

Dissertationes Forestales 340

On the reconfiguring value creation logic and networks
of the forest sector in a changing business environment

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Academic dissertation

To be presented, with the permission of the Faculty of Science, Forestry and
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of the University of Eastern Finland, Yliopistokatu 4, Joensuu, on 29th of September 2023,
at 12 o' clock noon.

Title of dissertation: On the reconfiguring value creation logic and networks of the forest sector in a changing business environment

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Dissertationes Forestales 340

<https://doi.org/10.14214/df.340>

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ISSN 1795-7389 (online)

ISBN 978-951-651-770-7 (pdf)

Publishers:

Finnish Society of Forest Science

Faculty of Agriculture and Forestry of the University of Helsinki

School of Forest Sciences of the University of Eastern Finland

Editorial Office:

Finnish Society of Forest Science

Viikinkaari 6, FI-00790 Helsinki, Finland

<https://www.dissertationesforestales.fi>

Laakkonen A. (2023). On the reconfiguring value creation logic and networks of the forest sector in a changing business environment. *Dissertationes Forestales* 340. 91 p. <https://doi.org/10.14214/df.340>

ABSTRACT

Numerous phenomena, such as sustainability challenges and the increasing importance of knowledge and digitalisation, have tremendous impacts on the global socio-economic system. These phenomena affect the dynamic and complex business environment where different actors from various sectors interact with each other. Responding to the phenomena and changes in the business environment calls for a systemic change in the ways that value-creating activities are performed. One suggested systemic change is a transition to a sustainable circular bioeconomy. Changes in the business environment pressure established business sectors, such as the forest sector, to reconfigure their networks and value creation logic, i.e., the ways in which actors co-create value.

In this dissertation I investigated how the value creation logic of the forest sector changes when entering the sustainable circular forest-based bioeconomy. The research design followed a qualitative theory-guided interdisciplinary case study strategy. I analysed scientific and non-scientific documents to determine the past and currently occurring adaptations within the forest industry's value creation logic. I conducted interviews to identify the possible future value creation logic of forestry service providers and the readiness of forest owners to respond to the occurring changes.

According to the findings, the forest sector's value creation logic is incrementally changing towards holistically sustainable, collaborative and cross-sectoral value co-creation logic. The sector has been able to reconfigure its networks and value creation logic in the past and it seems that the sector's actors have understood the importance of cross-sectoral collaboration and intangible resources in the sustainable value-creating activities. They have acknowledged that their attitudes and actions will affect the future value creation within the sector. To reach holistic sustainability, actors need to consider the whole forest ecosystem as a capital and a resource base from where value and benefits for the common good are co-created in a forest-based sector.

Keywords: business sustainability; circular forest-based bioeconomy; value-creating network; business network; forest industry; forest owner

Laakkonen A. (2023). Metsäsektorin muuttuvasta arvonluontilogiikasta ja verkostoista osana muuttuvaa liiketoimintaympäristöä. *Dissertationes Forestales* 340. 91 s. <https://doi.org/10.14214/df.340>

TIIVISTELMÄ

Useilla ilmiöillä, kuten kestävyysshaasteet sekä tiedon ja digitalisaation lisääntyvä merkitys, on valtavat vaikutukset globaaliin sosio-ekonomiseen järjestelmään. Nämä ilmiöt vaikuttavat myös dynaamiseen ja monimutkaiseen liiketoimintaympäristöön, jossa erilaiset toimijat useilta sektoreilta ovat vuorovaikutuksessa keskenään. Jotta voidaan vastata näihin ilmiöihin sekä muutoksiin liiketoimintaympäristössä, tarvitaan systeemistä muutosta tavoissa, joilla arvoa luodaan. Yksi ehdotettu systeeminen muutos on siirtyminen kestävään biokiertoalouteen. Nämä muutokset liiketoimintaympäristössä luovat paineita vakiintuneille sektoreille, kuten metsäsektorille, muuttaa verkostojaan ja arvonluontilogiikkaansa eli toimijoiden tapaa luoda arvoa yhdessä.

Tässä väitöskirjassa tutkin, miten metsäsektorin arvonluontilogiikka on muuttumassa siirryttäessä kestävään metsäpohjaiseen biokiertoalouteen. Tutkimusstrategiana oli tieteidenvälinen teoriaohjattu laadullinen tapaustutkimus. Analysoin tieteellisiä ja eieteellisiä dokumentteja, jotta pystyin tunnistamaan metsäteollisuuden arvonluontilogiikassa aiemmin tapahtuneet ja tällä hetkellä tapahtuvat muutokset. Haastatteluiden avulla kartoitin metsäpalveluiden tarjoajien mahdollista tulevaa arvonluontilogiikkaa ja metsänomistajien valmiutta reagoida tapahtuviin muutoksiin.

Tutkimustulosten perusteella metsäsektorin arvonluontilogiikka on vähitellen muuttumassa kokonaisvaltaisesti kestäväksi, yhteistoiminnalliseksi ja monialaiseksi arvon yhteisluontilogiikaksi. Sektori on pystynyt muuttamaan verkostojaan ja arvonluontilogiikkaansa aiemmin ja vaikuttaa siltä, että alan toimijat ovat ymmärtäneet monialaisen yhteistoiminnan ja aineettomien resurssien merkityksen osana kestäviä arvoa luovia toimintoja. Toimijat ovat tunnistaneet, että heidän asenteensa ja toimintansa vaikuttavat sektorin tulevaan arvonluontiin. Kokonaisvaltaisen kestävyuden saavuttamiseksi toimijoiden on otettava huomioon koko metsäekosysteemi pääomana ja resurssipohjana, josta metsäpohjaisella sektorilla luodaan arvoa ja hyötyjä yhteiseksi hyväksi.

Asiasanat: kestävä liiketoiminta; metsäpohjainen biokiertoalous; arvoa luova verkko; liiketoimintaverkosto; metsäteollisuus; metsänomistaja

ACKNOWLEDGEMENTS

‘Planned happenstance’ (määrätietoinen ajelehtiminen) is a career theory by Professor John Krumboltz, where a person should focus less on having specific plans and more on finding and seizing the opportunities in unplanned events. This theory describes my personal beliefs on life, career and doctoral studies. My doctoral studies have been anything but a purposeful linear research process. It has been a continuous, iterative and abductive cycle of learning, discovering and understanding new things. Even the subject of the dissertation has changed several times; from value networks of multiple-use forests through bioeconomy discussions to sustainability awakening. However, in the background, my view has always been that forests are much more than just trees and that different actors, their perspectives, and connections to others in the past, present and future, are incredibly important.

My sincere gratitude goes to my main supervisor Professor Jouni Pykäläinen for giving me, an outsider, the opportunity to become a researcher in forest sciences. After your gentle nudging, I started to pursue doctoral studies. I appreciate your way of supervising and advising me. You provided me with ideas and the freedom to figure things out by myself. I am truly grateful to Professor Teppo Hujala, my second supervisor and international networking mentor, who I (un)intentionally followed to conferences and meetings. I valued your supervising and advising, and you gave me direct answers when I desperately needed them. I want to thank my third supervisor Professor Raija Komppula for providing me guidance with business perspectives early on by also being the supervisor of my master’s thesis. I am thankful to Research Director Jukka Tikkanen for cultivating the first sparks in my becoming a researcher. Many thanks also to all my co-authors: Rebekah Zimmerer, Tanja Kähkönen, Tuomo Takala, Mika Gabrielsson and Katri Rusanen. I want to especially give my thanks to Katri, as you completely opened my eyes to the importance of holistic sustainability. I wish to thank the pre-examiners, Dean and Professor Arto Rajala and Associate Professor Anni Tuppuru, for their positive comments on the manuscript. Thanks to all my colleagues and friends at the university for peer support and many lunch and coffee break discussions. I warmly thank all the interviewed forest owners and business actors for their valuable time and insights.

I warmly acknowledge the funding I received from the Towards European Societal Sustainability (TESS) -project of the EU-Seventh Framework Programme, the Metsävuoro-project of Tekes – the Finnish Funding Agency for Innovation, and the Business Models of Born Globals in a Forest-based Bioeconomy (BIOBM) -project of the Academy of Finland. I want to thank the Doctoral School of the University of Eastern Finland School of Forest Sciences for granting me an Early-Stage Researcher position.

I am deeply grateful to my family for all the support I have had during my life. Thank you to my parents, Juha and Hannele, you have always been there for me and have always let me do my stuff. Thank you, Mum, especially, for the loving care of your grandchildren. Without this invaluable support, getting the dissertation ready would have taken much longer. Thank you to our dear children, Elli and Antti, you have been extremely successful in bringing my thoughts back to daily life. To our dog, Patu, thank you so much for all the walks which helped clear my tangled thoughts. Finally, thank you my dear husband Pekka, without you I would never have even considered studying at university, let alone forest sciences. I am finally able to fulfil my promise to you: it’s time to celebrate karonkka!

Vaivio, 1.8.2023
Anu Laakkonen

LIST OF ORIGINAL ARTICLES

This thesis is based on data presented in the following articles, referred to by the Roman Numerals I-IV. Article I is licensed CC BY-SA 4.0, article II is a submitted version of the manuscript and articles III and IV are reprinted with the kind permission of the publisher.

- I** Laakkonen A, Hujala T, Pykäläinen J (2022) Defining the systemic development of the Finnish pulp and paper industry's business network. *Silva Fennica*, 56(2) article id 10599: 30.
<https://doi.org/10.14214/sf.10599>
- II** Laakkonen A, Rusanen K, Hujala T, Gabrielsson M, Pykäläinen J (2023) Implications of the sustainability transition on the industry value creation logic - case of Finnish pulp and paper industry. Submitted manuscript.
- III** Laakkonen A, Hujala T, Pykäläinen J (2019) Integrating intangible resources enables creating new types of forest services - developing forest leasing value network in Finland. *Forest Policy and Economics* 99: 157–168.
<https://doi.org/10.1016/j.forpol.2018.07.003>
- IV** Laakkonen A, Zimmerer R, Kähkönen T, Hujala T, Takala T, Tikkanen J (2018) Forest owners' attitudes toward pro-climate and climate-responsive forest management. *Forest Policy and Economics* 87: 1–10.
<https://doi.org/10.1016/j.forpol.2017.11.001>

Anu Laakkonen is fully responsible for the summary of this doctoral dissertation and had the overall responsibility in articles I, II and III and shared the responsibility with Jukka Tikkanen in article IV. She was the corresponding author in articles I, II, III and IV. See a more detailed description of her contribution below.

- I** Anu Laakkonen was responsible for the data collection, analysis and interpretation as well as writing the original draft. The conceptualisation of the research work and research questions, and reviewing and editing of the published work, was shared with co-authors.
- II** Anu Laakkonen shared responsibility for the data collection, analysis and interpretation as well as writing the original draft with Katri Rusanen. The conceptualisation of the research work and research questions, and reviewing and editing the published work, was shared with co-authors.
- III** Anu Laakkonen was responsible for the data collection and analysis. The conceptualisation of the research work and research questions, writing the original draft and reviewing and editing the published work was shared with co-authors.
- IV** Anu Laakkonen was responsible for the data collection. The conceptualisation of the research work and research questions, data analysis, writing the original draft, and reviewing and editing the published work was shared with co-authors.

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INTRODUCTION

Sustainability transitions, circular bioeconomy and changing business environment

The current millennium has been characterised by global sustainability challenges, such as climate change, biodiversity loss, lack of clean water, overconsumption, waste production, poverty and inequality. Similarly, the increasing importance of knowledge in economic activities, together with servitisation, digitalisation and rising eco-awareness of societies, are all phenomena having tremendous effects on the global socio-economic system crossing environmental, social and economic levels. These phenomena are also known as change drivers, which are direct or indirect factors causing a change in a natural or a human ecosystem (Nelson et al. 2006). Responding to these change drivers requires a radical systemic change where extensive adjustments in the way people live and how companies organise their business activities are needed (Loorbach and Wijsman 2013; Köhler et al. 2019), which is an issue investigated within a research tradition of transition studies and the focus is often on macro-level developments. This systemic change can be defined as sustainability transitions, which are “fundamental changes in socio-technical systems such as energy, food or transportation that aim to address grand challenges in a way that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Markard et al. 2020).

One part of sustainability transitions can be a transition from a fossil resource-based economy towards a circular bioeconomy, which is an economic model focusing on the sustainable well-being of societies and nature (Palahí et al. 2020), where renewable non-fossil raw materials and products are used in a sustainable, resource-efficient and circular way (Hetemäki et al. 2017). The substitution of fossil-based resources with sustainably sourced biobased resources (D’Amato et al. 2020), the utilisation of side and waste streams in manufacturing (Winkel 2017a) and the development of innovative, sustainable and responsible products and services with cross-sectoral knowledge (Hetemäki et al. 2017; Winkel 2017b; Hadley Kershaw et al. 2021) are important aspects within the knowledge-based circular bioeconomy (Pietzsch and Schurr 2020).

Now more than ever, continuous interactions between different actors in the dynamic, nested and complex business environment, with blurring sectoral boundaries (Vargo and Lusch 2011; Håkansson and Snehota 2017; Möller et al. 2020) influence companies into altering their networks and business and value creation logics, which are issues investigated within research traditions of network and strategic management. The shift in companies’ business and value creation logics has occurred for decades when the traditional logic of minimising transaction costs, i.e., make-or-buy decisions (Coase 1937; Williamson 1981) and operating as a separate part of a value-adding chain (Porter 1985) have started to evolve towards intentionally created strategic value networks, where the value creation logic is based on collaboration (Jarillo 1988; Normann and Ramírez 1993; Kothandaraman and Wilson 2001; Möller and Rajala 2007) at the meso and network levels. Thus, the focus is on the relationships and networked activities between actors. In strategic management studies, a dominant business logic describes the established ways of managing business activities and strategic decision-making (Prahalad and Bettis 1986) to create value at the micro- and company-levels. In this dissertation, value co-creation logic describes the established and common ways in which actors co-create social, environmental and economic good, that is value, by performing activities that integrate tangible and intangible resources in a value-

creating network (Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Vargo and Lusch 2011; Dyllick and Muff 2016).

To respond to the above-mentioned phenomena, a systemic understanding is needed to recognise the impacts they have on the business environment, networks and actors' value-creating activities. To gain a systemic understanding, it is important to recognise the historical developments, the current adaptations and the optional ways to react to the changes in the future. In addition, investigations should be widened to consider all actors at different levels that call for an interdisciplinary perspective. For example, at the micro and meso levels, the companies within established sectors and industries are pressured to alter their value-creating networks, which are collaborative networks of directly and indirectly connected actors performing value co-creating activities with the resource constellations they control (Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Allee 2009; Vargo and Lusch 2011; Aarikka-Stenroos et al. 2017). If the pressures and alterations in the business environment are radical enough, the established industries transform or even new industries might emerge (Lamberg et al. 2012; Möller et al. 2020). There is evidence that the digitalisation of services (Pajarinen et al. 2013) and service platforms (Gawer and Cusumano 2014) have already had effects on many industries, such as transportation and hospitality, as, e.g., Uber and Airbnb have largely changed companies' value creation logic (Boswijk 2017; Niemimaa et al. 2019). Similarly, it seems that business sustainability (Dyllick and Muff 2016) will alter established industries and companies as sustainable business activities, and business models ought to create a competitive advantage for companies (Bocken et al. 2014). Sustainable value-creating activities do not only reduce and minimise negative impacts for society and the environment, but they also create substantial positive impacts and contributions to overcome sustainability issues, thus creating benefits for the common good: the planet, society and the economy (Bocken et al. 2014; Dyllick and Muff 2016).

Nevertheless, circular bioeconomy and the related value creation logics are not self-evidently sustainable. For example, at the macro-level transition studies, the current policies, strategies and science acknowledge sustainability's three dimensions: economic, environmental and social; they are still considered equally sized with symmetrical interconnections, and finding a balance between them means being sustainable (Giddings et al. 2002). Similarly, it is assumed that social and environmental problems can be solved with economic growth and technological development (Morandín-Ahuerma et al. 2019). However, the notions of planetary boundaries (Rockström et al. 2009) and strong sustainability (Ayres et al. 2001) are shifting the view of sustainability towards being nested, meaning that the economy is dependent on society, and these are both dependent on the environment (Giddings et al. 2002; Folke et al. 2016; Dasgupta 2021). Thus, the perspective of being sustainable is shifting from balancing the three dimensions with technological and quantitative developments, defined as weak sustainability, to operating within the boundaries of the planet by increasing the qualitative well-being of its ecosystems and actors within, defined as strong sustainability. So far, research on bioeconomy has highlighted its economic benefits (Korhonen et al. 2018; Ramcilovic-Suominen and Pülzl 2018), but the resulting intensified use of natural resources and land space, together with effects on social aspects, have been increasingly questioned (Pfauf et al. 2014; Karvonen et al. 2017; Gawel et al. 2019). Similarly, it seems that the sustainability strategies of many industries and companies currently follow either a business-centred weak or a systemic intermediate corporate sustainability strategy; thus business-as-usual strategies and incremental improvements will not generate business activities following a regenerative or strong sustainability strategy (Landrum 2018). In this dissertation, a concept of holistic sustainability is adopted when

talking about nested sustainability, where the economy and society are embedded within the biosphere as intertwined parts of the planet (Folke et al. 2016), and where companies and business sectors follow regenerative corporate sustainability strategies (Landrum 2018).

