cases, makes the process by which innovations are appropriated very slow (Taylor, Levitt, & Fellow, 2006; Winch, 1998).

In the capital goods sector, the existence of an integrator – an actor responsible for the task coordination, network management and integration of systems composed components produced in the network (Brady et al., 2005b; Windahl & Lakemond, 2006) – is seen to facilitate the coordination of the activities of the network actors towards a coherent, customer-facing solution. The relative ease with which business-to-business networks form is also found to be influenced by social institutions (Nooteboom, 2000). According to the empirical evidence, these institutions can shape the cultural conditions and infrastructure for networking, as well as acting as innovation brokers and intermediaries in network formation (Bolton et al., 1994; Cooke, 1996; Hanna and Walsh, 2002 in Pittaway et al., 2004). Due to this phenomenon, external legitimacy of the innovating endeavours is particularly important (Windahl & Lakemond, 2006). Legitimacy is “a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions” (Suchman, 1995, p. 574). This means that the actions and goals of the network should take into account the underlying industry architectures (Tee & Gawer, 2009) that are accepted by various actors at the permanent network level (Bygballe & Ingemansson, 2014; Orstavik, 2014).

The existing procurement system in the construction industry is also pointed to as an impediment of innovation, with traditional lump-sum contracts that trigger price competition rather than interaction (Dubois & Gadde, 2000). Recent studies by Orstavik (2015) address the temporal separation of value creation and capture processes in the construction industry and argue that insufficient and asymmetric information is the single issue that reduces economic incentives for innovation in the design and production of the built environment. The “market of lemons” phenomenon is pinpointed as a main hindrance to those innovations, whose added value is demonstrated only through the use-phase of a building’s life cycle. Under conditions of severe asymmetric information prices will be discounted, reflecting the buyers’ assessment
of potential value and the risk that what is offered is of substandard quality. When the merit of higher quality is not seen or understood, capturing value from investment in a use-value improving innovation is not possible. The condition of asymmetric information, then, undermines the link between performance and price along the value chain, and hence, reduces economic incentives for quality improvement.
This dissertation seeks to develop an integrated understanding of the dynamics of value creation and capture processes and their role as drivers of collaboration between the parties involved in the innovation process. The scope of the investigation is explicitly set to cover the built environment lifecycle, from design to construction to use. As noted earlier, there is a lack of an integrated understanding of the dynamics of value creation and capture in the networked innovation context and across construction and use phases. Therefore, our first challenge is to identify a theoretical grounding for understanding and explaining value creation and capture dynamics in the built environment context.

In order to be able to discuss and make conclusions about the applicability and benefits of the ecosystem and business model approaches in the built environment context, a brief overview of the theories that have previously been applied to model networked innovation in the built environment context is given in this chapter. These are: transaction cost theory, project-oriented model, network perspective and institutional approach. A specific focus is given to their approach towards value co-creation and value capture, unit of analysis, conceptualization of innovations and their limitations in terms of analysing value creation and capture in a networked innovation context. We end this chapter with the presentation of the ecosystem and business model concepts as research perspectives used in this dissertation.

These research perspectives were chosen based on a view that research on value creation and capture in the built environment is characterized by multiple levels of analysis. This is due to the structure of the built environment networks as described in the previous chapter. Value creation and capture are two distinct processes that take place at different levels of these networks. Value is typically co-created at the temporary network level, whereas value capture takes place at the individual firm or actor level. In addition, the timing of these processes has an importance in the built environment sector. It is also relevant to incorporate aspects of wider institutional and societal interest into the discussion and not merely examine value creation and capture from the narrow perspective of a business organization. Potentially, ecosystem and business model concepts provide an enhanced theoretical framework for the industry that is able to address both value creation and value capture in a networked business environment, where the value propositions extend beyond firm boundaries and are dependent on industry complementarities and combine both product and service perspectives.
3.1 Theoretical models of inter-firm value creation and innovation in the built environment

3.1.1 Transaction cost theory

Transaction cost economics (TCE) traces its origins to seminal contributions in law, economics, and organization in the 1930’s (Coase, 1937). According to TCE, firms create value by utilising the most efficient form of governing transactions and interacting with the market. The properties of the transactions; asset specificity, uncertainty and the frequency with which transactions recur determine the most effective governance structure of the transaction. These properties are aligned with three overall governance structures: the market, the hierarchy, and the hybrid, which differ in their cost and ability to achieve economizing results (Williamson, 1987).

TCE represents a contractual approach to economic organization in which economizing on transaction costs is the main objective (Williamson, 2005 in Bygballe et al., 2012). Its chief unit of analysis is the dyadic relationship between actors. According to Williamson (2002), contracts are considered “as private ordering, which entails efforts by the immediate parties to a transaction to align incentives and to craft governance structures that are better attuned to their exchange needs”. Due to the bounded rationality and opportunism of the actors, all complex contracts are unavoidably incomplete due to gaps, errors and omissions in the original contract. As a consequence, parties of the contract need to prepare for adapting the contract through additional governance structures, so called governance modifiers (Pryke, 2012; Williamson, 2002). Some of the most commonly identified governance structures include trust, which is promoted through partnering and alliancing (Das & Teng, 1999; Nooteboom, 1996) and aligning the economic incentives of the parties of the transaction (Williamson, 1983; Dyer & Ouchi, 1993; Pisano, 1989). These structures aim at making the contract “self-enforcing”, so that the contract parties are motivated to act according to the contract and less external enforcing mechanisms, such as legal institutions, are needed, thus lowering the transaction costs and maximising the value created (Dyer & Singh, 1998).

According to the traditional TCE literature, vertical integration has been considered as the main means to manage risks related to asset specificity, i.e. idiosyncratic investments in transactions. However, it has been argued that due to the need for specialized labour, combined with the high degree of uncertainty related to the need for a workforce, neither the market nor hierarchical governance structure are appropriate in construction. Instead, firms tend to apply “hybrid governance modes” that combine subcontracting with the pursuit of creating continuous partnerships through selection procedures and the development of relational norms, so called “quasifirms” (Bygballe et al., 2013; Eccles, 1981).

TCE has traditionally viewed firms as separate entities from markets and the larger societal context and focused on the cost side of relating to others and the minimization of transaction costs (Powell, 1990). However, later contributions have recognised that relationships may create relational rents; that is, they may create additional value through relation-specific assets, knowledge-sharing routines, complementary resources, endowments, and effective governance. Relational rents also contribute to value creation initiatives, such as sharing knowledge and combining strategic resources (Dyer & Singh, 1998). However, this approach has limited applicability in the analysis of built environment innovations due to its narrow, dyadic view on interactions (Hartmann et al., 2014).
3.1.2 The project-oriented model and construction as a complex product system

The project-oriented model of construction views the construction project as a temporary organization that is made up of the interfaces between the involved firms in the project coalition, each engaged in the successful completion of the project (Winch, 1989). The contributions of participants in the project coalition depend on each other and their value creation, i.e. the successful delivery of a project requires the mutual adjustment of the participants. However, as Winch (1989) noted, while the firm may have a short-term interest in the “successful” completion of the project, their “longer-term interests of survival and growth as firms are divergent, if not at times contradictory” (p. 335). As a consequence, a key task in project management is to ensure that the project participants have sufficient incentives to contribute to the desired outcome of the project instead of pursuing their own objectives (Bygballe et al., 2013).

Much of the academic work on projects has adopted a transaction cost economics approach (Winch, 1989). Analysis of the project processes has often focused on the dyadic relations between participants in the project coalition, such as those of client and the contractor or general contractor and subcontractors (Eccles, 1981; Winch, 2001) and on formal contracts and conflict handling to cope with uncertainties and risk (e.g. Turner, 2004). More recently, the project coalition has been considered as a network of relationships, where unit of analysis is an individual project and the key issue is the roles of the actors and the relationships between them within the individual project (Bygballe et al., 2013; Pryke, 2005).

Conceptualising innovation through the project-oriented model has its roots in the complexities of the inter-organizational project basis of construction work. The construction industry is categorised as a complex product systems (CoPS) industry (Gann & Salter, 2000; Miozzo et al., 2004; Rutten et al., 2009; Winch, 1998). A defining feature of all CoPSs is that they consist of hierarchically organised interconnected parts, which are provided by specialised organisations; exhibit non-linear and emerging properties, whereby small changes in one part can lead to large changes in other parts; and exhibit a high degree of user involvement in the innovation process (Miller et al., 1995; Winch, 1998). In contrast to incremental cycles of the innovation process in manufacturing, a complex product system remains in a fluid phase, with continually evolving architectures, customized components and emerging client requirements, and the key challenge of innovation management is the integration and coordination of these disparate elements (Harty, 2008). Outside a single project sphere, at industry level, the key challenge of construction innovation through the CoPS lens is the integration of project experiences with continuous business processes and the adoption and diffusion of the innovations at industry level (Bygballe et al., 2013). Therefore, to succeed, innovation in CoPS requires a strong system integrator to orchestrate the innovation process (Winch, 1998). But orchestration does not equal full control, as organisations have varying and evolving expectations and preferences, and all of them have some power at their disposal (Harty 2005; 2008).

From the built environment perspective, the project-based model is well developed to describe and analyse the activities taking place during the design and construction phases of the built environment lifecycle – with clear boundaries of time, outcome and resources (Laursen & Svejvig, 2016). It, however, lacks the conceptualisation to describe continuous value creation during the use and redevelopment phases of the built environment – during which a significant part of value created during the project is being captured – and the influence of stakeholders outside the project boundaries (Brady et al. 2005a; Chang et al., 2013; Laursen & Svejvig, 2016; Lizarralde et al., 2015). This is also reflected in a vast number of research papers describing the transition towards product-service systems or integrated solutions (see Brady et al.,
2005a; 2005b; Davies, 2004; Hartmann et al., 2014) that have made an effort to implement the temporal and service provision aspects found in the project management literature.

3.1.3 Network perspective

In 1990, Powell questioned the potential of the TCE approach to adequately model the various forms and motivations for interactions between firms. According to Powell, networks form a new form of governance, in addition to the markets and hierarchies used by TCE. He identified network forms of governance as particularly suitable in situations, which demand distributed knowledge, the speed and responsiveness of developments and trust between firms. In the context of innovation, such networks have been referred to as “interconnected business relationships that form the basis for innovation processes” (Håkansson & Waluszewski, 2002) or as purposefully built nets which “create, capture and integrate the many different skills and knowledge needed to develop complex technologies and bring them into the market” (Calia et al., 2007, p. 427).

The industrial network approach or the network model of the organization–environment interface views companies operating in a context in which their behaviour is conditioned by a limited number of different actors, each of which is unique and engaged in pursuing its own goals (Håkansson & Snehota, 2006). Relationships with other actors make it possible to access and exploit the resources of other parties and to link the parties’ activities together (Håkansson & Snehota, 2006). The distinctive capabilities and the identity of an organization are developed through its interactions with other parties. Since the other parties of the interaction also operate under similar conditions, an organization’s value creation is dependent on the totality of the network as a context, i.e. even by interdependencies among third parties (Håkansson & Snehota, 2006).

The relevant unit of analysis in the industrial network approach is the relationships between companies, as well as the company, itself. The emphasis is on the interaction between companies and the focus is on how interdependencies can be exploited. This is a clear division from the TCE-based approaches, where the focus is chiefly on the transactions, and interdependencies are to be avoided. (Bygballe et al., 2013). The focus is on actor bonds, resource ties, and activity links, which are created through the interaction process. Actor bonds are mainly social and organisational phenomena, whereas resource ties can be both physical (products and facilities) and/or organisational entities (business units and business relationships). Activity links comprise different tangible activities taking place across organisational borders (Håkansson and Waluszewski, 2002). Through this perspective, innovation can be understood and studied as changes in bonds, ties and links, or as new combinations thereof (Bygballe et al., 2015). The interactions are both driving forces and impediments for innovation. New ideas often emerge at the intersection between different bodies of knowledge and the network is an enabler of change through the variation of actors and resources. However, the already-implemented solutions and investments to a network create a ‘heaviness’ in the system and a path dependency restricted to certain technologies can be difficult and costly to deviate from. (Håkansson and Ford, 2002; Bygballe et al., 2015).

The network approach has been successfully applied to construction sector studies (e.g. Håkansson et al., 1999; Dubois and Gadde, 2000, 2002; Andersen et al., 2004; Doree and Holmen, 2004; Johnston et al., 2006; Bygballe and Jahre, 2009; Håkansson and Ingemansson, 2011) and acknowledged in the urban development literature (Doak & Karadimitriou, 2007). As the majority of the built environment products are produced through unique projects
that combine the resources of participating companies, a key element in the model has been the conceptualisation of the project mode of working as temporary networks within more permanent networks of firms or the construction industry as a whole (Dubois & Gadde, 2000). A project activates resources in the permanent network to perform the activities required for the completion of the project. However, the permanent network also restricts the way these resources can be activated in the project (Dubois & Gadde, 2000). Consequently, implementing projects in the built environment requires the management of interdependencies between the tasks, parts, and units involved in the construction process (Gidado, 1996), as well as the interplay between firms’ temporary and permanent networks (Dubois & Gadde, 2002b).

Existing research on built sector innovation networks has often focused on the process of innovation, the creation of value, and used the term “value creation”, referring both to the process within the innovating firm and the consumption of value by clients and other stakeholders (see Bygballe et al., 2015; Bygballe & Jahre, 2009; Rutten et al., 2009). Consequently, the approach lacks conceptualisations of value capture and incentives of the interaction at different levels. To fully capture the role of motivation; incentives and logics in the formation of the network couplings, the network approach should be complemented with a more specific view on different means of value capture.

### 3.1.4 Institutional approach

Institutional theory provides a theoretical framework for understanding the processes of how rules, norms, and routines become established as authoritative guidelines for social interactions (Scott, 2005). According to DiMaggio and Powell (1983), a phenomenon termed isomorphism explains how coercive, normative and mimetic forces pressure organizations within a field to take on similar forms to survive competitively in their environment. Institutions, in this context, are the “humanly devised constraints” that govern social and economic forms of interaction undertaken by individuals and organizations (North, 1991). While these forms may or may not be optimal from a value creation perspective, they are perceived as legitimate and thus, essential. In recent years, the focus of institutional theorists has shifted from the process of isomorphism towards understanding how change, or innovations, can be initiated and sustained in institutional settings from bottom-up, in addition to the more prevailing top-down modes of influence (Scott, 2005). According to this perspective, institutional theory centres on the roles of actors that engage in strategic activities in pursuit of changing in their institutional environment (Biesenthal, Clegg, Mahalingam, & Sankaran, 2018; Powell & Colyvas, 2008).

The unit of analysis in the institutional approach is the “recognized area of institutional life”: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products. Thus, the unit of analysis is wider than in the network approach as it is not confined to actors that actually interact, but to “the totality of relevant actors” (DiMaggio & Powell, 1983; Scott, 2008).

A focus on institutions in the built environment context is particularly appropriate due to the high public interest in urban planning and construction, followed by a system of plans, permits, standards and other institutions established to steer the production process of built structures. D’Arcy and Keogh (2002) have presented an institutional hierarchy of property markets with three levels: the institutional environment, the property market as an institution and the property market organisations. The organisations involved in the built environment include public representatives, consultants, financiers, constructors and clients directly or indirectly involved
in commercial property, while institutions consist of the practices and networks that influence the ways in which organisations and individuals operate and are interrelated (Ball et al., 1998).

It has been argued that due to the fragmentation of the built environment industry and its loose couplings between the members of the permanent networks, the role of institutions is central in the development and diffusion of innovations across it. As in Winch’s (1998) project-oriented model, the institutional approach holds that the actors of the innovation process can be distinguished at two levels: within the innovation superstructure of clients, regulators, and professional bodies, and within the innovation infrastructure of specialized suppliers and builders. An innovation broker (or, in Winch’s terms, a system integrator) is often needed to create trust and to accommodate change between the two levels (Miller et al., 1995).

According to the institutional approach, a disruptive innovation in the built environment sector is a mechanism of institutionalization that may take several decades. Once institutionalised, the dominant regime is very stable and, as new innovations are adopted across the industry, a re-institutionalisation is needed (Orstavik, 2014). In their empirical studies, Orstavik (2014) and Rasmussen et al (2017) have concluded that the credibility of the broker is a key success factor for an innovation to break through, and close ties to an existing industry may contribute to the brokering institution being seen as a relevant to the technology development in its sector. However, through these ties the broker may be bound to the created, new dominant technology, which makes it hard for the brokering organization to be an active and impartial actor of subsequent radical and disruptive innovations (Orstavik, 2014; Rasmussen, Jensen, & Gottlieb, 2017).

3.1.5 Ecosystems

In this dissertation, the ecosystem theory is applied to describe and analyse value creation in the built environment context to gain an understanding of the factors affecting the dynamics of networked value creation in the industry. The underlying economic logic of the ecosystem approach falls under what Bygballe et al. (2013) refers to as “network-oriented models” (see chapter 3.1.3.). These models emphasize inter-organizational relationships as assets. Greater commitment, knowledge and resource sharing and trust are seen to increase value creation through efficiency and innovation (Bygballe et al., 2013; Shiu, Jiang, & Zaefarian, 2014).

The term ecosystem emerged in the research journals in the 1990s’ to describe the nature and implications of greater inter-linkages between multiple organizations (Autio & Thomas, 2014; Moore, 1993). Even though the definition of ecosystems is still evolving, most agree that business ecosystems are dynamic and purposive networks, organized around a focal firm or a platform, whose participants co-create value based on non-linear value creation and non-market governance mechanisms, as well as the co-evolution of participants (Adner & Kapoor, 2010; Autio & Thomas, 2014; Iansiti & Levien, 2004b; Jacobides et al., 2006; Moore, 1993; Ritala et al., 2013). Previously, the ecosystem concept was applied in hi-tech industries, such as telecommunications and e-commerce (see Adner & Kapoor, 2010; Iansiti & Levien, 2004b; Iansiti & Richards, 2006; Li, 2009).

A distinction is often made between business, platform and innovation ecosystems. Business ecosystems encompass all entities that influence the focal business (Iansiti & Levien, 2004b). Although value creation in a business ecosystem takes place at the system level, it is most commonly analysed from the perspective of one, often large focal organization (Moore, 2006). Platform ecosystems form around shared technology, standards and other assets that benefit its
members (Thomas, Autio, & Gann, 2014). Innovation ecosystems are similar to business ecosystems, but value creation is focused on the development of new value through innovation (Autio & Thomas, 2014; Ritala et al., 2013). Both focal businesses and holistic network perspectives have been used to analyse innovation ecosystems (Adner & Kapoor, 2010; Ritala et al., 2013). In this dissertation, the holistic approach is used.

In this dissertation, ecosystems are defined following an institutional approach proposed by Thomas and Autio (2014). According to Thomas et al. (2014a, 2014b), the organizational field is able to account for collective value creation and provides a sophisticated theoretical perspective with which to consider ecosystems. Organizational fields are defined as “those organizations that, in the aggregate, constitute a recognized area of institutional life” (DiMaggio & Powell, 1983, p. 148). Utilising the institutional view, the ecosystem is the fifth aspect of the organizational field construct (Thomas & Autio, 2014). The ecosystem is distinct from the four other aspects of the organizational field – common industry, common technologies, social issues and markets – because it is focused on collective value creation as the recognized area of institutional life (Thomas & Autio, 2014). According to this definition, the ecosystem is not treated as a distinctive organizational form. Rather, the ecosystem construct is seen as an analytical lens which can be used to examine any network of actors that recognize that they are collaborating to create value. Through this delineation, it is possible to analyse temporary project networks, permanent networks and the wider institutional context.

The concept of an ecosystem shares several characteristics with the traditional institutional approach. First, both constructs address the network of actors embedded within a network, which influences the power of each participant to capture or direct the actions being taken (D’Arcy & Keogh, 2002). Second, both ecosystems and organizational fields have governance systems consisting of regulative and normative elements. Third, both address the need for joint logic in their organising principles, a logic that is available to organisations and individuals, alike, and that can easily be elaborated upon. In addition, the ecosystem construct complements the traditional institutional approach with the aspect of collective value creation.

The ecosystem construct differs from other network oriented models used to analyse networked value creation as it incorporates both production and uses side participants in the analysis; and includes both vertical and horizontal relationships between actors distinguishing it from value chains and industry networks (Normann & Ramirez, 1993). In addition, the ecosystem construct is able to incorporate both value creation and value appropriation, setting it apart from value nets and value constellations (Autio & Thomas, 2014; Thomas & Autio, 2014). Consequently, use of ecosystem concept enables the analysis of non-linear value creation and combining aspects of formal and informal processes to holistically view the value creation process beyond the firm, contractual or project limits, including the focal firm, its suppliers, complementors and the client. Through the joint evolution of the networks of interconnected actors, the aspect of innovation is often emphasised in the ecosystem context, rather than focusing only on the optimisation of the productivity of the existing network configuration (Autio & Thomas, 2014).

A specific case of ecosystems, the platform ecosystem, is a business ecosystem that is arranged around a central coordinating device, the platform. The platform is a set of shared core services, tools, technologies, standards or other assets underlying an organizational field which serve as foundations upon which a larger number of firms can build further complementary innovations or use to enhance their own performance (Gawer & Cusumano, 2013, 2002; Iansiti & Levien, 2004a; Li, 2009; Nambisan & Sawhney, 2011; Thomas, Autio, & Gann, 2014).
Platform ecosystems are based on an open system, i.e., the platform exhibits a diversity of ownership and control, of both complementary assets and the components that make up the platform (Cusumano & Gawer, 2002; Gawer & Henderson, 2007). Through this system, the ecosystem participants create and appropriate value (Autio & Thomas, 2014; Thomas et al., 2014). The ability to create network effects, or leverage, is a defining factor for platforms (Gawer, 2014; Thomas et al., 2014). In other words, the more users who adopt the platform, the more valuable the platform becomes to the owner and to the users. The leverage can consider production, transactions or creation of innovations (Thomas et al., 2014). Platform ecosystems facilitate and increase innovation through complementary products and services. The more innovation there is in complementary products and services, the more value it creates via network effects (Gawer & Cusumano, 2013).

Literature on platforms and platform ecosystems have traditionally been applied to the high-tech industries from the perspective of engineering (Cusumano & Gawer, 2002; Gawer & Cusumano, 2013, 2002; Tee & Gawer, 2009). However, later contributions have conceptualised platforms as evolving organizations or meta-organizations that coordinate constitutive agents who can innovate and compete (Gawer, 2014). To function and develop, platforms typically need one firm or a small group of firms to act as a “platform leader” (Cusumano & Gawer, 2002). A platform’s “keystone firm” is a firm that plays a fundamental role in the creation of the platform and focuses on ecosystem value creation. The individual members of the ecosystem may change, but the system as a whole, along with its keystones, persists (Iansiti & Levien, 2004b).

### 3.1.6 Business models

The second analytical lens applied is also a relatively new concept. The business model is used to examine the logic of value capture at the firm level and its relation value created through inter-firm collaboration in a network. During the past 20 years, the business model concept has been used increasingly by researchers, particularly in the fields of technology and innovation management, strategy and sustainability (Massa, Tucci, & Afuah, 2017; Zott & Amit, 2013; Zott, Amit, & Massa, 2011). There have been debates over the theoretical roots of the concept and its applicability in research. However, the usability of the concept has been promoted within the context of innovation studies, where the business model represents a new dimension of innovation that complements product, process, and organizational innovation (Casadesus-Masanell & Zhu, 2013; Massa, Tucci, & Afuah, 2017).