Impacts of sustainability transitions on the global forest sector and its networks and value creation logic

The aforementioned phenomena and changes in the global business environment, especially digitalisation and servitisation, have already had impacts on the global, established forest sector. For example, the demand for the forest industry's traditional products, such as communication paper, has decreased and resulted in ongoing structural changes within the industry (Hetemäki and Hurmekoski 2016). In addition, traditional natural resource-based industrial sectors, holding features from primary, manufacturing and service sectors, with the main production factors provided by nature (Andersen et al. 2018), have long been seen as hindering economic growth and innovation developments in resource-abundant countries as they, e.g., do not support the export orientation of high-technology products (Sachs and Warner 2001; van der Ploeg 2011). However, when the socio-economic systems are facing many environmental challenges, natural ecosystems, such as forests, and the resources they offer, are seen to play a key role in providing solutions for these challenges. For example, the transition towards sustainable circular knowledge-based bioeconomy (Fritsche and Rösch 2020) is recognised as one of these solutions. In the European Union (EU), there is a strong political will for a sustainability transition towards a circular bioeconomy, where forest ecosystems act as one key resource base (EC 2018, 2021). Forests are expected to continue generating economic wealth while offering ecological benefits by functioning, for example, as carbon sinks and sustaining biodiversity (Hetemäki et al. 2017; Hansen and Juslin 2018; Valtioneuvosto 2022). Therefore, the forest sector is expected to retain its important role as a part of a sustainable circular bioeconomy; thus, in this dissertation, the focus is on the circular forest-based bioeconomy, which covers all economic activities related to forest ecosystems (Winkel 2017a).

Similarly, in Finland, the forest sector has long had an essential role in Finnish society and the national economy (Sajasalo 2002): it has integrated Finland, a small and open economy (Ojala et al. 2006), into international business systems (Kuisma 2006) for nearly the last two hundred years. Today, the companies in the Finnish forest industry are important actors on a global scale, as the three largest companies were included in the top 100 in the global pulp and paper market in 2019, where Stora Enso and UPM were in the top ten (Newton Consulting Partners 2022). Equally important is to acknowledge the role of non-industrial private forest owners (here after forest owners, unless otherwise specified) within the forest sector, as they own, control and manage the crucial resource base. In Finland, over 50% of forests are in their possession, and over 80% of all roundwood purchased by the forest industry comes from their forests (Karppinen et al. 2020). However, forest ownership is changing, where new types of forest owners, e.g., new urbanised forest owners, may have non-traditional objectives and motives for owning forest, or they may represent traditional forest owner types, whose motives, and approaches to owning and managing forests, have changed (Bengston et al. 2011; Živojinović et al. 2015; Weiss et al. 2019). In addition, climate change has and will continue to have, distinct effects on forests (Harris et al. 2009; IPCC 2022) and forest management practices (Eriksson 2014; van Gameren and Zaccai 2015; Sohngen and Tian 2016; Lawrence 2017). Thus, it is important to study the perceptions,

observations and attitudes of forest owners regarding climate change (Hopkins et al. 2017) and how they see themselves in the larger framework of this global sustainability challenge. These attitudes, perceptions and changes in behaviour can be investigated with psychological theories on behavioural change. Traditionally, in Finland, the forest owners living next to their forests have done silvicultural work by themselves, but government-led organisations have had an important role in providing forestry services for forest owners (Kotilainen and Rytteri 2011). However, due to changes in forest ownership, their needs for forestry services are changing, resulting also in changes in the forestry service companies. It has been claimed that the new forest owners are insufficiently served by current operators in the forestry service market (Mattila and Roos 2014). The reasons behind this are the dominant roles of traditional service providers following the raw material needs of the forest industry (Mattila et al. 2013), as well as that forest owners' service needs are not necessarily recognised by the service providers nor even by themselves (Karppinen et al. 2015). Therefore, understanding forest owners' perceptions towards climate change, and acknowledging their altering objectives and motives, could bring up new insights when considering service provisioning (Valatin et al. 2016).

Finland's great forest reserves, long forestry traditions and strong industrial actors have offered, and will most likely continue to offer, prosperity to Finnish society. However, the use of forests and their resources, and especially the holistic sustainability of this use, is getting to the centre of conflicting attention. On one hand, forest-based bioeconomy has many opportunities, since most of the promising innovations, especially related to substituting fossil-based products, are related to wood-based solutions (Hurmekoski et al. 2018), and it offers possibilities for rural socio-economic development by offering, e.g., employment possibilities (Lehtonen and Okkonen 2013). On the other hand, forest-based biomass is a limited and scarce resource, and thus its use should be prioritised for the most high-value and long-lasting products (Leturcq 2020; Material Economics 2021). Likewise, the inclusion of different social dimensions and local stakeholder points of view in bioeconomy related to, e.g., political decision-making (Mustalahti 2018) and global investments (Lehtimäki et al. 2011) is crucial, as merely creating employment possibilities and economic growth does not lead to holistically sustainable business practices (Landrum 2018; Hadley Kershaw et al. 2021).

That being said, the traditional forest sector is facing many challenges due to changing business environments. The sector has been characterised as mature (Hansen et al. 2007; Guerrero and Hansen 2018), strongly path-dependent (Näsi et al. 2001; Lamberg et al. 2017; Luhas et al. 2019) and following dominant business and value creation logics, which make it difficult to alter current ways of operating. In the forest industry, the business logics of economies of scale and scope (Diesen 2007) have especially been followed, as the manufacturing has focused on producing large amounts of traditional products, materials and energy in integrated mill sites by operating in traditional supply chains and with traditional business models. In Finland, there are long traditions in forest policy with well-established approaches and practices for managing forests where the forest industry, governmental institutions and forest professionals have a strong role (Kotilainen and Rytteri 2011; Karppinen et al. 2015). This can be noticed especially in the culture where traditional forestry services are offered by following a product-oriented value creation logic, where organisations compete towards each other by price and quality factors of services. Thus, the traditional value creation logic of a value chain is still prevailing, even though the role of services as a part of companies' strategies and collaborative value co-creation logic with sharing information and knowledge are starting to gain increasing attention (Pelli et al. 2017).

The research gap and the objectives of the dissertation

The forest sector and its companies are increasingly pressured to reconfigure their networks and value creation logic due to changes in the business environment, which creates an interesting study context. Current foresight studies investigating the forest sector's transition to a sustainable circular bioeconomy (Pätäri et al. 2016; Toppinen et al. 2017; Korhonen et al. 2021; Luhas et al. 2021) do not explicitly investigate the sustainable value creation within the sector. In addition, there are studies investigating how (circular) bioeconomy will affect the business activities and sustainable value creation of forest(-based) companies of different sizes (Mattila and Roos 2014; Korhonen et al. 2018; Näyhä 2019, 2020, 2021; D'Amato et al. 2020; Guerrero and Hansen 2021); yet in these studies, a sector-level investigation is somewhat missing. Despite the study of Pelli & Lähtinen (2020), there are no studies investigating the forest sector's transition to bioeconomy by integrating both sector and company levels (Pelli and Lähtinen 2020). Additionally, the study by Luhas et al. (2019) seems to be the only study focusing on the development of the sector's business and value creation logic (Luhas et al. 2019). In addition, a systemic approach to the development of sustainable value co-creation in collaborative networks has not been taken.

The diverse group of forest owners with differing objectives also have an important role in the sustainability transition, as they own, control and manage forest ecosystems and the resources, products and services they provide. Thus, their perceptions, attitudes and readiness to be part of the transition are of crucial importance. The influence of forest owners' attitudes towards forest values and forest management has been a frequently studied topic (Belin et al. 2005; Nordlund and Westin 2011; Degnet et al. 2022). Similarly, the impacts of sustainability, climate change and biodiversity loss on forest management and forest owners' decision-making have been studied (Blennow 2012; van Gameren and Zaccai 2015; Bissonnette et al. 2017; Husa and Kosenius 2021; Takala et al. 2022). Theories of behavioural change, e.g., the theory of planned behaviour, have been utilised in these studies (Thompson and Hansen 2013; Karppinen and Berghäll 2015; Takala et al. 2020). However, most of the studies take a policy and administrative perspective, and thus forest owners' roles as active decision-makers, entrepreneurs and contributors to the development of innovations and value co-creation is limited (Lunnan et al. 2006; Nybakk et al. 2009; Okkonen and Suhonen 2010). Therefore, it is important to study forest owners' active roles and readiness of being a part of the sustainability transition and reconfiguration of the forest sector's value creation logic.

This dissertation aims at closing the above-mentioned research gaps. The main objective is to investigate **how the value creation logic of the forest sector is changing when entering the sustainable circular forest-based bioeconomy**. The main objective will be met by investigating the past, the present and the possible future value creation within the Finnish forest sector. Furthermore, the following research questions will be answered:

- RQ1) How has the forest sector's value creation logic previously adapted to meet the changes in the business environment?
- RQ2) How is the forest sector's value creation logic currently adapting to the changes occurring in the business environment?
- RQ3) What kind of optional reconfigurations does the forest sector's value creation logic have in responding to the identified change drivers within the business environment?

Table 1. The individual studies and their research objectives and contributions to the research questions of the dissertation.

The article, level of investigation and forest sector context	Research objective and research questions of individual studies	Contribution to the dissertation's research questions
Article I Macro and meso level Pulp and paper industry	To construct a systemic picture of the historical development of the Finnish pulp and paper industry's business network. 1) How has the Finnish pulp and paper industry's business network developed? 2) What internal and external events have triggered the network to change?	RQ1
Article II Macro and meso level Pulp and paper industry	To investigate the transformation of the pulp and paper industry towards a sustainable circular bioeconomy through the business environment formation process framework. 1) How has Finnish pulp and paper industry reconfigured its value creation logic towards holistic sustainability?	RQ2
Article III Micro level Forestry service	To scrutinise the value network of the potential forest leasing service for family forests with a focus on wood production. 1) What kind of structure might a feasible value network, i.e., business collaboration network, have to enable the forest leasing service in Finland? 2) What are the key attributes and exchanges within the value network that foster introducing new types of forest services?	RQ3
Article IV Micro level Forest owners	To add to the existing knowledge of forest owners' attitudes towards climate change through a qualitative and mixed-methods approach. 1) cognitive element of attitudes: What is the role/position of climate change in the Finnish forest owners' perceptions of change in their forest and forest management? 2) affective element of attitudes: What affective statements do forest owners associate with impacts of climate change in their forests? 3) behavioural element of attitudes: How prepared are forest owners to adapt their management practices in response to climate change? What behavioural control statements do forest owners associate with their intentions towards climate-responsive forest management?	RQ3

The individual studies of this dissertation (Table 1) contribute to the identified research gaps. The individual studies acted as cases through which parts of the forest sector were investigated to gain an in-depth understanding into the phenomena. The findings are then reflected to consider the whole sector. First, I investigated the forest sector's history to learn how the value creation logic has previously adapted and what it is currently (Article I and RQ1). Second, I investigated the present situation to understand how the value creation logic is adapting to the ongoing changes (Article II and RQ2). Third, I investigated an optional reconfiguration for the forest sector's value creation logic (Article III and RQ3). Fourth, I investigated forest owners' perceptions and attitudes to determine which forest owners would be more ready and willing to adapt their forest management practices by following a reconfigured value creation logic (Article IV and RQ3). As the transition to sustainable circular forest-based bioeconomy is likely to continue having tremendous impacts on the whole forest sector and its value creation logic, it is important to investigate and understand how the transition affects the forest sector, the companies' value-creating networks and the actors operating within these networks, and thus the individual studies will contribute to the main objective of this dissertation.

The research framework, positioning of the study and the key concepts

The research framework of the dissertation is presented in Figure 1. The dissertation investigates the forest sector's dynamic, complex and nested business environment and how it has shaped the development of the sector's value creation logic, from the past to what it is currently. The business environment is constantly changing, and it has been noticed that certain phenomena, or change drivers, and events occurring in the environment have impacts on the environment, causing it to change even faster and more radically. One such change

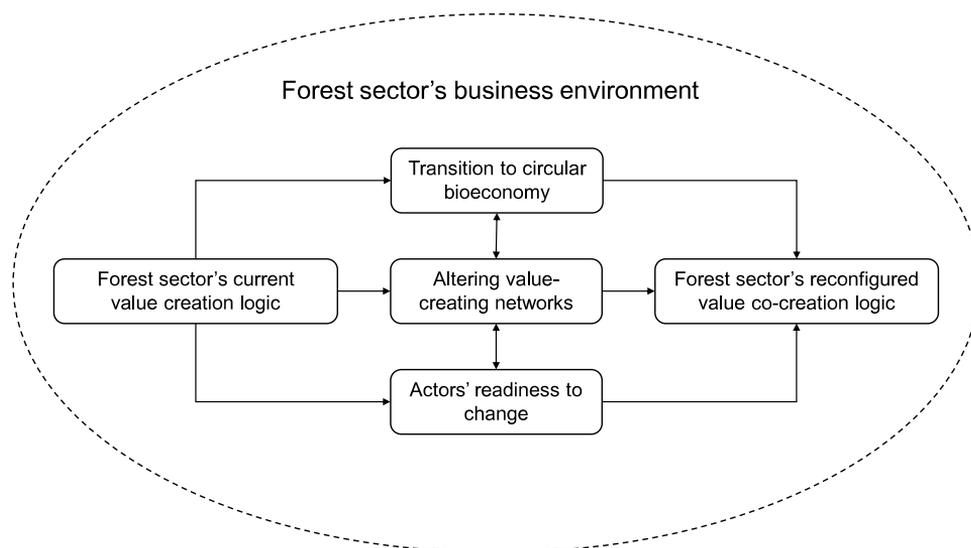


Figure 1. The research framework.

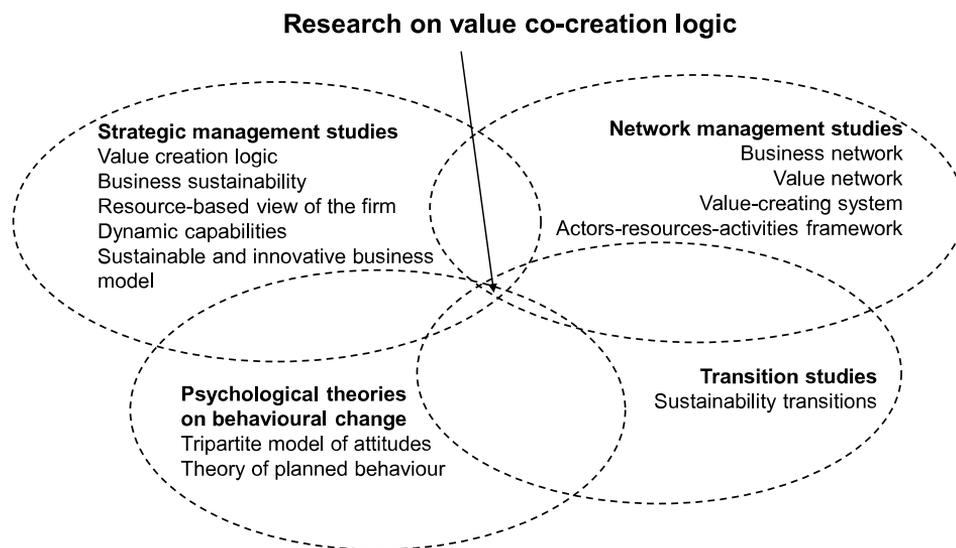


Figure 2. Positioning of the dissertation. Strategic management studies provide a micro- and managerial-level understanding, and network management studies provide a meso- and network-level understanding, of sustainable value co-creation. Transition studies provide macro- and society-level understanding and psychological theories on behavioural change provide a micro- and actor-level understanding of the occurring changes in the business environment. The ellipses are a schematic representation of the applied theories and concepts.

driver is the shift to a circular bioeconomy as one sustainability transition. Similarly, the forest sector's value creation logic and value-creating networks are under pressure to change due to changes in the business environment. Furthermore, the actors' readiness and willingness to change and respond to the occurred changes will have an important role in achieving the needed reconfigurations in the value creation logic to meet future needs. Therefore, it is important to understand how to include the perspectives of all actors, for example, owners of the forest-based resources (forest owners), service producers (forestry services) and actors utilising the forest-based resources (pulp and paper industry), to the co-creation of holistically sustainable value from forest ecosystems. Thus, all the above-mentioned issues will contribute to the reconfiguration of the forest sector's networks and value creation logic.