There are multiple definitions of a business model (c.f. Chesbrough & Rosenbloom, 2002; Osterwalder & Pigneur, 2005; Teece, 2010; Zott, Amit, & Massa, 2011). Recent comprehensive analyses of the literature streams have concluded that the business models literature can be divided into three basic interpretations: (a) the business model as an attribute of a firm, (b) the business model as a cognitive or linguistic schema, and (c) the business model as a formal conceptual representation describing the activities of a firm (Massa et al., 2017; Zott et al., 2011). The interpretation followed in this dissertation is the third, a business model as the conceptual representation describing the activities of a firm. This approach is summarised in the definition of business models by Teece (2010), who states that “a business model articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers. It also outlines the architecture of revenues, costs, and profits associated with the business enterprise delivering that value”. According to this view, each business model has two sides: the type of activities that a firm performs and the capabilities that it
chooses to use to determine the outcome that is produced, usually the value created and captured (Massa et al., 2017)

Like ecosystems, business models enable the analysis of networked value creation. However, while the unit of analysis in the ecosystem approach is the network, the unit of analysis for a business model is the focal firm. The ecosystem concept focuses on value creation while the business model focuses on the sources of profit relevant for the focal company in relation to its value offering, making it an appropriate approach to effectively analyse the value capturing activities of an individual firm (Massa et al., 2017). However, business models are not bound to the organizational or transactional boundaries, as set forth by TCE (Sheehan & Foss, 2007; Zott & Amit, 2008), but the factors contributing to the creation of value can be identified in the firm’s wider network, as well as from outside its immediate suppliers. This is a clear diversion from the traditional theories of value creation, such as the resource-based view (RBV) of the firm or the positioning view, in which value creation is a supply-side phenomenon and competitive advantage is single sourced, either resource-based only or activities-based only (Barney, 1991; Peteraf, 1993; Porter, 1980, 1985, 1996; Massa et al., 2017). In addition, the business model approach allows the concurrent examination of multiple income streams, such as tangible products and services, sales and capital investment incomes (cf. Jacobides et al., 2006).

As the built environment sector is highly networked and characterized by the interdependence of its actors (Nam & Tatum, 1988), a business model is a particularly suitable construct for analysing the strategic, organizational and economic drivers in the sectors’ value systems (Christoph Zott & Amit, 2008).

In this dissertation, the particular framework used to analyse business models is the business model as an activity system (Zott & Amit, 2010). An activity in a focal firm’s business model can be viewed as the engagement of human, physical or capital resources of any party to the business model (the focal firm, end customers, vendors, etc.) to serve a specific purpose toward the fulfillment of the overall objective. Thus, an activity system is a set of interdependent organizational activities centred on a focal firm, including those conducted by the focal firm, its partners, vendors or customers. Analyses of the business model as an activity system focuses on the interdependencies between activities, as they provide insights into the processes that enable the evolution of a focal firm’s activity system over time. The firm’s activity system may transcend the focal firm and span its boundaries, but will remain firm-centric to enable the focal firm not only to create value with its partners, but also to appropriate a share of the created value, itself (Zott & Amit, 2010). Their framework of activity-based business model framework consists of: (a) design elements – content, structure and governance of activities – that describe the architecture of a firm’s activity system; and (b) design themes – novelty, lock-in, complementarities and efficiency – that describe the sources of the activity system’s value creation and subsequent capture.

Capabilities have a central role in defining how a firm may perform its activities. Capabilities can be dynamic and operational. Operational capabilities are skills and knowledge residing in an organisation to perform daily operational routines (Helfat and Peteraf, 2003). Dynamic capabilities refer to the strategic ability of the firm to sense and react to opportunities and threats and to integrate, build and reconfigure skills and knowledge to address a changing environment (Teece, 2007). Capabilities are created through the coevolution of tacit knowledge accumulation as a result of learning-by-doing and embedded in an organisation’s routines, explicitly articulated and codified knowledge and investments to improve an organisation’s routines and activities (Zollo & Winter, 2002).
4. Methodology

4.1 Research approach and methodological fit

This dissertation is built around two research questions, which are addressed through several focused research questions in three separate studies. It combines prior work and the theoretical contributions of the three publications to form mutual conclusions. The methodological fit of the research is created through the combination of the individual study designs in terms of research questions and design, data collection and analysis. Value creation and innovations in the built environment sector take place in a complex real-world context and, thus, the topic requires an understanding of a multitude of contextual issues, such as physical structures and projects, and relationships between individuals, business entities and institutions. In addition, there are several theories in engineering, management and economics that have been applied to the model. This interdisciplinarity has implications for the research design, as well as the methods applied in this dissertation.

A multidisciplinary view requires a flexible research approach, as different philosophies may be appropriate for different questions (Hantrais, 2009). According to Greene & Caracelli (1997), there is a wide consensus that mixing different types of methods can strengthen a study, especially those that approach complex phenomena where the understanding of contextual information is needed. According to Edmonson and McManus (2007), particularly studies employing nascent or intermediate theories may gain benefits through employing multiple methods, as the use of multiple methods is seen to help establish the external and construct validity of new measures through triangulation (Jick, 1979).

Consequently, this research employs a mixed methods research design (Miles & Huberman, 1994; Creswell, 2017; Johnson & Onwuegbuzie, 2004). Mixed methods research can be defined as “the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (i.e., use of qualitative and quantitative viewpoints, data collection, analysis and inference techniques) for the broad purposes of breadth and depth of understanding and corroboration” (Johnson, Onwuegbuzie, & Turner, 2007). The selected methodology is attached to the philosophical underpinning of pragmatism (e.g., Patton, 1990; Tashakkori & Teddlie, 1998). This means that the research is not committed to any one system of philosophy or reality as in a single method research; instead, research is viewed as an instrument of practical problem solving. Consequently, different research approaches, both attached to observable phenomena and subjective meanings, for confirmation and exploration, can be combined to provide the best understanding of the research problem (Creswell, 2017).

Greene et al. (1989) have outlined purposes of mixed methods research as follows: (a) triangulation (seeking convergence of results from different methods), (b) complementarity (elab-
oration or clarification of results), (c) development (using the results from one method to inform the other), (d) initiation (finding contradictions and explanations for them) and (e) expansion (extending the breadth and range of inquiry). The purpose of the design of this research is mostly related to the points (b), (c) and (e) - to use different methods in a complementary fashion so that the results from one method elaborates, enhances or illustrates the results from the other. The use of multiple methods also allows triangulation of the findings to examine the same phenomenon from multiple perspectives and to enrich our understanding by allowing new or deeper dimensions to emerge (Greene, Caracelli, & Graham, 1989; Jick, 1979).

However, the use of mixed methods does not liberate the researcher to apply the chosen methods carefully. According to Bergman (2011), some characteristics of a good quality mixed methods research include: (a) conductivity of the research design to both qualitative and quantitative methods; (b) acknowledgement of the limitations of qualitative and quantitative inquiries and dealing with these limitations to improve on the limits of such findings, in contrast to falsely assuming that mixing methods would cancel out their individual shortcomings; (c) the use of qualitative and quantitative components is justified as opposed to assuming that the mixed methods design is better than monomethod research in principle and; (d) both qualitative and quantitative methods are used with a similar rigour. The qualitative and quantitative components of this dissertation have been applied in separate peer-reviewed research papers. During the review, all papers were assessed to merit their publication and the related shortcomings of the methods have been discussed in detail in the papers. Therefore, it is argued that the methodological quality criterion (a), (b) and (d) are met in this dissertation. In turn, the quality criterion (c), the justification of the use of both qualitative and quantitative methods is discussed in the dissertation.

4.2 Research design and methods

On the whole, the research design of this dissertation can be considered as the sequential exploratory design, where internal consistency is achieved through designing and conducting the studies in a sequential fashion, thereby ensuring that the individual studies form a meaningful entity regarding the research question of the dissertation (Creswell, 2017). In addition, the label “qualitative dominant mixed methods research” could be used (Johnson et al., 2007) as both the quantitative and qualitative data were analysed dominantly in a qualitative matter, where the qualitative data and analysis functioned as the “glue that cements the interpretation of multimethod results” (Jick, 1979, p. 609). Figure 2 illustrates the research design of this dissertation.

The research commenced with a review of the literature that considered networked innovation, value creation and capture. Specifically, the review covered the theoretical approaches used and the empirical results of research in the built environment context, as well as more general literature in the fields of management and strategy. The findings of the review functioned as guidance for the design of individual studies and their data collection. However, the theoretical propositions were used as flexible guide-lines rather that stringent limits and emergent data was combined with the ongoing development of the interview templates and survey constructs (Dubois, Gadde 2002b; Eisenhardt, 1989).
Papers I and II comprise the qualitative part of the dissertation. Paper III constitutes the quantitative section. Paper I seeks to establish an understanding of the value creation prerequisites in the built environment networks. The subsequent study (Paper II) analyses value creation and capture in a network at multiple levels in detail. These studies create an in-depth understanding of the creation and impacts of shared logic in the built environment networks. Paper III, the quantitative study, seeks to apply these findings to a wider population of built environment networks and to find patterns that are typical of the market. Subsequently, the findings of the individual papers are jointly analysed to answer the first research question.

Parallel to its pursuit to find answers to its first research question, the research aimed at evaluating the applicability of new conceptualizations of the built environment networks: the ecosystem and the business model. In Paper I the applicability and benefits of the ecosystem concept in the built environment context was analysed though multiple cases at network level. The Paper II demonstrated the applicability of the business model concept as an analytical lens in examining value creation and capture drivers and their dynamics in detail, both at firm and network levels. The ecosystem construct introduced in Paper I was further developed by the usage of the platform ecosystem concept in Paper III. Subsequently, the findings of the individual papers are jointly analysed to answer the second research question.

4.3 Data

The data for the dissertation were collected and individual studies were conducted in a four-year period between 2013 and 2017. Table 1 summarises the data collected in a qualitative manner and its application in Research Papers I, II and III. Table 2 summarises the quantitative data collected through the survey and applied in Research Paper III.

The principal qualitative data used in the dissertation consisted of six cases. Data collection methods included interviews, participant observation, confidential and publicly available documents and case reports. All the six cases (A-F) were used in Paper I and two of the cases (cases D and E) were used also in Paper II, where they were further analysed in detail. Qualitative
data were used in Paper III where the survey constructs were complemented by interviews and analyses of other material in three commercial developments (Cases F-H), of which one was utilised also in Paper I (case F). The quantitative data used in the dissertation consisted of a survey of 76 respondents involved in Finnish commercial development projects. The response rate of the survey 21.5%.

The data collection methods and the use of data is described further in sections 4.4. and 4.5.

**Table 1: Qualitative data collected through cases**

<table>
<thead>
<tr>
<th>Project/ case</th>
<th>Purpose</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case A</td>
<td>Creation of a concept and designs for industrially manufactured, low-technology, sustainable detached houses and building them in Finland and Sweden</td>
<td>Interviews; Confidential and public documents; Case study report</td>
</tr>
<tr>
<td>Case B</td>
<td>Development and construction of low-energy multi-storey apartment buildings in Finland</td>
<td>Interviews; Public documents; Case study report</td>
</tr>
<tr>
<td>Case C</td>
<td>Development and construction of affordable apartments with complimentary interior services in Sweden and Finland</td>
<td>Interviews; Participant observation; Public documents</td>
</tr>
<tr>
<td>Case D</td>
<td>Sustainable health-care construction, with integrated design, construction and maintenance service delivery responsibility for 30 years in Sweden</td>
<td>Interviews; Participant observation; Confidential and public documents; Case study report</td>
</tr>
<tr>
<td>Case E</td>
<td>Low-energy office building development, following an industry-standard approach in Finland</td>
<td>Interviews; Participant observation; Confidential documents; Case study report</td>
</tr>
<tr>
<td>Case F</td>
<td>Urban planning and commercial development phase of a new town centre with 100 000 m2 of retail, office, public service and residential space in Finland</td>
<td>Interviews; Participant observation; Public documents; Case study report</td>
</tr>
<tr>
<td>(Case G)</td>
<td>A greenfield, mixed-use development (retail, housing, public services) with a focus on creating physical solutions for internet-based commercial services, such as e-retailing and local health care services</td>
<td>Interviews, participant observation; planning strategy workshop, Public documents and website</td>
</tr>
<tr>
<td>(Case H)</td>
<td>A brownfield, mixed-use development (retail, housing, public services) with a focus on testing a flexible zoning approach</td>
<td>Interviews, public documents and website</td>
</tr>
</tbody>
</table>

**Table 2: Quantitative data collected. Targeted population and response rate for the survey, conducted in 2015**

<table>
<thead>
<tr>
<th>Population</th>
<th>Responses (absolute)</th>
<th>Responses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees of municipalities</td>
<td>238</td>
<td>36</td>
</tr>
<tr>
<td>Employees of private developers</td>
<td>35</td>
<td>17</td>
</tr>
<tr>
<td>Private shopping centre managers</td>
<td>80</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>353</td>
<td>76</td>
</tr>
</tbody>
</table>
4.4 The qualitative component: case study

The qualitative approach selected in Papers I and II is appropriate for the in-depth study of a limited number of cases (Johnson and Onwuegbuzie 2004). Case studies are an appropriate research strategy for asking “how” and “why” questions about a contemporary phenomenon within its real-life context (Yin, 2003). It is especially well-suited when the boundaries between the phenomenon and context are unclear and the understanding the informal structures is important (Yin, 2003). This is particularly the case in exploring ecosystems, where the permeability and openness of the system boundaries make defining and operationalizing them complex (Thomas & Autio, 2014). In addition, both the value creation in ecosystems and value capture through business models depends not only on the properties of the network or a firm, but also on the qualities of the environment that they are embedded in (Teece, 2010; Zott & Amit, 2010). This argumentation is further strengthened by the fundamental aim of the studies: to introduce and develop novel concepts of ecosystems and business model in the construction industry context (e.g. Eisenhardt, 1989). Therefore, in Papers I and II, a case study strategy was used.

Although both Papers I and II employ case study strategies, the methodology is applied differently. The aim of Paper I is to utilize replication logic through multiple case studies to form propositions and gain a new theoretical vision through the candid examination of evidence across cases and data sets, between cases and literature, and through the creative reframing of the phenomenon (Eisenhardt 1989). The applied logic approaches what Onwuegbuzie and Leech (2005) term the confirmatory use of qualitative methods. Paper II is, in turn, explorative in nature. The cases utilised in the papers were selected following theoretical sampling, i.e., the cases were selected because they are particularly suitable for illuminating and extending relationships and logic among constructs (Eisenhardt & Graebner, 2007). The data have been collected with the purpose of understanding the activities of the network and the role of value creation and capture in the networks. All six cases utilised in the studies were embedded in a similar regulatory and cultural context: the construction industry in Finland, Sweden or both.

**Paper I** employed a multiple-case design. Compared to a single-case design, using multiple cases can enhance the robustness and transferability of qualitative research, and it allows for analysis within as well as across cases (Yin, 1994; Creswell, 1998; Stavros and Westberg, 2009). The approach was used to test the applicability of the ecosystem concept in the built environment and to understand the industry-wide phenomenon of collaborative value creation in multiple settings. The cases were selected according to the logic of literal replication, meaning that each case predicts similar results (Yin, 2003). Analogous to multiple experiments, replication logic is not used to assess the incidence of a phenomenon but to seek empirical support for theoretical propositions across cases (Eisenhardt, 1989).

The study consisted of six cases. Each case was an organizational network engaged in a common enterprise of value creation. Cases were holistic, meaning that there was one unit of analysis; namely, the network. While observations were made at many different levels from individual firms to industry, the results were aggregated at the network level (Yin, 1994). A holistic design was chosen because value creation in ecosystems, the object of the study, is a network-level phenomenon (Thomas and Autio, 2014). The sample was purposeful, which is widely considered appropriate for multiple-case studies, and therefore non-probabilistic (Marshall, 1996). Case selection was based on three main criteria: (a) the cases contained an element of novelty in the process or outcome, increasing their relative complexity and highlighting the importance of inter-organizational collaboration, (b) the cases included both project and other
ecosystems in construction networks and (c) they were embedded in a similar context to facilitate cross-case comparison.

**Paper II** is a comparative case study of two networks of firms applying different business models in their real estate development projects. The unit of analysis is twofold: the individual business models of the companies in the temporary network at the project level and the network formed by these companies. The comparative case study strategy was selected as the paper’s purpose is to understand a change – the similarities and differences between the two case settings (Yin, 2003, Eisenhardt & Grabner, 2007). The cases were selected with the intention to apply a replication logic to gain information or findings, or findings that are contrary but predictable and, as such, allow us to build more robust inductive theories across multiple, heterogeneous cases (Eisenhardt, 1989). Case selection was based on three main criteria: (a) to find polar types of integrated and disintegrated project delivery modes in which the process of interest is transparently observable (Eisenhardt, 1989; Pettigrew, 1990; Yin, 2003); (b) the case settings involved similar organizations, enabling the analysis of matching actors in different procurement contexts, to follow a replication logic (Eisenhardt, 1989; Yin, 2003); and (c) the business models of participating companies can be analysed with an identical scope: throughout project initiation, construction and maintenance.

In line with Yin (1994), multiple sources of evidence were used for each case to establish converging lines of inquiry. The data for all cases consisted of interviews and confidential and publicly available documents. Data collected through participant observation was used in four cases. All data was collected during a period of four years (2012-2015) by four researchers. All the interviews were semi-structured, except for one structured validation interview conducted in case F. The interviewees were selected to include key informants within each network, primarily managers from the leading or coordinating organizations and other core participants. In cases D and E, the interviewees were also particularly involved in the project contract design and bidding process and/or had direct operational responsibility to implement the contract. The interview results and on-site observations were mirrored against contract documentation to verify the credibility of the themes found in the data analysis.

Participant observation in four cases, C, D, E and F, consisted of participating in technical and operational meetings and conducting site visits during a 7-12-month period, done by two investigators currently working at case projects. Participant observations were used to interpret findings in the case context and to identify dynamics across the framework constructs, informal authority structures and conflict resolution mechanisms. Publicly available documents (e.g. web pages) and, in some cases, confidential documents (e.g. internal reports) were used to shed light on the same topics.

### 4.5 The quantitative component: survey method

Paper III is based on survey data of Finnish commercial development projects. The survey was conducted to understand the opportunities and challenges related to shifting the current, linear urban development practices towards a more eco-systemic approach, and to identify potential bottlenecks of shared logic and complementarity in urban development.

Commercial developments were selected as the focus of the study for three reasons: (a) shopping centres as development projects are clearly identifiable entities with a relatively uniform set of goals and actors, making it possible to compare data. In comparison, initiatives for the mixed-use development of a central business district are often geographically less well-framed,
last for a longer period and involve several developers and stakeholders and multiple goals. (b) Comprehensive data on the key actors in shopping centre development efforts were available from the Finnish Council of Shopping Centres. Through these records, we were able to identify the total number of Finnish shopping centres and match them with relevant actors in various municipalities and developer organisations. (c) The value creation process for the development of shopping centres was clearly more identifiable than in other types of urban development. Thus, shopping centre development was considered to provide a simpler model of an urban development project.

The data were collected through a survey because it enabled the inclusion of many respondents in the pursuit of examining the prevalence of a phenomenon. Otherwise, reaching a population this large through interviews would not have been practical. The Likert-type measurement scales were developed through combining key contributions to the generic platform ecosystem literature in the fields of engineering and management with existing research specific to urban development and construction management. In addition, the survey constructs were complemented by interviews and analysis of case reports, as well as other material in three commercial developments (Cases F, G and H), one of which was also utilised in the Paper I (Case F).

We defined the target set of survey respondents through identifying the key actors in commercial urban development projects who had an inter-dependent relationship with one another when developing and implementing a project. We focused on the key actors: (a) developers responsible for integrating the technical, financial and commercial aspects of the development; (b) users, typically represented by the shopping centre management or large anchor retailers; and (c) municipalities, whose involvement included the coordination of planned activities and construction regulations, the issuing of building permits and the implementation of public infrastructure. We limited our target group of survey participants in order to focus the analysis on their representativeness and to make the survey more manageable in practice. For example, sub-contractors, designers and consultants are, in practice, acting under the supervision and management of the planners and developers included in the survey. Similarly, residents, workers and shoppers are represented by the planners (municipalities) and shopping centre managers (users).

Utilising an internet-based survey tool, the survey was conducted between June and August of 2015. The online survey was sent out to 353 persons, representing the total population of Finnish shopping centre managers and representatives of authorities in the municipalities where the centres were located. In addition, the survey was sent to 35 project managers of the 12 largest private commercial developers in Finland. The survey was also sent to all municipalities where the surveyed shopping centres are located or that have supported commercial development activities in recent years. The focus group totalled 238 persons in 33 municipalities, which represents 58% of Finland’s total population in municipalities with an identified shopping centre or on-going commercial development. We sent the questionnaire to several persons and positions in the various municipalities, such as planning officers, land-use officers, commercial officers and urban project managers, since the roles and responsibilities related to commercial development are divided differently depending on the organisational structure and amount of resources in different municipalities. These respondents were identified through public records. The response rate of the survey was 22% overall (N = 353).
Even if Paper IV is built on quantitative data, and analysed statistically, it is by nature descriptive rather than confirmatory. Even though the data allowed for inferential statistical analysis and conclusions of the differences between the perceptions of the respondent groups, the analysis of the survey is explorative in nature and no hypotheses were tested.

4.6 Analytical process of the dissertation

In all papers a conceptual framework was built to guide data collection. However, the theoretical propositions were used as flexible guidelines rather than stringent limits. The purpose for this was to avoid constraining the research by imposing predetermined theoretical perspectives (Eisenhardt, 1989). In Paper I, Yin’s (1994) strategy of using theoretical propositions to guide the data analysis was followed, meaning that the propositions structured and delimited the analysis. In Paper II, emergent data were incorporated into the analysis applying systematic combining of the emerging issues and ongoing development of the interview templates (Dubois, Gadde 2002b; Eisenhardt 1989). In Paper III, the qualitative data gained from case studies applied in Paper I, Paper II and separate interviews complemented the literature review to design constructs for the survey.

The analysis proceeded separately for both quantitative and qualitative data, and the information was combined at the data interpretation phase to gain a rich set of conclusions, based on theoretical insights on innovation, value creation and capture in built environment sector networks. A dominantly qualitative approach was chosen, as the objective of the dissertation less researched and the research applies novel perspectives to the research phenomenon (Johnson & Onwuegbuzie, 2004). The structure of the research is presented in the Table 3. It describes how the research questions; findings of individual papers and the summary are linked together. The contribution of each paper to the argument of the dissertation is itemised briefly in Table 3 and described in more detail in the following section 5.
Table 3. The structure of the research