The theoretical position of this dissertation is interdisciplinary, because to reach sustainable value co-creation logic, perspectives from strategic management, network management, transition studies and psychological theories on behavioural change need to be applied (Figure 2). Strategic management studies are used to gain an understanding of the micro-level managerial perspectives on sustainable value co-creation. Network management studies are used to gain an understanding of the collaborative and networked part of sustainable value co-creation at the meso level. Usually, theories of strategic management take a micro-level perspective and consider a single company; but in this dissertation, they are viewed as theoretical foundations that can also guide and contribute to meso-level theory

and concept development when considering industries and collaborative networks. Transition studies are followed to gain an understanding of the macro-level societal aspects related to changes in the socio-economic systems. Psychological theories on behavioural change are used to gain an understanding of the role of attitudes and behaviour on the micro- and actor-level to respond to the changes. Finally, all these aspects are viewed in the context of the forest sector, and thus the dissertation is positioned within the research conducted in forest economics. In addition, the key concepts derived from the theoretical position of the dissertation are defined in Table 2.

Table 2. The key concepts of the dissertation.

Concept	Definition
Business environment	A dynamic, complex and emergent structure of embedded relationships, bonding actors, tying resources and linking activities together, also known as a business network. The relationships and interactions within the network evolve and influence the future state of the network; due to this, the network cannot be managed nor purposefully created. (Håkansson and Snehota 1995; Håkansson and Ford 2002; Möller et al. 2020)
Sustainable circular bioeconomy	An economic model focusing on the sustainable well-being of societies and nature. Renewable non-fossil raw materials, side-streams and cross-sectoral knowledge are utilised in developing and producing products, services and solutions in a sustainable, resource-efficient and circular way. (Hetemäki et al. 2017; Winkel 2017a; Palahí et al. 2020; Pietzsch and Schurr 2020)
Value co-creation logic	The actor's established and common ways of co-creating social, environmental and economic good, that is value, by performing activities that integrate tangible and intangible resources in a value-creating network. (Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Vargo and Lusch 2011; Dyllick and Muff 2016)
Business sustainability	The main purpose of business actors is to create value for the common good: to minimise negative and create substantial positive impacts and contributions to overcome sustainability issues that create benefits for society, the planet and the economy. (Bocken et al. 2014; Dyllick and Muff 2016)
Value-creating network	A collaborative network of directly and indirectly connected actors performing value co-creating activities with the resource constellations they control. (Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Allee 2009; Vargo and Lusch 2011; Aarikka-Stenroos et al. 2017)

THEORETICAL UNDERPINNINGS

In this chapter, I will introduce the theoretical underpinnings of the dissertation, how they and the theoretical positioning of the dissertation (Figure 2) are connected, and how they contribute to studying value co-creation logic in the forest sector. First, I will introduce the network management studies' perspective on the dynamic, complex and nested business environment. In addition, two analytical lenses for investigating change in the business environment are introduced. Second, I will intertwine transition studies with network and strategic management studies by introducing how a transition to a sustainable circular bioeconomy impacts the business environment and the value co-creation logic of companies and industries. Third, I will connect network and strategic management studies with transition studies by discussing the effects of business sustainability, cross-sectoral collaboration and intangible assets on the value co-creation logic and value-creating networks in the forest sector. Fourth, I will discuss psychological theories on behavioural change and their role in guiding actor behaviour in the changing environment.

Understanding a dynamic, nested and complex business environment

This sub-chapter contributes to the theoretical discussions on network management studies by providing perceptions and concepts for answering the main objective and the three research questions of the dissertation by introducing theoretical underpinnings to understand the dynamic, complex and nested business environment.

According to the theoretical foundations of the network management studies and Industrial Marketing and Purchasing Group's (IMP) research tradition, the business environment is a dynamic, complex and emergent structure of embedded relationships, bonding actors, tying resources and linking activities together (Håkansson and Snehota 1995, 2017). The relationships and interactions within the environment evolve over time and influence the future state of the relationships (Håkansson and Ford 2002). Similarly, the current state of the relationships is the outcome of previous interactions between the actors and the social, political and economic institutions affecting them (North 1990; Vargo and Lusch 2011, 2016; Möller et al. 2020). To understand the complexity of the business environment, Möller, Nenonen and Storbacka (2020) suggest viewing it as layered and nested, where actors and performed activities at different layers have causal power and thus influence each other. This causes social, economic, political and technological aspects to be intertwined. The nested interrelated layers are the actor layer at the micro level, the focal business ecosystem and business field layers at the meso level and the socio-economic-technological (SET) system layer at the macro level (Möller et al. 2020) (Figure 3). Within network management studies, the business environment can also be conceptualised as a business network (Håkansson and Snehota 1995, 2017; Möller et al. 2020). Despite these two concepts sharing similar characteristics and meanings, they have slightly differing connotations, and thus, in this dissertation, I use the concept of business environment when dealing with the dynamic and nested operating environment constituting from the four nested layers (Article II). The concept of the business network is used when dealing with the emergent structure of relationships between directly and indirectly connected interdependent

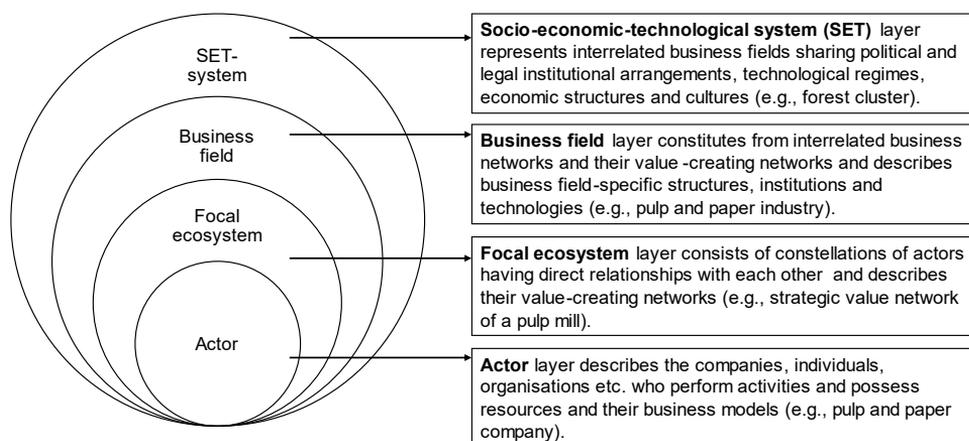


Figure 3. Layers of nested business environment framework. Modified from Möller et al. 2020.

actors, which is characterised through interaction and resource-integrating activities performed by actors. Thus, the business network is never ready, it cannot be purposefully created, actors are in it despite their own will, and thus actors cannot manage it (Article I).

The actor layer describes the actors (e.g., companies, individuals and organisations) who perform activities, possess resources and maintain relationships. In the forest sector context, an actor can be a forest owner (Article IV). Powerful actors can have performative power on the other layers through, e.g., their influencing capabilities and business models (Möller et al. 2020). The focal ecosystem layer consists of constellations of actors that have direct relationships with each other, for example, a purposeful strategic value network of a forest leasing service (Article III). At this layer, the value-creating networks, which include both purposeful strategic value networks as well as more loosely defined extensive value-creating networks, their structure and underlying shared objectives, norms and organisational arrangements, are described (Möller et al. 2020). The business field layer constitutes from interrelated business networks and their value-creating networks and describes business field-specific structures, institutions and technologies. Business fields, which can also be called industries, have a dominant value creation logic, and the field-specific activities are performed by actors with business field-specific resources (Möller et al. 2020), which change according to the maturity and complexity of the business field, like within the pulp and paper industry (Article I and II). The SET-system layer represents interrelated business fields sharing political and legal institutional arrangements, technological regimes, economic structures and cultures. At this layer, the business environment is described through understanding the social power structures and evolution of the SET-system at national, regional and global levels (Möller et al. 2020). In the smallest representation, the forest cluster can represent a SET-system, but mainly, e.g., the whole Finnish socio-economic system is considered to represent a SET-system. Each layer of the nested business environment influences and conditions the actors, activities, choices and contents of the other ones (Möller et al. 2020). Therefore, there is a need to understand the role of companies and other actors at the micro level, as well as how these actors and their activities within the focal ecosystems and business fields at the meso level then affect and are affected by the

institutional, political and economic factors at the macro level within the changing business environment.

Due to the dynamic nature of the business environment, it has a spatial and temporal structure, which is under constant pressure to change. In this dissertation, two approaches and analytical lenses originating from the network management studies to investigate this change are introduced and applied (Figures 4 & 5). Although transition studies also provide approaches and frameworks to investigate a change in the business environment, such as the multi-level perspective (Geels 2002, 2011) and the transition management cycle (Loorbach and Rotmans 2010; Loorbach and Wijsman 2013), in this dissertation, the network management approaches are utilised, as they emphasise the perspective of value co-creation and networks, and how these should be reconfigured due to changes in the business environment. The first approach, applied in Article I and responding to RQ1, focuses on the business network's deep structure and how it evolves and adapts due to critical external and internal events occurring in the operating environment (Halinen et al. 1999). The second approach, applied in Article II and responding to RQ2, focuses on the transformation of the business environment due to constricting and enabling forces, as well as change drivers originating from the different nested layers of the business environment (Möller et al. 2020). The main difference between these two lenses is the level of analysis: the first one focuses on a dyad in the network and how the change affects a relationship between actors, and the second one considers how change drivers affect different layers of the business environment to transform.

According to the first analytical lens (Figure 4), changes in a network emerge at a dyadic, single relationship level, but depending on the magnitude of the change, it can affect only

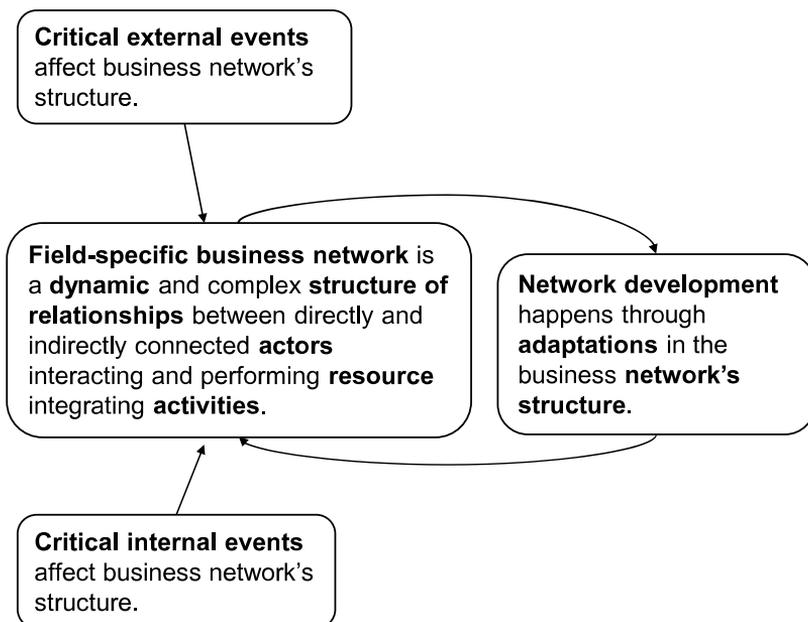


Figure 4. The business network's development through critical events and changes in the network's deep structure as an analytical lens to investigate developments within the pulp and paper industry. Source: Article I Laakkonen et al. 2022.

that dyad or spread along the whole network (Halinen et al. 1999). Thus, to understand the reasons behind changes in a business network, internal and external impulses and incidents, i.e., critical events, in the environment need to be detected and determined if they trigger the network to change (ibid). The internal change factors arise from the actor, such as learning and new relationships, and the external change factors arise from the network and its environment, such as general economic conditions and social, technological and cultural developments.

It is important to acknowledge that a network's historical change should be understood through evolutions in society caused by an institutional change (North 1990), and institutions can either slow down or speed up the change process (Matthyssens et al. 2013). Regardless of the cause of the change, actors across the whole network must adapt to them, and thus the deep structure of the network is reconfigured (Håkansson and Snehota 1995; Halinen et al. 1999). In Article I, the development of the Finnish pulp and paper industry's business network was observed. The development of the business network happens through adaptations in the network's structure, i.e., actors, resources and/or activities, which are caused by critical external and internal events happening on the different nested layers of the business environment.

According to the second analytical lens (Figure 5), the business environment is constantly pressured by constricting and enabling change drivers originating from the different nested layers (Möller et al. 2020). The business environment formation process framework introduces three (trans)formation phases of exploration, mobilisation and stabilisation, where innovation, coalition formation and institutionalising and influencing micro-processes influence each phase. The phases can describe either a formation of, e.g., a new industry, or a transformation of an old industry. This depends on the magnitude of the occurring changes. Thus, the framework helps creating an understanding of the dynamic and nested business environment and the conditioning forces and transformation processes constricting and enabling a business transformation. It can be argued that the business environment's (trans)formation is not actually a process per se, but it could be considered as a cycle. The business environment with four interrelated layers is in a perpetual transformation cycle, where the three phases follow each other and are likely to be partially overlapping. Due to this, when considering, e.g., an industry's transformation, it is very likely that individual companies within the industry are at different transformation phases.

During the exploration phase, actors seek path-breaking systemic business innovations with what they can respond to the changes in the business environment (Möller et al. 2020). After finding the innovation, actors aim at creating a common development agenda which can also manifest a value co-creation logic, to promote the business innovations to potential partners; and the purpose of developing such an agenda is to construct solutions that can be commercialised and stabilised in the transformed business environment (ibid). Hence, the actors create together a shared purpose for the innovation. Creating a common development agenda can be done by using narratives as a mode of communication. A narrative is a story of human actions and behaviour, which is a way to understand and position actors and their actions within a context (Czarniawska 2004). A proactive actor can have strong influencing power in selecting which business innovations and development agendas are promoted (Möller 2010).

During the mobilisation phase, a collaborative, cross-sectoral and sustainable value co-creation logic for the industry is created which requires choosing and motivating partners, agreeing on roles and responsibilities, and creating shared goals, governance and

Business environment transformation cycle and conditioning change drivers

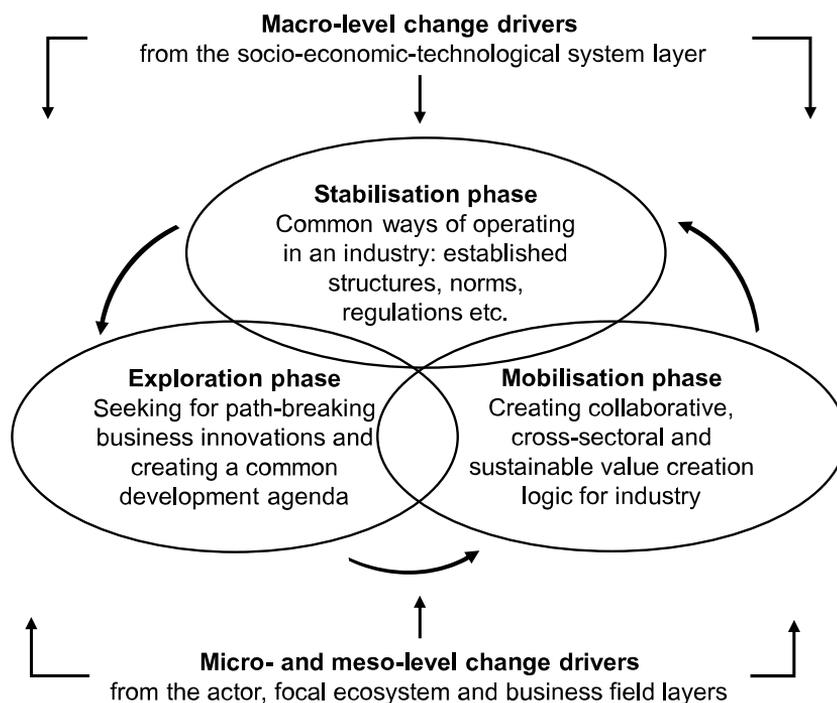


Figure 5. The business environment's transformation cycle conditioned by change drivers as an analytical lens to investigate developments within the pulp and paper industry. Source: Article II Laakkonen et al.

management principles (Möller et al. 2020), thus also adaptations in value-creating networks are needed (Möller and Svahn 2006; Möller and Rajala 2007; Möller et al. 2020). This may take years, depending on whether the adaptations and changes are incremental or radical (Möller and Svahn 2006). During the stabilisation phase, the occurred sustainability developments are stabilised, requiring activities from several actors to secure and institutionalise the reconfigured sustainable value co-creation logic and value-creating networks (Möller et al. 2020). It is especially important to overcome institutional misfits, i.e., the different perceptions and expectations of stakeholders regarding certain behaviour or performed activities, between different actors (Matthyssens et al. 2013). Thus, influencing and communicating the field-specific norms, regulations and standards to relevant decision-making actors is essential to gain, expand and maintain credibility and societal approval for the operations (Möller et al. 2020). This is an especially important step when aiming at holistic sustainability in all business activities in the extended networks (Dyllick and Muff 2016).