<table>
<thead>
<tr>
<th>Research questions</th>
<th>RQ1: What is the role of value creation and capture dynamics in the built environment sector innovation networks?</th>
<th>RQ2: What are the benefits of ecosystem and business model concepts in managing innovations in built environment networks?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>Applicability and benefits of the ecosystem concept in the construction industry</td>
<td>Business model renewal in context of integrated solutions delivery: a network perspective</td>
</tr>
<tr>
<td>Paper III</td>
<td>The relationship between ecosystem characteristics and value creation in construction networks</td>
<td>Dynamics of value creation and capture in real estate development networks</td>
</tr>
<tr>
<td>Paper IV</td>
<td>Creating urban platforms – opportunities and challenges for innovation in commercial real estate development</td>
<td>Opportunities and barriers to promote continuous value creation in the commercial urban development process</td>
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<td>Title</td>
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<td></td>
<td>Applicability and benefits of the ecosystem concept in the construction industry</td>
<td>Business model renewal in context of integrated solutions delivery: a network perspective</td>
</tr>
<tr>
<td>Theme</td>
<td>The relationship between ecosystem characteristics and value creation in construction networks</td>
<td>Dynamics of value creation and capture in real estate development networks</td>
</tr>
<tr>
<td>Core concepts</td>
<td>Ecosystems (Thomas &amp; Autio, 2014)</td>
<td>Business model as an activity system (Amit &amp; Zott, 2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value creation in platform ecosystems (Thomas, Autio, Gann 2014)</td>
</tr>
<tr>
<td>Unit of analysis</td>
<td>Permanent networks</td>
<td>Temporary networks, firm level business model</td>
</tr>
<tr>
<td>Research design</td>
<td>Multiple case study (Cases A, B, C, D, E, F)</td>
<td>Comparative case study (Cases D, E)</td>
</tr>
<tr>
<td>Relevant findings</td>
<td>The ecosystem concept is an applicable theoretical approach to describe and analyse value creation in the construction industry.</td>
<td>The business model as an activity system concept enables a richer analysis of value creation and capture drivers of businesses than transactional approach only.</td>
</tr>
<tr>
<td>for the Thesis</td>
<td>The governance system and shared logic shape the composition of network participants, which determines value creation.</td>
<td>The network’s joint ability to create value and the complementary value capture opportunities of the network members corroborates to the network’s perceived success.</td>
</tr>
<tr>
<td></td>
<td>The shared logic consists of legitimacy, mutual awareness and trust components.</td>
<td>The role of risk is central in achieving business model alignment among a network of companies.</td>
</tr>
<tr>
<td></td>
<td>Mutual awareness consists of shared vision and alignment of business models, that both directed the actions of the participants. Legitimacy consists of socio-political legitimacy and cognitive legitimacy.</td>
<td>The mutual alignment of the value creation and capture mechanisms of companies contributed positively to the value creation through steering and directing the choice of formal and informal activities contributing to the creation of shared logic and trust.</td>
</tr>
<tr>
<td>Relevant findings</td>
<td></td>
<td>Built environment sector ecosystems are characterised by the significant role of public authorities.</td>
</tr>
<tr>
<td>for the Thesis</td>
<td>The platform ecosystem approach has a good fit within an urban development context, and the operationalisation of the boundary conditions for a platform ecosystem’s success makes it possible to identify key areas for improvement within the current process.</td>
<td>Significant differences in the capacity of public and private sector actors to promote platform ecosystem emergence, due to their limited knowledge of the value creation and capture processes for an urban ecosystem and a lack of shared logic with the users.</td>
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</table>

The complementary or similar value creation and capturing dynamics of participants, i.e., shared logic has the key role in determining the quality of collaboration of built environment sector networks. They improve governance and reduce the complexity related to innovations. However, the environment in which the network firms operate, at the permanent network level, set the boundary conditions on how these incentives may be formed. Of these, the legitimacy and perceptions on risk and risk management capabilities are the most notable. The public sector authorities specifically seem to be ill-equipped to promote shared logic in the built environment networks.

When managing innovations in the built environment sector, the current project-based conceptualisations of value creation and capture could be complemented with an ecosystem and business model approach. These approaches can model value creation processes at multiple levels of the network and across the lifecycle of built assets and combine it with an analysis of value capture in detail.
This chapter summarises the research papers included in the dissertation. The summaries focus on the purpose, research methodology, findings and contribution of each paper. The full scientific papers are appended to the dissertation.

5.1 Paper I: Applicability and benefits of the ecosystem concept in construction industry

Given the highly networked nature of the built environment industries, the traditional, linear concepts utilised to describe value creation, such as value chains, are not enough. New concepts that allow the conceptualisation of non-linear value creation are needed to identify generalizable, desirable properties of the innovating network (Autio & Thomas, 2014; Moore, 2006). Paper I examines whether the ecosystem theory could be an applicable lens to analyse networked, non-linear value creation in the construction industry and identify any special features of the construction industry might have in the use of the theory.

Paper I uses the ecosystem concept of Thomas and Autio (2014) as a starting point. It is based on the institutional view, where the ecosystem consists of a network of actors that recognize they are engaged in a common enterprise of collective value creation. Thus, the ecosystem can be used as an analytical tool irrespective of industry. It consists of three characteristics: network of participants, governance system and shared logic. The characteristics break further down into three elements each. Based on a construction industry specific review of literature, Paper I suggests theoretical propositions that link the ecosystem elements to value creation in construction networks.

The research employed a multiple-case design, consisting of six cases. Each case was an organizational network engaged in a common enterprise of value creation. The cases were holistic, by which it is meant that there is one unit of analysis, the network. A holistic design was chosen because value creation in ecosystems, the object of the study, is a network-level phenomenon (Thomas and Autio, 2014). The selection of cases mirrored the different types of networks, permanent and temporary, as identified in the construction industry (Dubois & Gadde, 2002b). One of the cases were later examined in detail in the Paper II and two of the cases in Paper III.

Based on the literature review and the results of the multiple-case study, it was found that the ecosystem concept can be applied as a useful analytical lens for examining and understanding value creation in networks in the construction industry. Because Thomas and Autio (2014) define ecosystem boundaries with references to its participants, organizations that recognize...
that they are engaged in a common enterprise of collective value creation, it is possible to analyse even temporary project networks through the ecosystem lens. In addition, a positive connection between operating according to ecosystem principles and value creation was found (Table 4).

Table 4. Summary of the main results of the multiple-case study

<table>
<thead>
<tr>
<th>Network of participants</th>
<th>Governance system</th>
<th>Shared logic</th>
<th>Value creation</th>
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<tbody>
<tr>
<td>Case A</td>
<td>Failure to utilize high potential for combining complementary and specialized inputs of capable participants</td>
<td>Discrepancy between centralized goal setting and weak formal task coordination resulted in shallow collaboration</td>
<td>Despite mutual awareness, no informal support for task coordination, due to lack of trust</td>
</tr>
<tr>
<td>Case B</td>
<td>Participants contribute highly complementary inputs that have been partially customized for greater synergies</td>
<td>Prominence of expert power and informal task coordination promote efficiency of combining inputs</td>
<td>Dedication to shared goals and high level of mutual trust support co-evolution and task coordination</td>
</tr>
<tr>
<td>Case C</td>
<td>High complementarity of technical inputs but also participants’ business models, design-to-cost method required co-evolution</td>
<td>Developer and retailer formed a joint company for shared responsibility and decision-making</td>
<td>Design-to-cost method and transparency regarding business logics created mutual awareness, increasing commitment</td>
</tr>
<tr>
<td>Case D</td>
<td>High complementarity of specialized inputs through mutually reinforcing incentives</td>
<td>Transparent authority structure and informal task coordination drive joint problem solving</td>
<td>Transparency, trust, and high cognitive legitimacy created a shared vision</td>
</tr>
<tr>
<td>Case E</td>
<td>Complementarity of inputs coordinated through contracts; conflicts over content of adjustments</td>
<td>Inefficient task coordination due to ambiguous formal and informal authority structure</td>
<td>Mistrust, lack of transparency and fear of opportunism decreased commitment</td>
</tr>
<tr>
<td>Case F</td>
<td>Complementarity of specialized inputs determined possibilities for value creation in construction networks, but success hinges on complementarity</td>
<td>Governance system consisted of partially overlapping subgroups of participants with varying authority and coordination tasks</td>
<td>Active clients helped to create shared vision and mutual awareness that guide parts of the project towards common goals</td>
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The results suggest that the three ecosystem characteristics; network of participants, governance system and shared logic, affect value creation in different ways. The governance system and shared logic shape the network of participants, which determines value creation (Figure 3).
Figure 3. Main connections between ecosystem characteristics and value creation

The link from the network of participants to value creation is direct, but the governance system and shared logic are connected to value creation indirectly through the network of participants. The shared logic could be seen to consist of two main components, a shared vision and alignment of business models, that both directed the actions of the participants. The shared logic defines acceptability of value creation from a societal perspective and guides the formation of common goals. Furthermore, shared logic, through creation of trust, can influence and substitute for parts of the governance system. The prominent role of the public sector in value creation rose as a factor specific to built environment networks and is an issue that calls for further research.

The contribution of Paper I is twofold: First, the ecosystem concept offers a structured and holistic method for analysing construction networks, building mainly on existing practices. It considers both formal and informal elements of collaboration as well as the influence of the network's environment on value creation. This is beneficial because many organization theories are too simplistic to accurately reflect the complexity of the industry and are therefore disregarded by practitioners (Lansley, 1994). Second, as the ecosystem concept is applicable in the construction industry context, it has the potential not only to help us to understand value creation in construction networks but also to narrow the perceived gap between construction and other industries.

5.2 Paper II: Business model renewal in the context of integrated solutions delivery: a network perspective

Paper I concluded that the governance system and shared logic shape the composition of network participants, which determines value creation. The shared logic consists of two main components, a shared vision and alignment of business models, both of which direct the actions of the participants. Paper II makes a further, detailed study on factors contributing to the creation of shared logic in a network. The study makes a comprehensive analysis of direct and indirect value creation drivers of the project at network level, while addressing the firm level capturing mechanisms (Nenonen & Storbacka, 2010). Furthermore, income streams that typically fall out of the immediate construction project scope, such as sales and asset appreciation, were included into the analysis (cf. Jacobides et al., 2006).
Paper II compares two cases of real estate development project networks that share a similar set of actors but differ in terms of their governance model and the value proposition to understand the factors that either promote or hinder value creation in these networks. The cases were analysed utilizing Zott & Amit’s (2010) conceptualization of business models as activity systems. The framework of activity-based business model framework consists of (a) design elements – content, structure and governance of activities – that describe the architecture of an activity system; and (b) design themes – novelty, lock-in, complementarities and efficiency – that describe the sources of the activity system’s value creation and subsequent appropriation.

A comparative case study was selected as an appropriate research strategy of the study, due to its purpose is to understand a change – the similarities and differences between the two-case setting (Yin, 2003). The cases were selected with the intention of finding polar types of integrated and disintegrated project delivery modes (Eisenhardt, 1989; Pettigrew, 1990; Yin, 2003). The analysis was conducted at two levels: first, the business model of the joint network was analysed to understand the purpose of the project, value provided to the client and the projects’ governance model. Second, the business model of each participating firm was examined in detail to identify their value appropriation drivers and their sources of shared logic.

The study found that the formal content, structure and governance of activities of the participating companies’ business models remained surprisingly similar in the two cases, despite the major differences in the value proposition of the projects. In contrast, the design themes – the sources of value creation and appropriation – were clearly different. The mutual alignment of the value creation and capture mechanisms of companies contributed positively to the value creation through steering and directing the choice of formal and informal activities contributing to the creation of shared logic and trust.

In addition, Paper II identified risk as the fifth design theme and a dominant value driver in the construction sector business models. Risk was identified by the impact of the cost incurred or the value delivered by an activity in three main ways: (a) The management of risk was identified to create a significant part of the client’s value proposition in both cases; (b) The high risk taking of companies was seen to strengthen the effect of other design themes, through promoting operational efficiency and in some cases innovations; and (c) The management of risk and subsequent deflation of the perceived risk level of the project deliveries resulted in asset appreciation and thus created value for the developers.

The findings suggest that firms that would enhance the joint value creation in real estate development networks should focus on creating shared logic primarily through a commercial structure that enables all parties to fulfil their financial objectives and utilise their existing resource in alignment with their respective risk-taking preferences. The networks’ joint ability to create value and the complementary value capture opportunities of the network members corroborates to the network’s perceived success.

The contribution of the Paper II is twofold: The paper demonstrates how business models in real estate development may be analysed through activities at intra and inter-firm levels incorporating also aspects of maintenance (use phase) and investment into the analysis. The result is more comprehensive than the traditional contractual and transactional approach, taking into consideration the effect of formal and informal governance in creating value. Second, it contributes to the general management literature by adding a component of risk as a design theme to Amit & Zott’s (2010) activity-based business model analysis.
5.3 Paper III: Creating urban platforms – opportunities and challenges for innovation in commercial real estate development

Papers I and II modelled the dynamics of value creation in REC sector networks through case studies. Their findings suggest that the role of shared logic is central in promoting value creation. The role of complementarity and alignment of the value appropriation mechanisms and risk-taking capability as means to create shared logic was highlighted in their findings. Additionally, their key conclusion was that non-linear models were needed to adequately describe and analyse construction sector’s networked value creation. In Paper I, the public institutions in the construction sector appeared to have a prominent role in the network’s value creation, that calls for further research.

Consequently, in Paper III the level of analysis was again lifted from the detailed firm level to the level of an ecosystem, to focus on the dominant institutions, including the public sector, in creating built environment. However, instead of identifying the prerequisites of value creation, as in Paper I, Paper III focused on the role of key actors in the ecosystem in search of differences in their capabilities to promote the creation of ecosystems in urban development. More specifically, the aim of Paper IV was to identify the opportunities and challenges related to shifting current urban development practices towards a more systemic and adaptive approach.

Paper III employs the platform ecosystem concept as a research perspective, demonstrating that urban areas are ecosystems organised around both a shared location and technological platforms. As a recent, comprehensive review of platform ecosystem literature, Thomas et al. (2014) identified the concepts of modularity, connectivity, standardisation and complementarity as the key boundary conditions for the value creation potential of platform ecosystems’ technology architecture, the study elaborates on these boundary conditions.

The study was conducted as a cross-sectional survey. Operationalisation of the Likert-type measurement scales was made based on a literature review and practitioner interviews regarding three commercial developments. The target group of the survey was limited to: (a) developers; (b) users, typically represented by the shopping centre management; and (c) representatives of municipalities who were responsible for coordinating or planning activities and construction regulations. The responses were analysed using SPSS statistical software.

The survey scope was comprised of: all managers of Finnish shopping centres who were members of The Finnish Council of Shopping Centres; project managers of private commercial developers as well as premise retail managers of the largest retail corporations in Finland and all municipalities where the surveyed shopping centres are located or that have supported commercial development activities in recent years (see Table 5).

<table>
<thead>
<tr>
<th>Table 5. Targeted population and response rate for the survey</th>
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<tbody>
<tr>
<td>Population</td>
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<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td>Employees of municipalities</td>
</tr>
<tr>
<td>Employees of private developers</td>
</tr>
<tr>
<td>Private shopping centre managers</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
The results indicate that there are significant differences in perceptions regarding platform ecosystem principles in urban commercial development, highlighting the differing roles of the actors in the developments under investigation. This was particularly evident in constructs related to complementarity, a precondition for capturing synergies and achieving co-evolution (see Figure 4).

**Figure 4.** The implementation of boundary conditions necessary for value creation in platform ecosystems

Furthermore, the results highlight the different current capabilities of the respondent groups to apply the ecosystem approach in urban development, indicating that municipal respondents currently have less knowledge of time, visibility, resources or interest in these issues as they relate to commercial urban development. Figure 5 represents the proportion of do-not-know responses of different respondent groups. Most notably, municipalities currently appear to be ill-equipped to adopt a new model of development due to their limited knowledge of the value creation processes for an urban ecosystem, along with their low scores on issues of complementarity. Furthermore, a lack of connection with the business logic of the users may result in plans and visions that do not support the long-term value creation potential of the planned development.
The findings suggest that the current urban development process is dominated by a traditional event-sequenced linear approach even though the increasing pace of change in the environment calls for more agile processes that emphasize value co-creation. The linear approach prevents the public sector from actively influencing and understanding the logic of value creation process during the life-cycle of the urban commercial development and appropriating a share of the value created (Letaifa, 2014; Chou & Huang, 2012; Thomas et al., 2014).

Paper III confirms that the platform ecosystem approach has a good fit within an urban development context, and the operationalisation of the necessary boundary conditions for a platform ecosystem’s success makes it possible to identify key areas for improvement within the current process. A platform ecosystem approach sees the process of platform creation as just the starting point, acknowledging that most of the value is created after the platform has been set up, during the use phase of the new development. This difference highlights the major departure point between traditional urban development models and platform ecosystems. It also represents the key discontinuity in the traditional linear approach to urban development: traditional models do not allow for an analysis of the factors promoting continuous modular renewal and adaptability of the urban areas produced through the process. For practitioners, both from commercial organisations and public bodies, the study provides insights into how to promote the co-creation of value and new innovations in commercial urban development.
6. Discussion and Conclusions

6.1 Summary of the results

This dissertation set out to create a better understanding of the factors that either promote or hamper the creation of innovations in built environment networks. It examines the mechanisms of value creation and capture in the networked innovation context and how these contribute to the collaboration of the parties involved in the innovation process. Following the notion that the value of innovations is only realised during their use, the scope of investigation in this dissertation has been extended to cover not only the innovations taking place in the production (i.e. construction) of built structures but also during their use phase in the built environment. Particularly, this dissertation seeks to answer the following research questions:

RQ1: What is the role of value creation and capture dynamics in the built environment sector innovation networks?

RQ2: What are the benefits of ecosystem and business model concepts in managing innovations in built environment networks?

The answer to these questions is based on a combination of the findings of the three papers that comprise the body of the dissertation.

The response to the first research question is threefold. Based on the findings of three studies, this dissertation argues that (a) the complementary or similar value creation and capturing dynamics of participants, i.e. shared logic, have the key role in determining the quality of collaboration of built environment sector networks. They improve governance and reduce complexity related to innovations. (b) However, the environment in which the network firms operate, at the permanent network level, set the boundary conditions on how these incentives may be formed. Of these, legitimacy and perceptions on risk and risk management capabilities are the most notable. (c) The public sector authorities specifically seem to be ill equipped to promote shared logic in the built environment networks.

As the response to the second research question, this dissertation concludes that when managing innovations in the built environment sector, the current project-based conceptualisations of value creation and capture could be complemented with an ecosystem and business model approach. These approaches can model value creation processes both at multiple levels of the network and across the lifecycle of built assets and combine it with an analysis of value capture in detail.

In the next sub-chapter, each of these arguments are presented in more detail and subsequently, their joint implications are discussed.
6.2 Discussion

6.2.1 Shared logic enhances the quality of collaboration

Paper I demonstrated how value creation in a network is facilitated when it operates according to the ecosystem principles. The results of both temporary and permanent network analysis indicate that the networks whose shared logic – the identity of the network, goals and incentives – support the network of participants functioned well and were able to attain their goals. According to the framework constructed as a result of Paper I, the governance system and shared logic influence value creation through the network of participants, which determines value creation. Moreover, shared logic can substitute parts of the governance system. Paper II complemented the findings of Paper I by examining in detail how shared logic is formed and how it facilitates the joint value creation of the case networks at temporary network level. At the temporary network level, shared logic was created chiefly through participants’ mutual understanding of the value being created through the network, and their compatible value creation and capture dynamics across different phases of the building’s life cycle. However, even though value was created jointly by the network to a shared client, the value capture was predominantly a firm specific process.

The findings of this dissertation suggest that firms wishing to enhance the joint value creation in built environment innovation networks should focus on creating shared logic primarily through a commercial structure that enables all parties to fulfil their financial objectives. These findings are in line with the existing literature on networked innovation, and the role of shared understanding of the value being created through the network (Blayse & Manley, 2004; Öberg & Shih, 2014; Windahl & Lakemond, 2006). According to existing research, unaligned value creation and capture logics negatively affect the efficiency of activities and development of trust within the network (Corsaro and Snehota, 2011; Ritala et al., 2012). The results of this dissertation elaborate these findings by describing how compatible dynamics of the value creation and capturing processes – i.e., the core of the business models – of the network members increased the efficiency of network governance.

The mechanisms identified are threefold: First, joint or complementary value appropriation incentives increases the commitment of network participants towards the network’s common goals. Joint goals steer and direct the choice of formal and informal activities that contribute to trust between members. Second, by explicitly allowing the partners to optimize their own private benefits, trust can be increased through transparency, thereby reducing the threat of opportunism. Third, increased trust enables non-contractual, informal task coordination and reduces the need for additional formal governance modifiers. The relationship between shared logic, governance system, network participants and subsequent value creation is described in the lower part of the figure 6 below.

In his article on innovation incentives, Orstavik (2015) demonstrated how the complexity related uncertainty in the built environment adds up to the uncertainty related to innovation, diminishing the motivation of firms to try new combinations or changes in established processes and thus increase the overall risks of the project. Shared logic of value creation and capture may reduce this perceived complexity of innovative pursuits, as managers may rely on their established heuristics of value capture and other incentives. The actors may then evaluate the consequences of their choice of (new) actions without the need to learn new decision-making models. This approach was visible in case D of Paper II. Evaluation of the shared logic may also assist firms in their evaluations of their optimal collaboration partners. For example, in
their empirical study of pharmaceuticals, Öberg & Shih (2014) argued that the disparity between the innovation logics of network members caused a barrier for the development of innovations. The results of this dissertation complement these findings by examining how the similarity of the logics between firms may be evaluated. In the built environment sector, the preferences over the timing of value capture and the ability to rely on established value creation and capture logics to manage uncertainty have a particularly central role.

The results of this dissertation also give some guidance on how firms may promote shared logic in their networks throughout the building life cycle. According to the analysis of cases D and E in Paper II, the mutual alignment of value capturing logics of the network members required a temporal overlap of the different project phases – or the temporary networks – responsible for the construction and use phases of the buildings. In case D, this was achieved through the developer providing “a technical platform”, i.e. the building, in which they remained as an owner even throughout the buildings’ use phase. This ownership enabled the developer’s capture value through the use of the platform, incentivising them to invest in technical features that enable a long-term functionality, i.e. use value of the buildings. These findings imply clear analogies with the general platform ecosystem approach and are in accordance with the insights provided in platform literature (e.g. Gawer, 2014; Gawer & Cusumano, 2013).

![Figure 6. Main connections between shared logic and value creation](image)

### 6.2.2 Legitimacy limits how shared logic may be formed

So why aren’t firms just changing their value creation and capturing logics according to the needs of their projects? Examples of the cases of Papers I through III imply that the motivation, alone, is not enough to ensure the value creation through inter-firm collaboration. Even though the actors may acknowledge the benefits gained through the innovation, their institutional background and routines at permanent network level effectively set limits to how their value creation and capture logics may be changed between projects. The findings of this dissertation suggest that the perceptions of risk and risk management capabilities within firms play a major role in evaluation of the cognitive legitimacy of innovations in the built environment (see the upper part of Figure 6).
The results of Paper I highlighted the role of socio-political and cognitive legitimacy in creating value in networks. Legitimacy can be defined “a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions” (Suchman, 1995, p. 574). The importance of legitimacy in built environment innovations is highlighted due to two reasons at firm and at permanent network levels. First, built environment sector firms need to coordinate their resources simultaneously at multiple levels, within projects and between projects at firm level (Bygballe et al., 2013). As was shown in Paper II, to manage complexity within projects as well as changing constellations between projects, firms rely on established routines and cognitive models. Second, at the permanent network level, due to the fragmentation of the industry, there are very few dominant firms with the capability to create new industry-wide practices. The role of industrial and research associations as innovation brokers is therefore important and the industry’s communities of practice are strong, maintaining a shared understanding of what is done and how it is to be done (Cacciatori & Jacobides, 2005; Whyte & Sexton, 2011). This importance of socio-political legitimacy was aptly demonstrated in case A in Paper I.

The central role of risk in the value creation and value capture processes and creating shared logic between network participants is one on the key findings of Paper II. The role of risk was identified as central in the formation of both value creation processes in networks and in value capture processes at firm level. Risk management as a key boundary condition steering the selection of project procurement practices was already identified by Davies in studies addressing complex infrastructure projects (Davies, Frederiksen, & Dewulf, 2010; Tee & Davies, 2012). However, the findings of this dissertation provide a more fine-grained picture on how risk mediates the formulation of business models. First, risk is a key value creation driver in real estate development networks, especially during the design and construction phase. The clients of construction companies are often inexperienced or otherwise incapable of managing technical and operational risks related to asset-intensive buildings and therefore gain value from utilising the knowledge and capabilities of the network members (Barlow, 2000; Davies et al., 2010). Second, information on risk and risk pricing were key factors affecting the value capture possibilities of the network members throughout the building use. The findings of Paper II demonstrate how the management of risk in projects and the subsequent deflation of the perceived risk level of the constructed assets resulted appreciation of the asset’s value. This enabled contractors to capture value through the divestment of the building shortly after the completion of the project. For maintenance service providers, the ability to absorb the risk of usability of the built assets provided value-capturing potential throughout the building’s life cycle.