The sustainability transition to circular bioeconomy and its impacts on the business environment and value creation logic

This sub-chapter contributes to the theoretical discussions on transition, network management and strategic management studies by providing perceptions and concepts for answering the RQ2 and RQ3 by acknowledging that the sustainability transition to circular bioeconomy has impacts on the business environment as well as companies' and industries' value creation logics.

Sustainability transition to circular bioeconomy

Sustainability transitions require systemic changes in the current SET-systems to address the change drivers in a way that does not compromise the needs of future generations (Markard et al. 2020). Transitions are shifts from one dominant and dynamic system to another one, requiring massive reconfigurations of the ways that societies, industries and actors operate (Loorbach and Wijsman 2013). Business actors can comprehend transitions as a threat to existing operations requiring adaptations in current operations or as an opportunity to proactively guide the transition to a desired direction (ibid.); thus, business actors could benefit from adopting an interdisciplinary systemic sustainability management perspective. This perspective acknowledges the interdependence between actors and the natural environment through, for example, resource inputs and feedback loops, connecting economic, political, social and environmental issues (Williams et al. 2017). In business sustainability management literature, the concepts of corporate and/or business sustainability (Loorbach and Wijsman 2013; Dyllick and Muff 2016; Landrum 2018) have been introduced to acknowledge the role of companies in achieving sustainability. Often, business sustainability is considered as a company and micro-level strategic activity connected with, e.g., corporate social responsibility (Landrum 2018). Many studies on business sustainability take either a socio-economic (Porter and Kramer 2011; D'Adamo et al. 2020; Jarosch et al. 2020) or an environmental-economic (Hart 1997; Lahntinen et al. 2016; Keranen et al. 2021) perspective, meaning that all three dimensions of sustainability are not investigated, or they are only vaguely connected. The sustainability framework of the triple bottom line, first introduced in 1997 by Elkington, aims at noticing all dimensions by examining the social, economic and environmental impacts of a company and its operations (Elkington 2018, 2020), but it has been largely adopted as an accounting tool, and thus the trade-offs between the three dimensions are not clearly addressed (Dyllick and Muff 2016). Many studies on the sustainability transition of businesses have investigated how companies create economic value with a minimal impact on the environment while operating socially responsibly (Loorbach and Wijsman 2013), thus making the business case the focus of sustainable business activities (Dyllick and Muff 2016; Landrum 2018) and leading to weak sustainability. However, in this dissertation achieving business sustainability means that the main purpose of business actors is to create value for the common good, that is, to minimise and reduce negative impacts and to create substantial positive impacts and contributions to overcome sustainability issues, while creating benefits for society, the planet and the economy (Bocken et al. 2014; Dyllick and Muff 2016). This leads to strong and holistic sustainability. Even though systemic perspective and sustainability were both considered only in Article II, they have been at least indirectly addressed also in the other articles. In Article I, a systemic perspective was taken by noticing that external and internal events change the structure of the pulp and paper industry's business network. In Article III, the

importance of intangible resources in a company's value co-creation was acknowledged, and in Article IV the actors' readiness to act or not to act through behavioural change was studied, and how these are both seen as possible responses to the change drivers. Thus, all the individual articles contribute to all research questions and integration of transition studies with strategic and network management studies.

A transition to (circular) bioeconomy has been suggested as one sustainability transition. As an emerging concept and economic model, (circular) bioeconomy does not have a universally adopted definition, but it includes the idea, adopted also in this dissertation, to transition from a fossil resource-based economy towards a circular bioeconomy, where fossil-based resources are substituted with renewable non-fossil raw materials, and products are used in a sustainable, resource-efficient and circular way (Hetemäki et al. 2017; D'Amato et al. 2020), while also utilising side and waste streams of production processes (Winkel 2017a). An important part of (circular) bioeconomy is the development of innovative, sustainable and responsible products and services with multidisciplinary and cross-sectoral knowledge (Hetemäki et al. 2017; Winkel 2017b; Pietzsch and Schurr 2020; Hadley Kershaw et al. 2021). Therefore, the transition to a sustainable circular bioeconomy requires sustainable innovations, which are "(radically) new or (incrementally) improved products and services or entire systems, which, based on traceable comparative analysis, lead to environmental and (or) social benefits that surpass those of the prior products, services, or systems" (Bocken et al. 2019). Even though the (circular) bioeconomy has been claimed to be sustainable, there remain unsolved sustainability issues. So far, research on bioeconomy has especially highlighted the economic benefits in policy (Ramcilovic-Suominen and Pülzl 2018) and company levels (Korhonen et al. 2018), but the related intensified use of natural resources and land space has been questioned, together with bioeconomy's effect on social sustainability (Pfau et al. 2014). There is a growing number of scholars challenging the idea of bioeconomy's sustainability and incorporating the environmental and social views on the bioeconomy discourse (Karvonen et al. 2017; Mustalahti 2018; Gawel et al. 2019; Holmgren et al. 2020). These developments bring all three dimensions of sustainability under consideration, which helps in making the (bio)economy environmentally restorative, socially just and economically inclusive (Elkington 2020). Similarly, within holistically sustainable circular bioeconomy a nested perspective on sustainability is taken. This means that the economy and society are embedded within the biosphere as intertwined parts of the planet (Folke et al. 2016; Dasgupta 2021), and the planetary boundaries (Rockström et al. 2009) and strong sustainability (Ayres et al. 2001; Giddings et al. 2002) are acknowledged. This transition to holistic sustainability was investigated in Article II to determine whether the forest sector is indeed a part of the sustainability transition and adapting its operations accordingly, and thus contributions to RQ2 are made.

Reconfiguring definitions of value and value creation

The sustainability transitions and systemic change will also reconfigure the perceptions and definition of value. Traditionally in business studies, value has been considered in economic and monetary terms in the form of exchange value (Vargo and Lusch 2012) and shareholder value (Friedman 1970). According to this traditional view, value is something that is created when a product or service is produced, added in different processes, and realised in the monetary exchange and consumption of that product or service. Following this, the purpose of a company is "to use its resources and engage in activities designed to increase its profits" (Friedman 1970); and thus, its purpose is to increase shareholder value. However, the

developments and discussions in business and management studies during the current millennium have shifted the view of value from being understood as simply added value and value-in-exchange to include also the views of value as value-in-use and value-in-context, where value is co-created in an exchange between actors; and thus, it is a benefit resulting in an increase in the well-being of an actor (Lusch and Vargo 2014) in the context of his or her life. Tying value in use and context emphasises the point that actors need to feel that their wishes are considered in the interactions and communication between other actors in the network, which is an especially important point when dealing with forest owners, as they are the actors controlling the forest-based resources (Articles III and IV). Furthermore, value is subjective and contextual (Allee and Schwabe 2015), which makes it unique and experiential rather than just tied to a certain product, service or resource (Lusch and Vargo 2014); thus, an actor experiences the value subjectively based on the social context.

In addition, the sustainability management literature contributes to the perception and definition of value, and it has developed an idea of shared value where operating practices “enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates” (Porter and Kramer 2011). Thus, planning for companies’ operations should aim at creating economic and societal value (Porter and Kramer 2011; Dyllick and Muff 2016). However, it has been suggested that creating shared value is not enough, as the business case is seen as primary, and society is secondary (Dyllick and Muff 2016), while widely forgetting the environment. Therefore, shifts towards a sustainable value (Hart and Milstein 2003; Evans et al. 2017) and a system value (Dyllick and Muff 2016; Elkington 2020) have been suggested. Sustainable value combines economic, social and environmental benefits to the concept of value (Evans et al. 2017), while still mainly focusing on the business case where addressing environmental and social sustainability is seen as an opportunity for business actors to create financial value to the company (Hart and Milstein 2003). The concept of system value takes a step further by noting that the business serves society, where both are dependent on the natural environment, and sustainable business practices should protect and regenerate the natural environment, thus contributing to the progress towards a prosperous future (Elkington 2020). Business activities should be considered as tools to achieve societal well-being and fulfil basic human needs, while preserving, protecting and regenerating natural ecosystems. Thus, the extra-financial values or resources, which are not captured in current financial accounting, related to natural ecosystems and the resources offered by them, as well as the intangible assets and human capital, are increasingly being acknowledged (Teece et al. 1997; Allee 2003; Teece 2007; Elkington 2020). Article III and RQ3 aimed at bringing these new insights to the forest sector by acknowledging the increasing importance of intangible resources as an extra-financial value in companies’ value co-creation.

Similarly, the view on value creation has shifted to co-creation, meaning that value co-creation is enabled by economic and social actors who are involved in the integration of tangible (e.g., goods and raw materials) and intangible (e.g., knowledge and skills) resources in a service ecosystem (Lusch and Vargo 2014), which is a networked construct of directly and indirectly connected actors. Being able to access and control valuable tangible and intangible resources, and to create different kinds of resource constellations from them, provides opportunities for value co-creation (Håkansson and Snehota 1995; Allee 2008; Vargo and Lusch 2011). In the service-based knowledge (bio)economy, the actor’s ability to integrate intangible knowledge with other resources is crucial (Allee 2003; Vargo and Lusch 2004; Teece 2007; Akaka et al. 2012). Similarly, when co-creating sustainable system value, the economic, social, and environmental forms of value are integrated (Evans et al. 2017),

and value co-creation makes relevant contributions to overcome societal and planetary challenges, thus creating benefits for the business, society and the planet as a whole (Dyllick and Muff 2016). To understand this systemic, dynamic and collaborative view on sustainable value co-creation, a more generic actor-perspective is adopted instead of dividing actors between different roles and performed activities. Thus, all actors are basically doing the same: co-creating sustainable value by integrating resources (Håkansson and Snehota 1995; Vargo and Lusch 2011). Thus, the view to whom value-creating activities are targeted widens as value is co-created together with and for actors. Especially, when dealing with forest owners, this is an important notion, as they are both the producers of forest-based resources (Article IV) as well as buyers of services (Article III).

Responding to the occurring changes in the business environment and altering perceptions on value and sustainable value co-creation will result in reconfigurations in companies' and industries' business and value creation logics. Business logic describes the established ways of managing business activities and strategic decision-making (Prahalad and Bettis 1986). In this dissertation, the definition of value co-creation logic is derived from the concepts of business logic and value co-creation, thus, it describes the established and common ways in which actors co-create social, environmental and economic good, that is value, by performing activities that integrate tangible and intangible resources in a value-creating network (Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Vargo and Lusch 2011; Dyllick and Muff 2016). A company and an industry both can have a value co-creation logic. In the context of forestry services, Table 3 represents the identified potential differences between the traditional value creation logic based on a value chain, and the reconfigured value co-creation logic based on a value network (Article III).

Table 3. Identified differences between the traditional value creation logic of forest holding management services versus the reconfigured value co-creation logic of the new forest leasing service. Source: Article III Laakkonen et al. 2019.

	Traditional forest holding management services	New forest leasing service
Forest owner's role	Operates by her-/himself, active decision-making	Gives power to tenant to make operational decisions related to forests
Income generation	Roundwood sale	Lease
Focus of activities	Single activity, e.g., tending of seedling stand	All-inclusive forest holding management service
Company's business logic	Make-or-buy decision, aim to minimise transaction costs. Information sharing: single wood sale and technical details.	Networked activities in collaborative network. Information sharing: wood sale as a process linked to forest owner's and buyer's objectives.
Value creation logic	Value created and added by the company in value chain.	Value co-created in value network. Shared value propositions: actors define value.
Value	Value-in-exchange	Value-in-use, value-in-context
Key resources	Tangible (e.g., machines, products)	Intangible (e.g., competence, skills)

Sustainable, collaborative and cross-sectoral value-creating networks

In this sub-chapter, the discussion will move on to value-creating networks in the forest sector and how sustainability and cross-sectoral collaboration will affect the value-creating networks and value creation logic. The role of resources and capabilities, especially highlighting the increasing role of intangible resources and natural capital, in value co-creation will be discussed. In addition, the actors-resources-activities (ARA) framework for analysing value co-creation will be introduced. Thus, contributions to RQ2 and RQ3 are made.

A shift towards sustainable value-creating networks

A shift in companies' traditional value creation logics from minimising transaction costs (Coase 1937; Williamson 1981) and operating in a linear intra-industry, value-adding chain (Porter 1985) to intentionally created collaborative strategic value networks (Jarillo 1988; Normann and Ramírez 1993; Kothandaraman and Wilson 2001; Möller and Rajala 2007) has been prevalent within the strategic management and network management studies. The notions of complexity and continuous cross-sectoral interactions, as well as business sustainability due to global change drivers, are speeding up the shift within the business environment (Nelson et al. 2006; Teece 2007; Vargo and Lusch 2011; Loorbach and Wijsman 2013; Dyllick and Muff 2016; Håkansson and Snehota 2017; Landrum 2018; Köhler et al. 2019; Möller et al. 2020).

In network management studies, there are two research streams investigating networked and collaborative value creation, and they are defined as strategic networks and markets-as-networks (Möller et al. 2020). Jarillo (1988), Håkansson and Johansson (1992), and Normann and Ramírez (1993) have been some of the first to mention that a company's long-term relationships and interactions between other actors are the key to gaining a competitive advantage. Jarillo (1988), representing the strategic network research stream, states that a network is a mode of organisation stating a company's competitive position. This strategic value network is intentionally constructed, has a specific business purpose and goal, and has one actor operating as a hub or an integrator managing and orchestrating the network (Jarillo 1988; Möller et al. 2005; Dhanaraj and Parkhe 2006; Allee 2008). In addition, Normann and Ramírez (1993), from the same research stream, see that a company should be organised as a value-creating system, where different actors collaborate, and value is created in inter-organisational relationships and knowledge exchange between companies. On the other hand, Håkansson and Johanson (1992), representing the markets-as-networks research stream, see a network as a dynamic structure of reciprocal relationships between actors, resources and activities (Håkansson and Johanson 1992). Collaborative interactions and knowledge creation between actors shape the value creation and the networks which can be boundaryless or more specifically defined (Håkansson and Snehota 1995). In this dissertation, both research streams are applied because, despite the research stream, both acknowledge that the core purpose of economic actors is to co-create social, environmental and economic value by performing resource-integrating activities (Jarillo 1988; Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Vargo and Lusch 2011; Dyllick and Muff 2016).

In addition, in network management studies, the value co-creating networked construct is often seen as an actor-centric activity structure, where the actor with the right resources and capabilities can influence and manage the value-creating activities and relationships it is

engaged in (Möller et al. 2020). In the strategic network stream the construct is called a strategic net (Möller et al. 2005), a value-creating system (Möller and Svahn 2006; Möller and Rajala 2007) or a value network (Jarillo 1988; Allee 2008). Similarly, in strategic management studies, a business model (Zott and Amit 2010; Bocken et al. 2014; Evans et al. 2017) is a similar concept related to creating value in an actor-centric activity system: what kind of value, how and to whom a company creates. In a sustainable business model, value is proposed, created, delivered and captured in a way that significantly creates positive and/or reduces negative impacts on the natural environment and/or society (Bocken et al. 2014) and the economic, environmental and social value flows are embedded within the business model (Evans et al. 2017).

In this dissertation, these different concepts and perceptions of value-creating constructs, introduced in the network and strategic management studies, are tied together, and the concept of a value-creating network is applied. A value-creating network is defined as a collaborative network of directly and indirectly connected actors performing value co-creating activities with the resource constellations they control (Håkansson and Snehota 1995; Möller and Svahn 2006; Möller and Rajala 2007; Allee 2009; Vargo and Lusch 2011; Aarikka-Stenroos et al. 2017). The purpose of a company is to help other actors create their own value from the products and services offered by the company, rather than create value ready for them (Normann and Ramírez 1993), which highlights the essence of knowing the forest owner's motivations and objectives to be able to serve those with service offerings (Articles III and IV) in a purposeful strategic value network. However, the value-creating network recognises that it is not enough to consider only the focal strategic value network focusing on a specific business purpose because the network is affected by an extensive network (Aarikka-Stenroos et al. 2017), consisting of directly and indirectly connected actors, such as companies, universities, non-governmental organisations (NGOs) and government agencies, from all the nested layers of the business environment. Similarly, it recognises that the relationships and collaborative interactions between different actors, for example, companies and their stakeholders, are equally responsible parts of the value-creating activities. Thus, when considering reconfiguring the value creation logic of an industry, the interest is on a wider, non-manageable business network and the different relationships between all kinds of actors (Möller 2013), which highlights understanding the roles of non-business and indirectly connected actors and how events happening in the wider business environment affect value creation logic and the value-creating networks (Articles I and II).