In empirical studies of innovation networks in construction, Winch (2002), Bygballe et al (2013) and Bygballe & Ingemansson (2014) found that in the construction sector, the alignment with the internal network of the firm is particularly significant for innovation success. According to the network management approach, a project activates resources in the permanent network to perform the activities required for completion of the project. However, the permanent network also restricts the way these resources can be activated in the project (Dubois & Gadde, 2000). This dissertation complements these literature streams by describing how these decisions are made through the evaluation mechanisms for risks. The risk taking and timing preferences and consecutive risk management capabilities of individual firms affect the division of activities between network participants. Subsequently, these factors also effectively constrain the participants’ value capturing mechanisms and potential.
Researchers have suggested competency and information sharing, long-term relationships, objective reward criteria, a no-blame culture, shared direction and goals and equality and fairness as means to improve the relations between network members (Wong et al., 2005), Baiden et al., 2006; Ankrah et al., 2009; Gajendran and Brewer, 2012) (Maurer, 2010; Cheng and Li, 2001, (Rutten et al., 2009). In addition, formal contractual and technical arrangements, such as partnering and alliances have gained attention (Das &Teng, 2001, Dainty et al., 2001). These views assume, that the project level network could be an independent entity from its context, and that the mode of governance can be adjusted through contractual arrangements and additional governance modifiers or through requesting the change of attitude of the network participants. This dissertation argues that this contractual view is incomplete: The functioning of the temporary networks is subject to the interests, goals, priorities and timelines of the permanent networks and firms’ respective logic on the optimal approach towards value creation and capture.

6.2.3 The public authorities are currently ill-equipped to create shared logic in the built environment development processes

One of key characteristics of the built environment industry is the heavy involvement of public actors, as recognised in the Paper I. In addition to regulating the building products, the design solutions are under a detailed regulation and permitting process. In most countries, the public authorities regulate or assign the use of land to specific purposes and volumes. The results of this dissertation bring light to the discussion on the role of public authorities in planning, steering and controlling the development activities in the built environment. Consequently, they should be considered as members of the built environment networks and have an impact on the functioning of these networks.

In urban development, the public sector has a challenge to promote innovativeness and flexibility. Public actors have a keystone role in value creation in built environment but are currently lacking the capability to capture part of that value. This last argument is essentially the main finding of Paper III. It demonstrates how the public authorities responsible for land-use planning and construction currently appear to be ill-equipped to promote innovations due to their limited knowledge of the value creation and capture processes for an urban ecosystem and a lack of shared logic with the users. The results comply with the existing studies that have identified contradictions between the objectives of public authorities and other stakeholders (Klijn & Koppenjan, 2000; Säynäjoki et al., 2014). Consequently, value is captured only at the project level, with focus on short-term completion of the project rather than optimizing the value being created to users, residents or the society. From the perspective of public authorities as the guardians of common good (Väyrynen 2010; Naess 2011), this can be considered as value slippage.

In addition to increasing their knowledge and/or interest towards the value creation and capture processes for all urban ecosystem participants, a shift in conceptualizing urban development as a process of sustaining an ecosystem instead of a project, could increase the ability of the public sector to capture sustainable value from these developments. A platform ecosystem approach sees the process of platform creation as just the starting point, acknowledging that most of the value is created after the platform has been set up, during the use phase of the new development. Public sector authorities should acknowledge their role as the platform leaders (or as “keystones”) and find ways to remain as interest holders of the core components of the urban platforms. Consequently they would be able to create incentives to sustainable use value
creation and the ability to capture value throughout the life-cycle of the developments through their interest in the urban platforms.

6.2.4 The ecosystem and business model concepts could analyse built environment networks more accurately than current project-based and network-oriented approaches

Existing research on innovations have concluded that the traditional, linear and temporally limited concepts utilised to describe value creation, such as value chains and projects, are not sufficient in built environment industries given their the non-linear, complex and highly networked nature (see e.g. Guy & Henneberry, 2002; Lizarralde et al., 2015; Ozorhon et al., 2010). As a response to the second research question of the dissertation, the results of this dissertation suggest that the ecosystem, platform ecosystem and business model concepts have several benefits in analysing and managing multi-level and temporal aspects of innovation in the built environment sector over traditional project-based approaches. The ecosystem and business model concepts can combine the aspects of temporary construction projects with the temporally delimited, continuous value creation throughout the use of built assets. In addition, they enable analysis of value creation processes and subsequent value capture at different levels of analysis: permanent network, temporary network and within a firm. The operationalisation of elements of the ecosystem value creation presented in this dissertation provide guidance for innovation management in the built environment sector.

Paper I concluded that the ecosystem concept can be applied as a useful analytical lens for examining and understanding value creation and innovations in permanent networks in the industry and that it is possible to analyse even temporary project networks through the ecosystem lens. Paper III further demonstrated that urban areas are ecosystems organised around both a shared location and technological platforms and that particularly, a platform ecosystem approach is a suitable lens for analysing their value creation processes. In addition, in the Paper II, the business model concept was applied to analyse the sources of value creation and appropriation at individual firm level. Existing research (e.g. Ritala et al., 2013) has concluded that the process of value creation and capture are separate and take place at different levels. Value capture is a firm level activity, whereas value is almost always created in a network, in the collaboration between several firms. Combining the analysis of both aspects can therefore be challenging. Subsequently, in this dissertation, the business model-based analysis was successfully utilised to complement the ecosystem approach to disclosure of the firm level sources of value capture and combine it with analysis of value creation in detail.

This dissertation has concluded that network participants should strive for compatible value creation and capture logics. This compatibility is typically assessed through how well these logics and their timing are complementary or similar between the network participants. The project-based approach typically conceptualises value creation through the achievement of the project goals that typically consist of the completion in time and in budget with a set quality of the product, a physical structure. The value capturing mechanisms are also limited to these boundaries. Due to this limited temporal focus, a significant amount of the value in use is ignored and possibilities to capture value during the use phase of the products is lost. As ecosystems and business models are not bound to the organizational or transactional boundaries, as set forth by TCE (Sheehan & Foss, 2007; Zott & Amit, 2008), the factors contributing to the creation of value can be identified in the firm’s wider network, also outside its immediate suppliers. Consequently, analysing business models as activity systems enables the identification.
of value creating activities at both the level of the network and firm in detail and locating the mechanisms of value capture separately for each firm at each point of the case projects’ life cycle.

The use of ecosystem and business model concepts enables the analysis of non-linear value creation and combining aspects of formal and informal processes to view holistically the value creation process beyond firm, contractual or project limits, including the focal firm, its suppliers, complementors and the client. At the same time, they unite several elements of value creation in the built environment that have already been identified in the existing literature. The key phases in a platform ecosystem’s lifecycle: birth, expansion, leadership and self-renewal (Moore, 1993) resonate with the traditional event-sequenced conceptualisation of the development actions in the built environment: evaluation, preparation, implementation and disposal (Cadman and Austin-Crowe, 1978). However, in contrast to the project-based approach, an ecosystem approach sees the process of platform creation as just the starting point, acknowledging that most of the value is created after the platform has been set up, during the use phase of the new development. Conceptualising value creation in the built environment as ecosystems and analysing the mechanisms of value capture through business model approach facilitates incorporating the design and construction phases of developments more tightly with temporally delimited, continuous value creation throughout the use of built assets. Consequently, it could help solve some of the fundamental limitations in the dominant conceptualisation of built environment sector value creation through offering a beneficial mindset for industrial renewal and shifting the communities of practice in built environment.

6.3 Contribution of the dissertation

The built environment has great financial, social and environmental importance. Innovations in the industry are urgently needed to respond to the global environmental challenges, stalling productivity and urbanisation. This dissertation has been able to identify some of the opportunities and hindrances related to these innovations. In the previous chapter, the detailed contributions of this dissertation in the field of networked innovation were identified and discussed. In this chapter, the overall contribution of this dissertation in theoretical and practical fields are identified.

The finding that the ability to benefit from collaboration affects the quality of collaboration and its success seems to be self-evident. However, both academia and the practitioners of the built environment have paid only limited attention to the effect of the value creation and capture dynamics on network success. For example, in a study on Finnish publicly supported innovation projects in the industry, the value network is utilized consciously only in one third of the projects (Sivunen, Pulkka, Heinonen, Kajander, & Junnila, 2013). In the UK, according to the SCRI research report by Ozorhon et al. (2010), “market penetration and growth”, “revenue growth due to new products or services” and “short and long-term profitability” of innovation projects was one of the smallest outcomes the companies were expecting.

The theoretical contributions of this dissertation are threefold. First, the results contribute to the current network management theories. Network management studies typically focus on analysing the interactions between network members, whereas the quality of these interactions in terms of motivations is more rarely discussed (see Öberg et al, 2014). The results of the dissertation elaborate the factors contributing to the formation of these motivations. In addi-
Discussion and Conclusions

tion, they shed light on how these motivations and logics are interconnected and how the different motivations of parties may have different impact on the choices made in the networks. The results also demonstrate the central role of aligned value creation and capture logics in the formation of network governance systems and their influence on value creation at multiple levels of analysis. According to the existing network management research, a project activates resources in the permanent network to perform the activities required for completion of the project. However, the permanent network also restricts the way these resources can be activated in the project (Dubois & Gadde, 2000). Our study complements these literature streams by describing the how these decisions are made, through risk perceptions.

Second, the dissertation has been able to add time into the conceptualizations of built environment sector networks. It has demonstrated how the value creation and capturing processes are separated at different network levels, and temporally. Consequently, it has examined the challenges that temporally limited approaches have in modelling value creation and capture dynamics in the built environment sector networks. Temporal orientation as a factor contributing to the formation of networks the built environment sector business models has earlier been identified in the literature in the context of “megaprojects” (Brookes, Sage, Dainty, Locatelli, & Whyte, 2017). This dissertation has been able to conceptualise this “network of temporalities” and located the role of time in the formation of value creation and capture logics of built environment sector organisations.

Third, for the industry specific literature, the ecosystem and business model concepts provide a novel framework for analysing networked value creation and capture and managing collaboration in the built environment. It adds to the existing research on built environment network characteristics and allows analysing them irrespective of the unit of analysis; temporary and permanent networks. As a clear advantage over project-oriented approaches, they enable the analysis of built environment innovation across design, construction and use phases of the built assets. The results are in line with studies suggesting that the quality of inter-organisational couplings is a determinant of the success of the network (e.g. Dorée & Holmen, 2004; Dubois & Gadde, 2002b). The nine elements of the ecosystem concept offer researchers a more detailed structure for analysing the quality of inter-organisational relations in networks than focusing on the tightness of these couplings only (Dubois & Gadde, 2002b). In addition, the operationalisation of the four boundary conditions of value creation in platform ecosystems to the built environment industry context provides a tool to measure and develop the adaptive capacity of urban development projects.

The development of the ecosystem concept has relied heavily on evidence from high-tech industries. Exploring ecosystems in a low-tech project-based context, the construction industry, is thus an important contribution of this dissertation. The articles within this dissertation are among the first to apply ecosystem and platform ecosystem theories in the built environment context. Demonstrating the applicability of the ecosystem and platform ecosystem concepts in the built environment context can help to narrow the gap between general organisational and innovation literature and literature specific to construction industry, enabling the industry to benefit directly from the growing body of ecosystem literature.

For practitioners, the dissertation provides guidance on the key success factors of project networks. Before entering an (innovation) project, firms should understand their joint value creation mechanisms and network’s goals and assess their fit with the firm’s own value capturing logic and risk-taking capability. The findings suggest that firms wishing to enhance the joint value creation in built environment development networks should focus on creating
shared logic primarily through a commercial structure that enables all parties to fulfil their financial objectives and utilise their existing resources in alignment with their respective risk-taking preferences. In addition, the nine elements of ecosystem and the four principles of platform ecosystem value creation operationalized in Papers 1 and 3 could potentially be utilized as guidance in setting up new projects that aim at either successful individual innovations or continuous value creation through adaptation.

Finally, the research has direct relevance for the public sector. The research has demonstrated the importance of public actors as active participants in constraining, steering and participating to value creation in the built environment. Based on the dissertation, it can be argued that public actors are not actively taking this role. Consequently, they are incapable of capturing long term value, such as improved sustainability, from the developments. Researchers such as Klijn & Koppenjan (2000) and Savini, Majoor, & Salet (2015) have suggested that network management strategies will have to become part of the standard operating procedures of public authorities and call for concrete techniques and supporting instruments. The conceptualization of built environment as a platform ecosystem and the operationalization of the four boundary conditions for its value creation provides one potential direction towards this.

6.4 Implications for practitioners

This dissertation has risen two major points related to managing innovations in the built environment sector: the strong role of permanent networks and the benefits of using of ecosystem approach. The real estate and construction industry is infamously conservative, and it is not difficult to anticipate arguments that the transformation of built environment sector networks towards ecosystems is too difficult due to the strong traditions of the industry and risk perceptions within them. However, viewed together, the three papers of this dissertation indicate that the required transformation is not too far-fetched. In fact, the transformation towards ecosystem-like practices in urban development is arguably already on-going.

As it was stated in the Paper I, although the ecosystem construct is relatively new, it mainly builds on existing practices. These “network oriented models” (Bygballe et al., 2013) have identified the relational context of all economic exchanges emphasizing inter-organizational relationships; greater commitment, knowledge and resource sharing and trust, as assets. These are also some of the core tenets of the ecosystem concept, which highlights the importance of relational interactions (Thomas and Autio, 2014). The ecosystem concept offers a beneficial mindset for industrial renewal because it emphasizes network-level value creation over firm-level value appropriation (Thomas and Autio, 2014). That the ecosystem concept is compatible with several practices that have already been recognized and taken up by the industry which makes it arguably easier to implement.

Recommendations how “value creation first –mindset” of the ecosystem approach can be balanced with the strong traditions of the industry were provided in Paper II. It was demonstrated how firms may succeed in innovations through aligning their commercial structure in a way that enables all firms within the network to fulfil their financial objectives and utilizing their established resource base. In order to succeed in this, firms need to be able to have a shared understanding of their clients’ needs and to transparently communicate and align their established requirements of return, risk and their timelines (i.e. commercial boundary conditions) both at firm (i.e. permanent network) and project (i.e. temporary network) levels. These recommendations complement the conclusions of earlier academic work by concretizing the
key practical aspects contributing to the creation of e.g. trust, commitment and knowledge sharing in networks.

In Paper III the keystone role of public actors were emphasized and critique towards their insufficient role in built environment projects and lack of capabilities in promoting innovation was raised. However, the paper also suggested a practical way forward by adopting a platform ecosystems approach. As in Paper I, also the results of Paper III confirm that the ecosystem approach has a good potential fit within an urban development context. Practitioners may use the operationalisation of the boundary conditions for modularity, standardisation, complementarity and connectivity as a measurement scale and joint framework. Through them relevant partners may assess the adaptive potential of any new urban development and identify key areas for improvement within their current processes.

In addition to increasing knowledge and interest towards the value creation and capture processes for all urban ecosystem participants, a shift in conceptualizing urban development as a process of sustaining a platform ecosystem instead of a project could increase the ability of the public sector to capture sustainable value from these developments. A platform ecosystem approach sees the process of platform creation as just the starting point, acknowledging that most of the value is created after the platform has been set up, during the use phase of the platform. This is indeed the case in urban development, particularly in issues with the most impact to the society and environmental sustainability, for example indoor air quality, emissions and energy usage.

However, it is relevant to ask, whether the current pressure on developers to solve these problems alone is realistic, given the rigidity of current traditions and industry practices and the contradictions that these long term requirements have with the dominant short-term business objectives of these actors. For example, building structures may have a life cycle of 70 years, with low risk and return rates less than 4%, whereas local energy production systems may have a life cycle of 15 years, with return rates of 8%. In addition, the management of these systems require very different knowledge and skills. It is then relevant to ask, whether developers are the best actors to integrate these systems into a single product that has a total value evaluated based on a ten-year cash flow and average return rate of 5%? Should the roles and responsibilities within urban developments and ownership of the assets be “sliced” differently – not across technical specialities or project phases, but according to the similar temporal interests and “payback-times” of related actors? Shoudn’t these different technologies have their specific business models and be managed separately through a joint technical platform?

The public sector authorities could play a central role in the future of built environment ecosystems as the platform leaders (or as “keystones”). The cities could have a natural position as a stakeholder aiming at remaining the long term value of the ecosystem. They could host the core components of the urban platforms with most sustainability and social value. Consequently, they would be able to create incentives to sustainable use value creation and the ability to capture value throughout the life-cycle of the developments through their interest in the urban platforms. Instead of managing uncertainty through stricter norms or their more effective implementation, they could focus on norms that allow for more creativity and change.
6.5 Evaluation of the research

There are several issues that affect the reliability and validity of the findings if the research. Issues concerning individual studies are described in the Papers I-III. In this chapter, the issues concerning the validity and reliability of the entire dissertation are discussed. Validity is defined by the extent to which research manages to address and answer a given research question or problem, in other words whether the conclusions describe the reality of the phenomenon that is supposed to be examined (Yin, 2003). According to Yin (2003), validity can be divided into three components: construct validity, internal validity and external validity. Construct validity means that the researcher has established correct measures for the concept being studied (Yin, 2003). Internal validity addresses the consistency of the identified causalities, focusing more on how the conclusions are drawn from the results (Amaratunga, Baldry, Sarshar, & Newton, 2002). External validity refers to the generalisation of results and conclusions (Yin, 1994; Amaratunga et al. 2002). Reliability refers to repeatability, defined by the extent to which the same research procedures would produce the same results under constant conditions on all occasions (Yin, 2003).

There are several strategies to enhance the construct validity of a study, of which multiple sources of evidence, investigator triangulation and chain of evidence have been employed in this study. In this dissertation, multiple sources of evidence consist of interviews, survey data, public and internal documents of companies and participant observation. Investigator triangulation was used in all three papers, as all of them are co-authored. In Papers I and II, employing case study strategies, chain of evidence was presented as transcribes from interviews or summarizing tables that have made visible the development of conclusion from the data through analysis. The selection of different settings from housing, commercial real estate and public buildings in different locations, inquiries of key actors throughout the built environment life cycle (development, construction, use), and the consistent use of theoretical analysis contributes to the internal validity of the findings.

The analytical generalisation in this dissertation means that the findings of this research may assist in understanding other cases and elaborating existing theory (e.g., Yin, 2002). However, analytical generalisation is not automatic but requires replications (Yin 1994; K. M. Eisenhardt, 1989), as conducted in this research. The replication logic has been illustrated in Table 3. In addition, the case selection and the results of the dissertation are tightly linked to existing literature, which demonstrates the relevance of the studied phenomenon. The case selection was guided by the specific research purposes of each individual study and the ability to compile enough and appropriate data to draw the mutual conclusion of the dissertation. However, because the qualitative approach aims at gaining rich data and creating in-depth analysis, the samples are still small and there is limited amount of evidence of the data saturation.

Internal generalizability refers to the generalizability of conclusions within the research setting (Johnson et al., 2007; Onwuegbuzie & Johnson, 2006). Especially in the survey part of the research, it could be argued that results would have been different if more respondents would have been included to the survey. Surveys were sent to a limited group of potential actors engaged in urban commercial development, and thus the analysis is based on the perceptions of the leading actors within those networks. Furthermore, the survey focused on commercial centre developments. However, data for all the members of this subgroup of urban development networks was transparently available, contributing to the internal generalisability of this part of the research. The relatively small market of Finnish property development and good
personal connection with the national association of construction clients allowed gaining information of the total population of shopping centres and related actors in the country. The access to the complete data sources steered the research to emphasize the quality and coherence of the source data over data from several markets but with less quality.

The external generalisability of the results is limited due to its focus on a limited geographical area. The context of the dissertation is mainly the built environment sector industry in Finland and, for one case, in Sweden. The results may differ in other countries with different decision-making and collaboration cultures (e.g. Miozzo et al., 2004; Skelcher, Klijn, Kübler, Sørensen, & Sullivan, 2011) The study was conducted in Finland, and the developments are all specific to that country. Particularly, the conclusion about the role of public sector may be dependent on the decision-making structures of the country. However, the conceptual models and analytical lenses developed and deployed in this dissertation may still be applied irrelevant of the location.

In this dissertation, the research process and activities in the research process are documented in the individual papers and the supplementary material of these papers are appended to these publications. In addition, the source data and supplementary material are stored in separate databases. Due to the nature of the research, biases from qualitative inquiries cannot be completely excluded, especially due to some of the researchers’ background in the industry. Strategies applied to minimize the bias includes methods and investigator triangulation, as described earlier. In addition, multiple sources of data were used to create a rich set of evidence and to establish converging lines of inquiry. All studies were conducted with a solid conceptual framework to guide the collection and interpretation of the data.

6.6 Future research

The first direction for future research considers improving the theoretical basis of the ecosystem and business model frameworks. The theoretical development considering both ecosystems and business models is still at nascent stages, intermediate at its best (Edmondson & McManus, 2007). To strengthen their theoretical validity, a substantial number of studies in different contexts on the dynamics of value creation and capture in different settings are needed. Beyond construction and built environment, these studies may help in applying these models more accurately to other capital-intensive industries. Since the development of built environment is predominantly local, studies at different markets and geographical areas are needed to enhance the generalisability of findings. The role of risk was identified as central in the formation of both value creation process in ecosystems and in value capture at firm level business models. To develop the conceptual approach of business models, more repeat studies and theoretical development are needed to model more detail the multiple mechanisms of uncertainty and risk perceptions of managers and their effect on the division of risk in inter-firm collaboration. For example, the integration of existing management literature on alliances and partnering could provide additional insights.

The second direction considers confirmatory research on performance. In this research, value creation was operationalised in the papers through goal attainment and functioning of the network. The development of theoretical propositions of ecosystem value creation in Paper I and the operationalisation of platform ecosystem elements of value creation in Paper III pro-
vide direction towards more confirmatory studies relating ecosystem elements with more accurately measured variables on profitability, environmental sustainability or social performance.

The third avenue for further research is to increase the understanding on the role of temporal aspects in creating built environment networks. Throughout the process of this dissertation, the importance of time has emerged. However, the results of this dissertation touch the topic only briefly. More research is needed to understand the role of time in the formation of business models of firms and how the temporally limited conceptualization of industry activity influences the formation of mental models and communities of practice in built environment.

The final direction for future research considers the role of public actors, particularly municipalities, in value creation. Public actors are keystones in built environment ecosystems through urban planning. Built environments operate decades, yet planning practices, have been concluded to address the future short sighted and through a linear world view (Myers and Kitsuse, 2000; Savini, Majoor, & Salet, 2015). There is a need to create a better understanding of planning mechanisms that could promote the flexibility and adaptation of the built environment.
References


References


References


It is evident that innovations are needed for advancing the ecological and social sustainability, as well as improving the productivity of the industry. However, the fragmentation of the industry, the dominant business logic of the industry, and the linear operational mode impede flexibility and adaptation of urban structures and related development processes. This dissertation set out to create a better understanding of the factors that either promote or hamper the creation of innovations in the built environment. Specifically, it examines the dynamics of value creation and capture as the key motivational factors for firms to innovate in inter-firm collaboration in the built environment sector. This dissertation also explores conceptualisations of networked innovation; particularly, the benefits of business ecosystem and business models’ concepts as an analytical lens and consequently in managing innovations is explored.

The results demonstrate the central role of aligned value creation and capture logics in the formation of network governance systems and their influence on value creation at multiple levels of analysis. The ecosystem concept provides a novel framework for analysing networked value creation in the built environment and allowing the incorporation of project development and use phases into the analysis. The dissertation also adds to the general management literature on business models by introducing risk as a potential new value driver. For practitioners, the findings provide tangible recommendations on how to increase the success of inter-firm collaboration in capital-intensive industries.