However, when the purpose is to investigate the actual structure, attributes and exchanges within a strategic value network, as in Article III with the new forestry service, the concept of value network as an intentionally created value configuration model (Stabell and Fjeldstad 1998; Allee 2009) was applied. When the purpose is to investigate a specific business case, the concept of a strategic value network having a specific business purpose and one actor operating as an integrator managing and orchestrating the network (Jarillo 1988; Dhanaraj and Parkhe 2006; Allee 2008, 2009; Möller and Halinen 2017) is suitable. In a strategic value network, an integrator connects actors and integrates their competences and resources for creating value propositions, thus creating a competitive advantage (Stabell and Fjeldstad 1998). In a value network, actors convert and exchange value via deliverables, the actual things moving from one actor to another (Allee 2008). These deliverables can be contract-based and tangible (e.g., goods, revenues) or informal and intangible (e.g., skills, ideas) (ibid.). However, value is realised and co-created only when other actors see that it is beneficial and accept it (Allee 2008; Vargo and Lusch 2011; Allee and Schwabe 2015); thus,

actors cannot just “create and add” value, but rather reinvent it in value networks where value propositions are co-created together (Normann and Ramírez 1993). Sharing intangible resources, such as information and knowledge, are essential for co-creating value where trust, transparency and integrity are key attributes of a value network (Allee 2003). Especially in the context of forestry services, each actor in the network must be able to trust others and feel that collaboration brings value, i.e., benefits, to oneself and other actors. Acknowledging this, and taking a systemic view on value co-creation can enhance sustainable business practices (Wagner and Svensson 2014; Evans et al. 2017), and thus strengthening companies’ and industries’ competitiveness (Nidumolu et al. 2009; Porter and Kramer 2011).

Role of resources and capabilities in sustainable value co-creation

The actor’s resources and capabilities are core elements in value co-creation, thus, a resource-based view of the firm (Barney 1991) and its extensions natural resource-based view (Hart 1995, 1997; Hart and Dowell 2011; McDougall et al. 2019) and social resource-based view (Tate and Bals 2018), from strategic management studies are considered in this dissertation. In addition, perspectives from the dynamic capabilities framework (Teece et al. 1997; Teece 2007) are considered. The actor’s success and the sustainability of performed activities are based on the availability and control over valuable, rare, imperfectly imitable and non-substitutable resources (Barney 1991), accompanied by the organisational abilities, i.e., dynamic capabilities, to reconfigure these tangible and intangible resources based on the detected needs of the changing business environment (Teece et al. 1997; Teece 2007). Thus, resources are an actor’s assets that are utilised in value-creating activities (Wernerfelt 1984), and they can be divided into tangible (e.g., goods, raw materials and technical facilities) and intangible (e.g., competence, skills, knowledge and trust) (Håkansson and Snehota 1995; Teece et al. 1997; Allee 2003). In addition, operating systems, processes and business relationships are intangible resources (Allee 2003), thus any assets that are difficult to imitate by other actors and transfer due to, e.g., tacit knowledge or high transaction costs are resources (Teece et al. 1997; Eisenhardt and Martin 2000). However, a resource has value only when there is a known use for it, and thus the value of a resource is dependent on its combination and integration with other resources (Barney 1991; Håkansson and Snehota 1995; Akaka et al. 2012). Hence, to co-create value, resource constellations are needed, where intangible, operant resources are purposefully integrated with other resources, for example, tangible operand resources (Håkansson and Snehota 1995; Vargo et al. 2008; Akaka et al. 2012). Similarly, actors are to perform activities according to a strategy facilitating environmentally sustainable business practices (Hart 1995; Hart and Dowell 2011), where the perspectives and social capabilities of economic, environmental and social stakeholders are considered (Tate and Bals 2018). However, value co-creation is not possible without actors that can integrate intangible resources with other resources and with other actors, which makes intangible resources vital for value co-creation (Allee 2003; Vargo and Lusch 2004; Akaka et al. 2012; Mouzas and Ford 2012). Especially the business actor’s ability to coordinate and reconfigure these valuable resource combinations according to changes in the business environment is expected to be crucial in creating a competitive advantage (Teece 2007). Therefore, everything and everyone can be seen as a resource when integrated into the value co-creation process (Löbler 2013).

Collaboration, long-term relationships and interactions between actors are essential for co-creating sustainable value and competitive advantage, and thus, a systemic view on resources and capabilities needs to be taken. Therefore, achieving holistic sustainability

requires broad and cross-sectoral knowledge and understanding of technologies, different resources, practices and societal values (Teece 2007; Möller and Svahn 2009; Evans et al. 2017; Bondeli et al. 2018; McDougall et al. 2019; Möller et al. 2020). Social exchange processes in relationship governance and development are important in value co-creation (Bondeli et al. 2018), together with including the perspectives of economic, environmental and social stakeholders (Tate and Bals 2018). Therefore, investigations on sustainable value co-creation should be carried out both at the actor or micro level (Articles III and IV) as well as at the industry or the meso and macro levels (Articles I and II). This is especially important when dealing with a natural resource-based industry (Andersen et al. 2018) acting globally and playing an important role in answering the socio-economic and environmental challenges and developments within the global business environment (Hansen and Juslin 2018).

World forests have a remarkable role in tackling global challenges by functioning as carbon sinks and sustaining biodiversity, among other ecosystem services, not to mention their role in facilitating human well-being. Therefore, the natural capital tied to the world's forest ecosystems should be acknowledged (Costanza et al. 1997; Daily 1997), both in the circular bioeconomy as well as in companies' and industries' value co-creation logics and networks. This makes the availability and control over forest-based resources, and the knowledge related to integrating them, crucial for actors (Articles III and IV and RQ3). Achieving competitive social sustainability locally and globally (McDougall et al. 2019) requires the integration of an actor's social capabilities (Tate and Bals 2018), sustainable technologies (Hart 1995; Hart and Dowell 2011) and management and sourcing of forest-based resources in a manner that covers all sustainability dimensions to mitigate the consequences for the environment (Eyvindson et al. 2018; Pukkala 2021). However, these company-level sustainability reconfigurations are not enough unless they are simultaneously communicated to the actors in the extensive business network (Lacoste 2016). Similarly, the reconfigured network structures and value co-creation rules need to be integrated with the old rules and maintained (Koskela-Huotari et al. 2016) to stabilise the reconfigurations and developments (Article II and RQ2).

The actors-resources-activities framework as a conceptual language to analyse value co-creation

Despite the slightly differing theoretical underpinnings in network and strategic management studies, value co-creation happens in a networked activity-construct, and the ARA-framework (Håkansson and Johanson 1992; Håkansson and Snehota 1995) offers a conceptual language for describing and analysing value co-creation. The ARA-framework is well-known in network management studies, and it has been widely utilised over the years, for example, when describing the business network of the Polish furniture industry (Ratajczak-Mrozek and Herbec 2013) or the Japanese seafood distribution system (Abrahamsen and Håkansson 2012). It has been applied when describing how actors act as key drivers in developing networks after industrial restructuring in Sweden (Lundberg et al. 2016), how company-specific resources and activities influence the relationships of industrial manufacturers in Japan (Choi and Hara 2018) and how servitisation and provisioning of solutions are embedded in business networks in timber transportation (Hedvall et al. 2019).

According to the ARA-framework, actors are economic, social or political entities that utilise resources in value co-creation (Håkansson and Johanson 1992), and bonds between actors affect how they perceive and evaluate each other (Håkansson and Snehota 1995). Each actor has differing knowledge, perceptions, capabilities and power within the network (ibid.),

which is why capable and proactive actors can try to influence other actors in the network (Medlin and Törnroos 2014). In addition, actors are constrained by social, economic and political institutions (North 1990), and thus, institutional structures guide their behaviour (Ojansivu et al. 2020). Actors perform purposeful resource integrating activities, which can be technical, administrative, commercial or any other activities that can be connected and linked to other actors' activities through interaction and relationships (Håkansson and Snehota 1995). To perform activities, actors need to utilise resources they control to create new resources by combining or exchanging them (Håkansson and Johanson 1992). However, no actor alone has all the needed resources, and thus, through relationships, actors can access and gain control over resources and tie them together (Håkansson and Snehota 1995). In this dissertation, the ARA-framework was directly applied as a theory-based analytical lens in Article I. In addition, it acted implicitly as a conceptual language to analyse value co-creation in Article II and III.

In Article II, the purpose was to understand the reconfiguring value creation logic of an industry (RQ2); thus the ARA-framework offered a conceptual language to investigate an industry-specific value creation logic and how it is communicated as a representation of the institutionalised consensus between the industry's actors guiding how value is created in the industry (Van Bockhaven and Matthyssens 2017; Möller et al. 2020). Similarly, it offered a language to understand the systemic and holistic perspective of the business environment, where one actor alone cannot create value and provide solutions, but rather a common understanding and a vision, i.e., an agenda, for sustainable value co-creation needs to be created (Möller 2010; Möller et al. 2020). In Article III, the purpose was to investigate potential reconfigurations in the value creation logic (RQ3), and thus the ARA-framework offered a conceptual language to investigate the actual structure, attributes and exchanges within a strategic value network of a new forestry service. Similarly, it offered a language to understand the important role of an integrator in connecting and integrating different actors' competences and resources for creating value propositions, and thus co-creating a competitive advantage (Stabell and Fjeldstad 1998; Dhanaraj and Parkhe 2006; Allee 2008).

Psychological theories on behavioural change

This sub-chapter contributes to the theoretical discussions on psychological theories on behavioural change by providing perceptions and concepts for answering the RQ3. The tripartite model of attitudes and the theory of planned behaviour are useful theories to create understandings of how an actor's attitudes affect and guide one's actions related to decision-making and willingness to adopt new practices in the changing environment. In Article IV, forest owners' behaviour related to the mitigation of climate change and increasing adaptive capacity in their own forests was investigated. Forest owners' decision-making related to forest management, and whether to adapt it, for example, to mitigate climate change through carbon sequestration or to improve the resilience of forests, is getting increasing attention.

The tripartite model of attitudes (Rosenberg and Hovland 1960; Breckler 1984; Eagly and Chaiken 1993) has three components: cognitive, affective and behavioural, which together form a subject's attitude. The cognitive component means that an actor is aware and has beliefs on a specific issue, e.g., person, place, thing or event. This guides the affective component, i.e., the actor's feelings towards the issue. This in turn guides the actor's intention to behave on the issue, i.e., the behavioural component. However, the link between an actor's cognitive awareness and beliefs, and behavioural intention is not direct, because behaviour

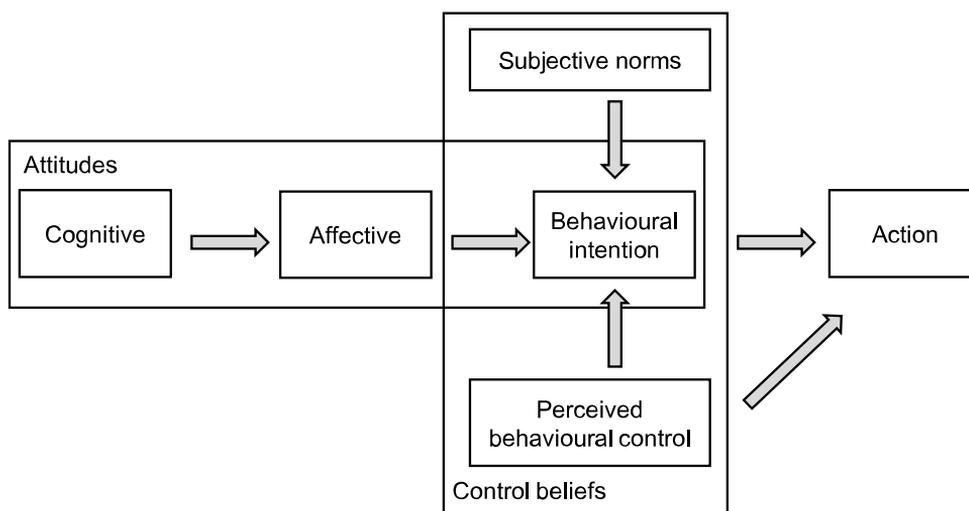


Figure 6. The analysis framework of Article IV combined the tripartite model of attitudes (Rosenberg and Hovland 1960) and the theory of planned behaviour (Ajzen 1991, 2011) with components of attitudes and control beliefs. Source: Article IV Laakkonen et al. 2018.

is largely socially determined (Rosenberg and Hovland 1960). Here the theory of planned behaviour works as a framework to understand the control mechanisms or beliefs of what is perceived as socially acceptable or preferable, thus influencing the actor's actions. According to the theory of planned behaviour, subjective norms and perceived behavioural control affect the actor's behavioural intention, and thus action. Therefore, the social environment is an added layer that can help or hinder an actor's practical capability to actualise behavioural intentions (Ajzen 1991, 2011; Ajzen et al. 2011). This means that actors' attitudes not only determine actions, but also, the pressures of their social environment have an effect.

In Article IV, an analysis framework that combines these two theories (Figure 6), with components of attitudes and control beliefs, was introduced. Regarding the attitudes component, it was argued that forest owners are likely to hold certain cognitive beliefs regarding climate change, and these beliefs are combined with affective evaluations of climate change, which will result in a behavioural intention in their forests. Regarding the control beliefs component, it was argued that the forest owner's behavioural intention is influenced by subjective norms and perceived behavioural control, together with pressure and support from the social environment. Furthermore, it was argued that attitude and control work together and influence each other to determine what, if any, action(s) forest owners may make regarding climate change. The(se) action(s) can be either receptive or opposing compared to dominant beliefs in society.

RESEARCH DESIGN

The philosophical position of critical realism

In this interdisciplinary dissertation, a qualitative research approach was followed. Qualitative research crosscuts disciplines, fields and subject matters, and it is considered “a situated activity that locates the observer in the world” (Denzin and Lincoln 2000). It aims at interpreting and understanding the socially constructed world (Eriksson and Kovalainen 2016) and the phenomena in it through the meanings people give to them (Denzin and Lincoln 2000). Similarly, phenomena are constantly changing due to being socially constructed through interactions between people having different perspectives, and thus the interpretations and meanings given to phenomena are also changing (Kekäle and Puusa 2020). The purpose of this dissertation was to create understandings of the phenomena changing the forest sector’s value creation logic. In addition, the dissertation aimed at interpreting what kind of meanings the forest owners, the forestry service providers and the pulp and paper industry give to the phenomena and how it will affect their activities. However, it was acknowledged that there is no “one” truth or interpretation about a phenomenon. Therefore, the findings and conclusions of this dissertation are time- and context-bound interpretations of the observer, i.e., the researcher, and thus are likely to change when time goes by, or they are taken into another context.

In this dissertation, the philosophical position of critical realism (or transcendental realism) (Sayer 2000; Bhaskar 2011) was followed. The ontology and epistemology are built on the positivist (often followed in natural sciences) and constructivist (often followed in social sciences) approaches (Gorski 2013); thus, critical realism offers an alternative for understanding and interpreting meanings given to phenomena occurring in an open system (Sayer 2000; Bhaskar 2011), where actors are capable of communication, creativity and resistance (Gorski 2013).

The ontology of critical realism follows realism by stating that the world is independent regardless of our knowledge of it, but it is divided into the real, the actual and the empirical domains (Sayer 2000). The world is socially structured, differentiated and changing, and thus objects have certain structures and causal powers (the real). However, the social structures, events and discourses can be understood and changed only by identifying the structures creating those events and discourses (the actual), and this identification can happen only through human agency and the practical and theoretical work of the social sciences (the empirical). (Bhaskar 2011) This makes ontology stratified, meaning that everything that exists can be observed (Sayer 2000). Similarly, the world is emergent; the conjunction of two or more factors can create or cause a new phenomenon (Sayer 2000), and thus some causal powers and tendencies can influence the world we experience, and the social actors can change and influence the future social structures. For example, social structures (economy, family, company, etc.) are needed to have human activity, and the relations between these people and their activities change the structures (Bhaskar 2011). Deriving from this, critical realism provided perspectives on understanding both the social and natural dimensions of existence and the continuous dynamic causal interactions between them and their influence on well-being (Bhaskar 2011).

Following the ontological views, the epistemology of critical realism notes that knowledge also is stratified, and it has an emergent nature; therefore, knowledge can be produced in an empirical process (Sayer 2000; Bhaskar 2011; Gorski 2013). The empirical

process can discover knowledge and create theories and concepts on a phenomenon; however, new knowledge and theories can also be discovered from the same phenomenon (Bhaskar 2011). A more subjectivist view on knowledge, instead of objectivist, is adopted as knowledge can be fallible, due to the transitive and intransitive dimensions of knowledge (Sayer 2000; Bhaskar 2011). The intransitive dimension (what the world is despite our knowledge of it) takes an objectivist view of knowledge (Sayer 2000), and thus objects of scientific inquiry exist and act quite independently of the knower and their activity (Bhaskar 2011). However, a transitive dimension (the changing knowledge and concepts) complements the intransitive dimension (Bhaskar 2011); thus, a more subjectivist view is adopted, as all beliefs are socially produced, and they can be value-laden or value-free and true or false (Sayer 2000). Thus, there are no truth-values, and criteria of rationality does not exist outside historical time (Bhaskar 2011). Observations and the derived knowledge are theory-laden, or -dependent, as they are interpreted through the earlier understandings of them.

In critical realism, many research methods can be utilised, depending on the nature of the studied object and what the researcher wants to learn about it, however typically an intensive research approach is followed (Sayer 2000). Therefore, critical realism is methodologically pluralist and inclusive, and it provides philosophically informed methodologies for generating new insights (Vincent and O'Mahoney 2018). When concerning analysis and reasoning logic, induction and deduction can be used, but to identify the causal mechanisms, abstraction and retroduction are often used (ibid). In this dissertation, an intensive research approach and abductive and retroductive reasoning logics were followed, as the purpose was to interpret a certain phenomenon (the reconfiguring value creation logic) and meanings and explanations given to it (existing theories and concepts) in a specified context (the forest sector). In addition, the dissertation aimed at identifying developments, connections and relations between social events and linking them to a wider context to create a holistic understanding of the effects that a sustainability transition has on the business environment.

To summarise, critical realism is about understanding and explaining what caused the events (causal tendencies), how they are connected holistically in a wider context (social structures) and how actors and their relationships and interaction between them affected the events (human agency). Thus, in this dissertation, reality is considered as emergent, relationships between different actors have causal power to change reality and the way it is socially constructed, and our knowledge of reality can be false (Easton 2010; Peters et al. 2013).

A case study research strategy

Intrinsic case study approach

The research strategy of this dissertation followed a theory-guided case study strategy. First, the aim was to create context-specific holistic understandings of a theoretically and practically interesting phenomenon, i.e., a case (Stake 1995; Easton 2010; Thomas and Myers 2015). A case study examines and analyses a case (persons, events, periods, policies, institutions, etc.) holistically intending to build knowledge or theory from the case evidence by making connections between the experiences of the researcher and other actors, seeing links and having insights from the noticed connections (Thomas and Myers 2015). Case selection was not guided by theory but rather it was seen as an opportunity to gain and extend

the researcher's knowledge and in-depth understanding of the case (Stake 1995; Easton 2010; Piekkari and Welch 2018). However, to adequately outline a case study, there should be a subject of interest, the case and an analytical frame, an object within which the case is investigated (Thomas and Myers 2015). Thus, the case is the lens through which the theoretical and conceptual frameworks are studied (*ibid.*). In this dissertation, the case was the reconfiguring value creation logic in the Finnish forest sector, and the analytical frame was the role of the dynamic business environment and the change drivers, especially the transition to a sustainable circular bioeconomy, affecting the networks and value creation logic. In addition, in a case study, a phenomenon is examined in its naturalistic context, where theory meets the empirical world (Piekkari et al. 2009), and thus it can provide a real-life inspiring illustration of a conceptual framework (Siggelkow 2007). The forest sector offered an interesting study context, as it has an important role within the circular bioeconomy, while contributing to a sustainability transition. It is important to acknowledge that the findings of this dissertation are a result of analytical reflections of the case data (Stake 2005) and chronological developments within the case, and in its context over time (Stake 1995), and thus, do not represent a universal truth about the phenomenon. This implies, with the basic assumption of critical realism, that knowledge is fallible.

The case study approach, as well as critical realism, is open towards applied research methodology, and this methodological eclecticism allows for choosing the methods that are most suitable for the research design and questions of a particular study. Each article of this dissertation had a slightly different case study approach (Articles I and II), and two of them (Articles III and IV) were not case studies per se, but they were investigating an interesting phenomenon through theoretical concepts. Despite that, each article investigated the same context, the forest sector operating in Finland, and thus they assisted in gaining a holistic understanding of the reconfiguring value creation logic in the forest sector and the factors affecting it. In Article I, an intrinsic case study strategy was followed, as it aimed at creating an understanding of a practically relevant and intrinsically interesting case, the development of the Finnish pulp and paper industry's business network. In this study, the case itself represented a phenomenon where uniqueness is embedded in the context, and the particularities of the case are more interesting than merely creating generalisations (Stake 1995). In Article II, the case study strategy focused more on creating theoretical and practical understandings of the case, reconfiguration of the Finnish pulp and paper industry's value creation logic. The case was investigated through a constructed conceptual framework and three companies operating in the industry. Thus, the case offered a real-life inspiring illustration of the conceptual framework (Siggelkow 2007) and an opportunity to gain an in-depth understanding of it (Easton 2010). In both articles, the research aimed at building new knowledge on the phenomenon by explaining it through a conceptual framework by applying a phenomenon-based research approach (Schwarz and Stensaker 2016).

Based on the research objectives of Articles I and II, other research approaches were also followed. In Article I, a constructive approach (Kasanen et al. 1993) was applied by constructing a "solution", i.e., development phases of the business network, for the study and connecting it with marketing and networking theories, with the purpose of gaining practical and theoretical understandings of the case. Similarly, approaches from historicism (Fullerton 1987) were applied, as a network is a complex and nested social system evolving over time and context; thus, the network was seen as a historical individual with its own time-bound identity, values, attitudes and conditions guiding its development. In Article II, approaches from strategic foresight (Heger and Rohrbeck 2012; Vecchiato 2012) were applied as the changing business environment holds major uncertainties, and thus strategic foresight can

aid companies in noticing change drivers originating from the changing business environment (Vecchiato 2012). Similarly, it can help companies to develop capabilities to explore, plan and develop new value-creating activities within industries (Heger and Rohrbeck 2012) while managing the evolving opportunities and threats (Vecchiato 2012).

In Article III, the characteristics of a case study can be noticed, as it investigated collaborative value creation logic through a potential forest leasing service that can be considered as a case. The case was investigated and analysed through theoretical concepts of service-dominant logic, value network as a value creation logic, and value network analysis, with the purpose of mapping the value network's actors and their roles, resources and competence, exchanges between these actors and how they convert value in the network. In Article IV, the forest owners' behaviour in their own forest related to mitigating climate change and increasing adaptive capacity was investigated through the theoretical concepts of the theory of planned behaviour and the tripartite model of attitudes. To capture the mental structures of the forest owners and interactions among the concepts related to attitudes and behaviour, cognitive mapping was applied. It can be used in developing a framework for introducing new ideas and developing appropriate responses to new issues (Kaplan and Kaplan 1989; Kearney and Kaplan 1997). Thus, these articles contributed to theoretically framing the reconfiguring value creation logic (Article III) and the forest owners' understandings and attitudes towards climate change (Article IV) in the context of the forest sector.

Finnish forest sector as a research context

The Finnish forest sector and its reconfiguring value creation logic was an interesting research context because it is expected to retain its important role in creating economic prosperity and well-being for Finnish society and the economy when transitioning towards a sustainable circular bioeconomy (MMM 2022; Valtioneuvosto 2022). For example, in 2020 the value added of the forest sector was 7.7 billion €, which comprised 3.8% of the total value added of the Finnish national economy and the exports of the sector were 18% of Finland's total goods exports (Vaahtera et al. 2021). In this dissertation, the concept of the forest sector covers the forest industry (pulp and paper and wood processing industries) and forestry (forest management, wood production, and harvesting). The forest sector is an important part of the circular bioeconomy. For example, it accounts for 35% of the total output of the Finnish bioeconomy, and the bioeconomy comprised 16% of the total output of the Finnish national economy in 2020 (Vaahtera et al. 2021). As the concept of circular bioeconomy covers all sectors utilising renewable non-fossil raw materials, the circular forest-based bioeconomy consists of the forest sector, as well as e.g., energy, chemical, natural product, food, cosmetics and medical industries, which utilise non-fossil raw materials derived from forest ecosystems. Similarly, sectors that provide services and solutions related to forest ecosystems, such as nature tourism, are considered as parts of the circular forest-based bioeconomy. Thus, a circular forest-based bioeconomy covers all economic activities related to forest ecosystems (Winkel 2017a).

In Articles I and II, the focus of the investigation was on the forest industry, and moreover, on the pulp and paper industry. The three Finnish multinational enterprises (MNEs), UPM, Metsä Group and Stora Enso, are important forest industry actors on a global scale. Their global operations cover the whole forest-related supply chain from forest management to manufacturing semi-finished products. They have also acted as pioneers in their global value networks by being among the first Nordic forest industry companies to expand operations,

e.g., to Latin America, especially in Uruguay. Similarly, the companies are self-proclaimed forerunners in the sustainable bioeconomy (Metsä Group 2022; Stora Enso 2022; UPM 2022), and they hold many promising features, e.g., in substituting fossil-based products. However, the mature (Guerrero and Hansen 2018) and strongly path-dependent (Näsi et al. 2001; Lamberg et al. 2017; Luhas et al. 2019) forest industry has been lacking the expected and needed longer-lasting and higher-value products – possibly due to its established value creation logic focusing on producing large amounts of traditional business-to-business (B2B) products, materials and energy in traditional and well-known networks with traditional business models. The industry appears to be making only incremental innovations and aims at maintaining its current market position.

In Article III, the focus was on forestry and moreover on forest management services. Traditionally in Finland, government-led organisations, such as local forest management associations (FMA), have had an important role in providing forestry services, especially forest management services (Kotilainen and Rytteri 2011). In addition, micro-, small- and medium-sized enterprises (SMEs) have an important role in the traditional forest industry supply chain, especially in harvesting and logistics, as the forest industry MNEs have outsourced these operations to the SMEs. However, during the 2000s, there have been reforms in forest-related legislation and organisational changes in private forestry. For example, the Finnish Forest Act was revised to reduce regulation on forest management practices and increase forest owners' self-determination in forest management-related decision-making (Harrinkari et al. 2016), and the Forest Management Association Act was revised to abolish the forest owner's obligatory membership in a local FMA (Pelkonen 2017; Valonen et al. 2019). These changes in the business environment have resulted in, e.g., diversified possibilities for forest management and opening the forestry service market for private companies. Thus, the role of SMEs in providing services in the traditional forest industry, as well as in circular forest-based bioeconomy-related supply chains, has been increasingly acknowledged (Lehtoviita et al. 2016). Similarly, the role of SMEs as producers and manufacturers of circular forest-based bioeconomy products and services has gained attention (Näyhä 2019; D'Amato et al. 2020).

In Article IV, the focus of the investigation was on forest owners, because they are an important part of forest-related networks. After all, they own, control and manage the crucial forest-based natural capital and resources. In Finland, these private forest owners own over 50% of the forestry land, and over 80% of all roundwood purchased by the forest industry comes from these private forests (Karpinen et al. 2020). Other important forest owners are the state (35%) and companies (7%), and the rest are owned by municipalities, parishes and various associations (Vaahtera et al. 2021). In this dissertation, the focus was only on private forest owners. The individual decisions forest owners make related to their forests will collectively have a large influence on the overall forest landscape, climate and economy of Finland. Similarly, the ownership of these forests is changing, and new ownership types have different motivations and attitudes for owning and managing forests (Bengston et al. 2011; Weiss et al. 2019), which will result in altering needs for different forestry services. A noteworthy change in forest ownership, occurring especially in Finland, is the increasing amount of institutional forest owners, such as investment funds (Viitala and Leppänen 2014; National Land Survey of Finland 2022). In addition, climate change will affect forest management and related decision-making; thus, understanding forest owners' perceptions towards climate change, while acknowledging the altering objectives and motives, could create possibilities to renew forest-based services.

Therefore, the Finnish forest sector offered an excellent case to investigate the reconfiguring value creation logic, as it has great potential to contribute to the sustainability transition. As a natural-resource-based industry, the forest sector has an important role in providing solutions to environmental and sustainability challenges by having access to and utilising the crucial natural resource base, while also possessing strong bargaining power in the global supply chains. However, forest ecosystems have an ambiguous role in sustainability transitions. On the one hand, forest ecosystems are expected to continue to generate economic wealth, while on the other hand, they should mitigate climate change and prevent biodiversity loss. In Finland, the forest sector, having long traditions with well-established industrial and forest management practices, together with powerful industrial and governmental actors, is likely to face challenges, as established business and value creation logics and value-creating networks are challenging to reconfigure. Therefore, the emerging sustainable value co-creation logic simultaneously challenges the forest sector to reconfigure its value creation logic and to adapt to changes in the utilisation of forest-based resources, but it also introduces many business opportunities arising from the new sustainable products, services and solutions.

Abductive and retroductive reasoning logic

In this dissertation, abductive and retroductive reasoning logics were followed as previously stated. Abductive reasoning logic sees the research process as non-linear, and thus the research process goes back and forth between the empirical observations and theory, as well as between different research activities (Dubois and Gadde 2002). The conceptual framework evolves along the empirical observations, allowing a dialogue between empirical and conceptual investigations (Dubois and Gibbert 2010); thus, conceptual observations can be modified or rejected if needed due to conflicting empirical observations (Dubois and Gadde 2002). Abductive logic is especially suitable if the investigation aims to match theory and reality and discover new things (ibid.). Thus, it allows for a flexible research design and can be applied where redirections gained from the studied case act as a source of theoretical insights and learnings (Piekkari and Welch 2018). Retroduction seeks to identify the contextual conditions for causal mechanisms, resulting in the observed empirical trends by constantly moving between the empirical and the different levels of reality to holistically understand the studied phenomenon (Fletcher 2017). Thus, retroduction seeks the social relations and structures that cause the events to happen (ibid.) and re-conceptualises the new, and even unanticipated, knowledge of the phenomenon, and it seeks to verify it in a broader context (Vincent and O'Mahoney 2018). Therefore, abductive and retroductive reasoning logics are suitable when following critical realism, because knowledge production is theory-laden or -dependent, while acknowledging that theories are fallible (Fletcher 2017; Piekkari and Welch 2018).

By applying a case study approach with abductive and retroductive reasoning, it was possible to create new knowledge and test different perspectives when investigating the forest sector from different levels. Therefore, it was possible to create a holistic and systemic understanding of the forest sector and what issues should be considered so that the sector could meet the needs of the changing business environment. In addition, research conducted in forest economics, often following the idea of applied research, can benefit from the interdisciplinary conceptual framework and empirical findings of this dissertation, when the created knowledge is put into practice to be utilised by decision-makers in business and

policy when planning sustainable business activities and policies within the forest sector. This is what critical realists pursue: to explain and critique social conditions and give policy recommendations that are based on the identified tendencies and causal mechanisms, while acknowledging that they can be fallible or have unexpected results under different contexts (Fletcher 2017).

Methods of data collection and analysis

The collected data and the applied data analysis methods for each article, together with the chosen research strategy, helped in gaining a comprehensive understanding of the forest sector's reconfiguring value creation logic (Table 4). By analysing documents, it was possible to recognise the past and currently occurring developments within the sector's value creation logic (Articles I and II). By conducting interviews, it was possible to gain more in-depth knowledge and understanding of the possible future value creation logic of forestry service providers (Article III) and the attitudes and readiness of forest owners to respond to the occurring changes (Article IV). In the following sub-chapters, the applied data collection and analysis methods in each article are discussed in more detail.

Table 4. The research strategy, data collection and data analysis methods of individual articles.

Article	Research strategy	Data collection	Data analysis method
Article I	Intrinsic case study with a constructive approach, historicism and phenomenon-based research	Documents	A qualitative document analysis, qualitative meta-analysis, qualitative deductive directed content analysis
Article II	Case study with strategic foresight and phenomenon-based research	Documents	A modified three-phase qualitative document analysis
Article III	Theory-guided framing of the changing value creation logic	Semi-structured interviews	Theory-driven value network analysis
Article IV	Theory-guided framing of the forest owners' attitudes towards climate change	"Forest walks": open-ended theme interviews, cognitive maps, questionnaire	Cognitive mapping, theory- and data-driven qualitative content analysis, qualitative and theory-driven graphical representation

Article I: Defining the systemic development of the Finnish pulp and paper industry's business network

The data analysis followed a qualitative document analysis method (Bowen 2009) with approaches from a qualitative meta-analysis (Timulak 2009) and a qualitative deductive directed content analysis (Hsieh and Shannon 2005). A qualitative document analysis reviews and analyses documents in a systematic manner (Bowen 2009), and the meta-analysis provided insights to get a comprehensive picture of the researched topic (Timulak 2009). A qualitative deductive directed content analysis provided views to utilise a conceptual framework in guiding the research process: drafting the research questions, creating initial coding for the data analysis and reporting and discussing the research findings (Hsieh and Shannon 2005).

The selected secondary dataset included documents discussing and analysing the history of the Finnish forest sector as a single entity, and data selection had two rounds: in summer 2017 and in autumn 2021. During the first round, the main sources of data were books presenting a reliable and systemic picture of the historical development of the Finnish forest industry. The second round of data selection was done to reach data saturation (i.e., new documents either contained the same information or findings as previously selected documents or cited the same studies as already selected). All in all, the dataset consisted of 31 documents, including books, reports and journal articles written in Finnish and English.

The conducted qualitative meta-analysis of documents followed the four-phased descriptive-interpretative approach (Timulak 2009). In summary, the data analysis resulted in naming dominant systemic development periods, identifying external and internal events changing the business network, and constructing and visualising networks according to the ARA-framework for each of the identified development periods.

Article II: Implications of the sustainability transition on the industry value creation logic - case of Finnish pulp and paper industry

The study was a result of a long-term continuous and iterative document search, reading and reflection cycle (Easton 2010), with the purpose of investigating the transformation of the Finnish pulp and paper industry towards a sustainable circular bioeconomy and the resulted reconfigurations in the industry's value creation logic. However, to adequately outline the abductive, iterative and non-linear research process, a research case and research objective were identified and theoretically framed in winter 2022, when the data selection was finalised. Relevant documents were searched from internet-based search engines with different combinations of words forest industry, pulp and paper industry, (forest-based) bioeconomy, value creation (logic), sustainability transition, sustainable business and business transformation. In addition, snowball sampling was used. The chosen documents (n=106) included, e.g., scientific research papers, non-academic reports, strategies, books, annual reports, webpages, press releases and other communications. The documents covered the time period from the globalisation of the Finnish forest industry and the introduction of the concept of sustainable development until today. Documents were considered suitable data, as they provided a carefully considered strategic, consistent and more objective perspective on the studied topic (Bowen 2009).

A modified three-phase qualitative document analysis, including approaches from content and thematic analyses (Bowen 2009), was applied. During the analysis, the conceptual investigations and empirical observations derived from the chosen documents were

abductively interpreted and reflected through the research objective, the research question and the conceptual framework. The focus of interpretation and reflection had two aims: first, relevant theoretical themes were identified, presenting the conceptual investigations; and second, empirical observations were made based on the identified theoretical themes.

Article III: Integrating intangible resources enables creating new types of forest services - developing forest leasing value network in Finland

The data collection and analysis were guided by theoretical concepts from service-dominant logic and service ecosystems, value network as a value creation logic, and value network analysis. Twelve semi-structured interviews with innovative forerunners and experts, who were seen to potentially play a key role in the forest leasing service, were conducted. The interview guide had five themes: background questions and a general view of the forest leasing service, mapping of the value network and value exchanges, impacts on actions in the network, value creation in the network, and a general view towards acting in the network.

The theory-driven qualitative data analysis was based on Allee's value network analysis (Allee 2008) and complemented with Biem and Caswell's model of economic entity for value network analysis (Biem and Caswell 2008). With Allee's value network analysis, value exchanges and conversion in a role-based value network are mapped and analysed. In addition, Biem and Caswell's model of economic entity introduced the actor's key competence, capabilities and resources to the analysis. Therefore, the combination of these two analysis approaches offered a systematic method to analyse value networks as a means to co-create value. The data analysis had four phases during which a potential value network for the novel forest leasing service was mapped and the service's key attributes and value creation logic were identified. The impact and value creation analyses related to the exchanges were done from an ego-centred perspective, i.e., from the perspective of an integrator.

Article IV: Forest owners' attitudes toward pro-climate and climate-responsive forest management

The data was collected by interviewing 20 forest owners living in Eastern Finland, near the city of Joensuu. The interviews were conducted as commented walks (Jones et al. 2008), i.e., forest walks, in the interviewees' own forests in summer 2015. The forest walk interviews had six phases, during which data was collected with cognitive mapping (Eden 1988; Kaplan and Kaplan 1989), an open-ended theme interview, and two short quantitative questionnaires. Cognitive mapping was used to identify and group all changes the forest owner had noticed in the forest, in forest management and decision-making, and generally related to forests and forestry. The open-ended theme interviews were conducted in the forest, and the discussed themes included observed or perceived changes in the forest, changes in forest management and usage, forest-related services and guidance and motivation toward forest management and usage, and perceived future management. In addition, forest owners were asked to share their opinions about climate change and its possible effects on forests.

The data were analysed using three methods. First, cognitive mapping was used to investigate the cognitive dimension of forest owners' attitudes towards climate change. Qualitative content analysis and categorisation of the messages in the cognitive maps were conducted separately by two authors; after that, the categorisations were compared by the same two authors. Later the categorisations were confirmed by all authors. In a quantitative

analysis, the message classes were cross-tabulated with individual respondents to create a distribution of climate change-related message classes among the interviewees. The cross-tabulation was a starting point for constructing a symmetric class-by-class proximity matrix, serving data for proximity calculations according to the 3CM cognitive mapping methodology by Kearney and Kaplan (1997). The results of the cognitive mapping tasks were illustrated as a mental network in a two-dimensional scaling space of a non-metric multidimensional scaling procedure (Borgatti et al. 2013). Second, a theory- and data-driven qualitative content analysis procedure (Green 2004) was used for finding narratives on affective evaluations, behavioural intentions and normative and personal control perceptions on forest owners' attitudes towards climate change. Third, after analysing the cognitive maps and narratives, the identified attitudes and perceptions were brought together coherently. Thus, illustrative quotations from the transcripts were located in a graphical representation in a qualitative and theory-driven manner. Locating the quotations was done according to joint discussions by all authors. The quotations were divided into five attitudinal positions, which helped in understanding forest owners' attitudes towards climate change within their own forests. The attitudinal positions represent an ideal type of forest owner based on the identified narratives.

RESEARCH FINDINGS

In this chapter, the findings of the individual articles are summarised through the research questions of the dissertation. In addition, this chapter aims at discussing the findings as a thematic entity covering the phenomenon of reconfiguring value creation logic due to sustainability-related change drivers. On the one hand, the perspective is on the macro- and meso-levels, as the forest sector's, especially the pulp and paper industry's, role in co-creating sustainable value for society, the environment and the economy are discussed. On the other hand, the perspective is on the micro-level as the role and impacts of holistic sustainability for the value co-creation logic of the forestry service companies and forest owners are discussed.

Forest sector's value creation logic in the past

The first research question of this dissertation is how the forest sector's value creation logic has previously adapted to meet the changes in the business environment. The findings of Article I revealed that, throughout its history, the Finnish pulp and paper industry, as a part of forest sector, has been able to alter its business network and reconfigure its value creation logic due to and according to critical external and internal events that have changed the business environment. The sector has been concerned about securing its key resources of cheap raw materials, energy and labour. Co-operational formal and informal activities and actors have been important, as the actors have collaborated through the whole production chain. Similarly, technological innovations and research have played an important role, but the actors have favoured a business-as-usual strategy, which has been overruled only by a radical change in the business environment, forcing the sector to reconfigure its value creation logic. Sometimes, the sector has been proactive in this change, but most often the reconfigurations have happened out of necessity. The maturity level of the sector has been an important factor in this. When the sector was in its embryonic phase and non-established, the changes were more proactive. After the sector reached maturity and was established, the responses to changes have started to be more reactive.

Examples on critical external and internal events in the business environment affecting the forest sector

In the latter part of the 1800s, increasing demand and consumption of paper in Europe and North America and new technological inventions for manufacturing paper and paperboard from mechanical and chemical wood-based pulp, were external events in the international business environment, enabling the emergence of a new industrial sector: the pulp and paper industry. In Finland, the emergence of the new industrial sector happened between the 1850-80s, when the innovation of manufacturing paper from mechanical wood pulp entered Finland. This was followed by the manufacturing of chemical wood pulp (cellulose) and the integration of paper and cardboard machines in the same mill site with mechanical or chemical pulp manufacturing in the 1870-80s. Even though, at the time, the forest industry in Finland, mainly regarded as a sawmill industry, was already a well-established industrial sector, the entrepreneurs who started to manufacture wood-based paper came from outside the traditional forest industry. At the beginning of the 1900s, companies operating in the

sawmill industry started to manufacture wood-based paper products in the same mill sites, due to recognising the profitability of pulp and paper manufacturing, which resulted in the emergence of saw and paper mill integrates. Hence, the mature forest industry was rather reactive in entering a new business sector but on the other hand, they reconfigured their value creation logic successfully and effectively by integrating traditional and new manufacturing processes in the same mill sites.

Other reconfigurations in the business network, and value creation logic due to critical events in the business environment, were also identified as manifesting the forest sector's ability to adapt its operations. In the late 1910s, external events, such as the First World War, the Russian revolution and Finland's independence, as well as internal events, such as the vanished division between the sawmill and pulp and paper industry, resulted in the second development phase. At the beginning of the 1950s, the network reconfigured again due to external events, such as the Second World War, two competing business systems of east and west and the establishment of global collaborative organisations, resulted in the third development phase. Similarly, during the third phase, critical events resulted in minor adaptations within the network and its activities, when, e.g., manufacturing was rationalised due to oil crises, and political lobbying was developed due to environmental concerns.

Historical development phases of the pulp and paper industry's business network viewed through actors-resources-activities framework

Figure 7 represents the first three historical development phases of the Finnish pulp and paper industry's business network, identified in Article I. The figure is a figure in principle, i.e., it represents the structure of the network and gives an overview on the number of roles and their power and what kind of relationships there are between the roles. The actors are presented as roles performing similar kinds of activities and possessing similar kinds of resources. To see the full figure with the central roles and the relationships, and value-creating interactions between them, see Article I (Laakkonen et al. 2022). During these three phases, almost the same key actors, resources and activities have been at the core of the Finnish pulp and paper industry for the entire time. However, some adjustments have happened according to each time period's requirements. For example, the names and power of an actor have altered.

The key actors during the three phases were companies, financial institutions, co-operation organisations, customers, the state, forest owners (state, non-industrial private and companies) and the labour force. The companies evolved from being family-owned, entrepreneur-led to being limited or state-owned integrated saw, pulp and paper companies. The financial institutions, mainly commercial banks, were important, because many banks were both financiers and co-owners in the companies; similarly, many company owners and decision-makers had important roles in these financial institutions. There were many co-operation organisations related to wood procurement, transportation and export activities. Coopetition, simultaneous co-operation in some activities and competition in others, between companies protected the industry from harmful competition and fluctuating business cycles, and thus was an important part of the industry's value creation logic. The importance of these organisations grew during the second phase, when export associations did most of the selling and exporting activities, and a new powerful political and lobbying organisation, the Central association, was established. The Central laboratory was established, as a research, development and innovation (RDI) organisation, to ensure the pulp and paper industry's RDI activities. The golden age for the cooperative value creation logic, the export associations and

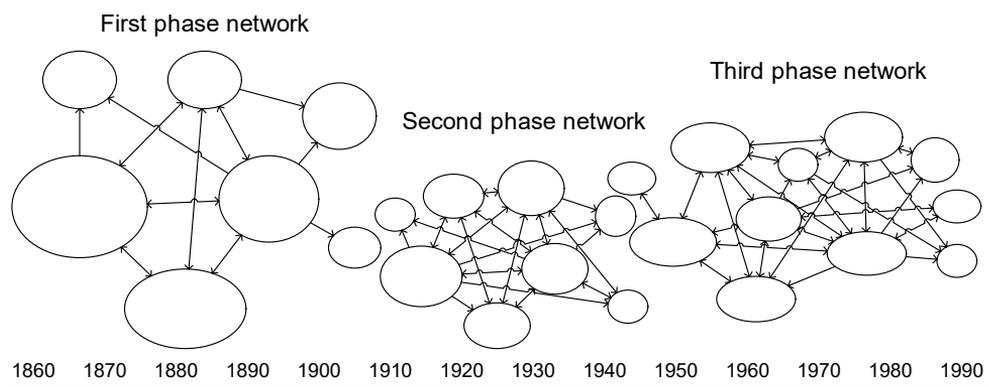


Figure 7. Historical development of the Finnish pulp and paper industry's business network: from the beginning of wood-based paper production (first phase) to increasing competition (second phase) to the golden age of the pulp and paper industry (third phase). The size of the ellipse represents the power of the role: the bigger the ellipse is, the more power the role has. Arrows represent relationships and interactions between roles. Double-headed lines are reciprocal, and one-directional arrows indicate parallel interaction. This is a figure in principle. For the full figure see Article I Laakkonen et al. 2022.

the Central association was during the third phase. The Finnish export associations, Finncell, Finnpap and Finnboard, were internationally established actors, which diminished the role of individual companies. The Central association was a powerful actor in politics and advocacy. Its role in public discussions and sharing financial and other information about the forest sector, and its impacts on forests and the environment, was significant in Finnish society. International customers were extremely important during all the phases. Russia, later the Soviet Union, and western Europe were the main regions for exports.

The state's role increased during the second and third phases, because after the independence, it became fourfold. It was a business actor through owning companies; a large forest owner; a political actor regulating the operating environment, preparing forest policy and providing guidance through many forestry organisations; and a financial actor through the Central Bank by preparing financial policies and utilising devaluations and revaluations of the domestic currency. Companies, private forest owners and the state were the main forest owner groups during these phases. During the second phase, local FMAs, partially funded by the state, were established to assist private forest owners in the timber trade. During the first and second phases, the professional labour force in the pulp and paper mills was foreign, but during the third phase, domestic professionals, especially skilled engineers, replaced them. In wood harvesting and logistics, the employees were domestic workers. During the second phase, a new profession of domestic forestry workers emerged to advise forest owners on forest management due to state-led forest administration. In addition, labour unions started to gain a foothold, even though the traditionally strong personal relationship between employer and employee remained.

Even though the key actors have remained rather the same during these three phases, there were some curiosities. For example, during the second phase, individual entrepreneurs, company directors, factory owners, political decision-makers, forest experts and researchers had strong social, political and economic power in the network with their personal

relationships and financial capital. During the third phase, the roles of the public and the forest cluster emerged. The public evolved as its own actor when the forest sector increased communication and influencing activities towards it. The industry thought that the public must be informed about the sector's importance to the Finnish economy and be educated on research-based forest management and utilisation. However, this omniscient attitude was increasingly challenged by the public's increasing environmental awareness, followed by criticism towards the sector in the 1960s. A cross-sectoral forest cluster emerged as an actor. The cluster consists of actors throughout the whole forest-based production chain, from harvesting to manufacturing to RDI. The co-operation in the cluster was beneficial to all actors in the cluster.

The most central resources in the pulp and paper industry's business network have been tangible and related to actual business activities and value creation. Since the emergence of the industry, cheap raw materials, especially wood, clean water, energy and labour have been the source of the industry's competitive advantage. Securing the availability of these key resources has been important, but only the focus has varied. Especially, ensuring a sufficient supply of wood has been of particular concern, and thus sustainable forest management with a focus on maximising wood yield was introduced already during the first phase. Similarly, during the second phase, the integration of the sawmill and the pulp and paper industry introduced sawing residue as a new raw material for pulp manufacturing and a new energy source for paper manufacturing. In addition, monetary capital was important, because pulp and paper manufacturing is capital-intensive due to machinery-based manufacturing processes.

Important intangible resources were related to competence in foreign trade and social capital, together with long-lasting relationships with national and international business and political actors. During the second phase, the competence related to operating and designing machines and developing technology gained attention, and new technologies and manufacturing processes were developed to utilise different tree species, timber grades and recycled fibres in the processes, as well as to recover precious fibres from the process. In addition, during the third phase, the forest cluster's emerging competence system strengthened the forest sector's competitive advantage. Therefore, the role of intangible resources in the business network, as well as in the value creation logic, gained more attention.

Similarly, the value-creating activities in the business network were mainly related to actual business, such as manufacturing, logistics, wood procurement, marketing and exporting. The manufacturing strategy was to have cost-efficient, large-scale intensive production of quality bulk products in integrated mills, where continuous production was the core of the value creation logic. Similarly, the manufactured products were chosen based on the assumption that markets and demand will be certain and increasing. From the beginning, market pulp and different papers were manufactured, but especially during the third phase, the manufacturing of newspaper and communication paper was extensive. RDI activities have been important, with aims to gain resource efficiency and environmentally friendly manufacturing. New machinery, manufacturing processes and products were developed. For example, during the second phase, a new product of dissolving pulp and by-products from side streams, e.g., ethanol, turpentine and tall oil, were invented. In addition, during the third phase, harvesting and forestry work were largely mechanised.

Collaboration along the whole production chain, from forests to customers, has been extensive, and thus an essential factor of the forest sector's value creation logic. Therefore, formal and informal influencing through personal and institutional networks was a key

activity. Personal networks were especially important during the second phase, when the individual actors had strong social, political and economic power within companies, co-operation organisations, the Finnish government, and financial institutions. The climax of this co-operation was during the third phase, when the central actors in the business network had formal negotiations and agreements on prices, production quotas, investments and wood procurement territories, both nationally and internationally. The Export associations of Finncell, Finnpap, and Finnboard replaced individual companies, especially in foreign trade, and the Central association was a strong actor in national political influencing towards the state and public.

Activities related to forest management and environmental issues have always been important for the whole forest sector. Already during the first phase, national concern about deforestation, which would cause a decreasing availability of wood, resulted in state-run forest governance and legislation. The objective of these activities was to intensify sustainable forest management, ensure wood supply and boost rational large-scale forestry. However, the notion of forest conservation was included in the forest legislation and concepts such as ‘protected forest’ and ‘retention trees’ were added to the forest management vocabulary. Despite that during the third phase, the intensified forest management and increased emissions from the mills were heavily criticised by the public and environmental organisations, thus, resulting in increased attention towards the pulp and paper industry’s environmental issues.

Historical reconfigurations in the pulp and paper industry’s sustainable value creation logic

When considering the long-term historical development of the Finnish forest sector’s sustainable value creation logic, the findings of Article I suggest that the value creation logic has been reconfigured according to changes in and needs of the business environment. The sector has secured its economic sustainability by ensuring continuous efficient manufacturing in integrated mill sites with cheap key resources, thus the value creation logic has followed economies of scale and integration. The sector has adopted new value-creating practices and developed new products and processes as well as collaborated with other actors when it has been beneficial. Similarly, the sector has been an active participant in political decision-making and public discussions. Regarding social sustainability, during the first and second phases, the entrepreneurial factory owners had an important role in providing well-being for the employees, their families and the whole mill region through offering, e.g., work, healthcare, accommodation and leisure-time activities. Similarly, environmental sustainability has been important, but it has mainly been related to ensuring a sustainable yield of wood raw materials by applying sustainable forest management practices. Thus, forest ecosystems have been considered as a resource bank offering provisioning services of wood-based raw materials. Important aspects of RDI have also been in increasing environmentally friendly manufacturing by reducing emissions from the processes. However, the environmental friendliness of the sector’s activities has been increasingly challenged, along with the increasing environmental awareness of the public. Despite that the forest sector has done adaptations in its sustainable value creation logic, it has favoured a business-as-usual strategy, which has been overruled only by a radical change in the business environment forcing the sector to change.

During its 150 or so years of history as an important industrial sector, the forest sector has established and stabilised its role in Finland. It has been an important societal actor with

large influencing power in political decision-making as well as in public discussions. It is still considered one of the cornerstones of the Finnish economic system, and its role is expected to remain the same or even grow within the evolving circular bioeconomy, which in the Finnish context is mainly comprehended as a forest-based bioeconomy. Therefore, the sector's ability to reconfigure its value creation logic due to the global economic, environmental and social challenges, and take part in the sustainability transitions as a truly sustainable industrial sector, is crucial for creating benefits and well-being for the planet, society and the economy.

Forest sector's currently adapting value creation logic

The second research question of this dissertation is how the forest sector's value creation logic is currently adapting to the changes occurring in the business environment. According to the findings of Articles I and II, the Finnish pulp and paper industry's value creation logic has been stabilised as capital-intensive and natural-resource-based, where three MNEs are dominant actors in the value-creating network following business logics of economies of scale and integration. Sustainability is considered as an essential part of value creation, which is largely the result of stakeholders affecting the industry's operations. The findings of Article II indicate that the industry is currently adapting its value creation logic due to many economic, environmental and social change drivers originating from the business environment. Yet, the adaptations have been only incremental. The three MNEs are having an increasing amount of cross-sectoral collaboration in circular bioeconomy-related RDI activities, but not with each other. They are manufacturing some new pulp-based products with new processes, and the paper-based business is transforming into a packaging business. However, the sustainability-related adaptations in the value creation logic have been contested, as the social and environmental dimensions are not sufficiently implemented.

The forest sector's current stabilised value creation logic following economies of scale and integration

The fourth phase, as indicated in Article I, represents the current stabilised business network and value creation logic of the Finnish pulp and paper industry (Figure 8). Structural changes in the Finnish business system due to critical events, such as the collapse of the Soviet Union, the Finnish recession, a shift to a free-market economy and EU membership, also caused structural changes in the forest industry companies at the turn of the 1980-90s. Massive reconfigurations in the business network and value creation logic occurred, because renewed competition legislation made the formal agreements of wood and chemical prices, and manufacturing and exporting quotas illegal. Thus, the previously powerful actors of co-operation organisations and financial institutions disappeared, or their roles changed. Even though formal agreements were illegal, state- and other organisation-led collaboration was still present, and the actors performing these activities are called stakeholders. The role of stakeholders includes different public and private interest groups: the public, consumers, banks, shareholders, NGOs and lobbying organisations. Central association, renamed as the Finnish Forest Industries Federation, transformed into a lobbyist and employers' association, but it maintained its strong role in advocating and reporting forest industry-related issues towards the state and the EU. Structural changes in the companies resulted in consolidations

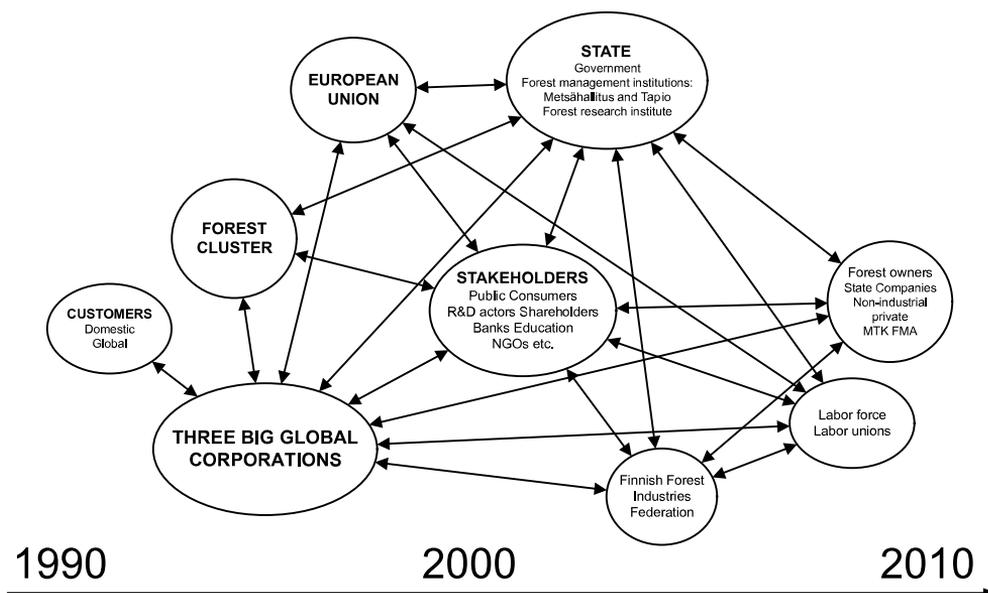


Figure 8. The Finnish pulp and paper industry's currently stabilised business network. The size and boldness of the font represent the power of that role: the bigger and bolder the font is, the more power the role has. Arrows represent relationships and interactions between roles. Double-headed lines are reciprocal, and one-directional arrows indicate parallel interaction. Source: Article I Laakkonen et al. 2022.

and three big global corporations (MNEs), UPM, Stora Enso and Metsä Group, became dominant actors, overtaking many of the activities performed by the disappeared actors.

There were also changes in resources and activities. Due to the globalisation of the industry, the MNEs had global manufacturing with lower raw material and manufacturing costs. The industry's manufacturing strategy followed the idea of more-of-the-same, where the manufactured products remained rather similar, but manufactured amounts increased. With the help of the forest cluster and its competence system, the Finnish forest sector had become an international leader in technology and one of the most modern and productive industrial sectors in the world. The introduction of economic, environmental and social sustainability through the concept of sustainable development, together with increasing environmental awareness of global consumers and customers, had a strong impact on the activities and value creation logic of the pulp and paper industry. The MNEs started to take sustainability issues seriously and see them as an essential part of value-creating activities and a means to create a competitive advantage. Thus, it can be said that the forest sector's value creation logic had stabilised as capital-intensive and natural-resource-based, where business logics of economies of scale and integration are followed (Article II).

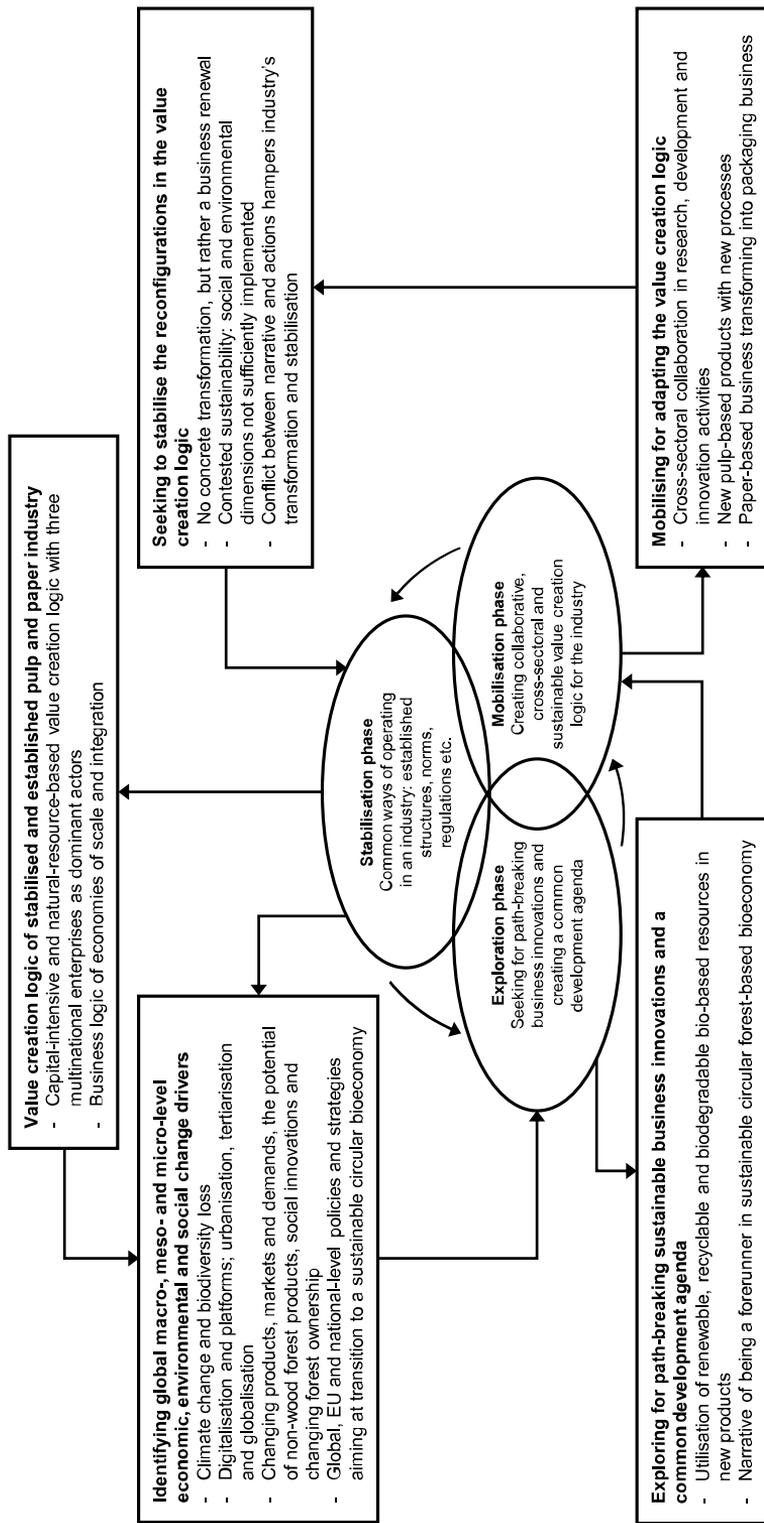


Figure 9. The pulp and paper industry's adapting value creation logic presented through the business environment transformation cycle framework. Arrows represent the direction of the transformation phases and the occurring adaptations in the industry's value creation logic due to identified conditioning change drivers originating from macro-, meso- and micro-levels. Source: Article II Laakkonen et al.

Currently occurring cross-sectoral sustainability adaptations in the forest sector's value creation logic

However, there are implications that the forest sector's business network and value creation logic are under pressure to change due to critical events occurring in the global business environment. Global macro-, meso- and micro-level economic, environmental and social change drivers are having an immense impact on the Finnish forest sector (Article II). Climate change and biodiversity loss are among the most influential global change drivers affecting the forest sector's value creation logic. Globalisation and digitalisation have affected the forest sector by changing the markets and demands for the sector's traditional products. In addition, the acknowledged potential of social innovations, non-wood forest products and services, and general tertiarisation create pressures to reconfigure the sector's traditional value creation logic. Similarly, changing forest ownership (Article II) and forest owners' different attitudes and perceptions towards changes (Article IV) are affecting the sector. The introduction of global, EU and national-level policies and strategies that aim at a transition to a sustainable circular bioeconomy are possibly transforming the forest sector and its value creation logic.

According to the findings of Article II, the Finnish pulp and paper industry has started to explore path-breaking sustainable business innovations to respond to the change drivers changing the business environment (Figure 9). In the industry's strategic narrative, these innovations are related to utilising renewable, recyclable and biodegradable bio-based resources in the manufacturing of products. Similarly, the industry has started to create a common development agenda to promote those innovations by having a strategic narrative of being a forerunner in sustainable circular forest-based bioeconomy. Thus, it can be said that an exploration phase has been initiated. The pulp and paper industry has started to adapt its value creation logic, and thus a mobilisation phase is in progress. According to the strategic narrative, the most significant adaptations in the value creation logic seem to be occurring in the key activities, because collaborative RDI activities have gained increased importance, along with manufacturing semi-finished B2B bulk products, which is one key activity in the traditional value creation logic. Each MNE has a slightly different strategy for operationalising the RDI activities. The MNEs are not collaborating with each other but the creation of collaborative coalitions between different actors from outside the traditional pulp and paper industry is central in all strategies. In addition, all MNEs have widened their product catalogue and started to manufacture new, sustainable, bio-based products with new processes. Many of the new products and processes are related to utilising pre- and post-manufacturing side-streams, such as sawdust or lignin, from the current processes, and thus approaches from the circular economy are introduced in the value creation logic. However, this has been enabled by manufacturing large amounts of traditional products, such as (market) pulp and different paper grades. In addition, the traditional paper-based business is transforming into a packaging business, because communication and writing papers are partly being substituted with different paperboard grades and packaging solutions.

All sustainability dimensions, economic, social and environmental, are considered in the pulp and paper industry's strategic narrative and adapting value creation logic, and the sustainable development goals (SDGs) of the United Nations (UN) are used to conceptualise sustainability. The economic dimension is emphasised as the industry creates economic value by utilising renewable wood from sustainably managed forests. Thus, as in the bioeconomy in general, natural resources are considered as the key resource for value creation. The creation of environmental value relates to mitigating climate change, maintaining

biodiversity and managing forests sustainably. The creation of social value covers issues such as leadership, work safety and community development.

Based on the findings of Article II, the pulp and paper industry has not gone through a concrete business transformation, but rather a business renewal. The adaptations in the value creation logic have not been radical and system-wide but rather aimed at stability and incremental changes in the existing value-creating network. The actors, resources and activities are to a large extent the same as in the traditional value creation logic introduced in Article I. The industry has sought to stabilise the incremental reconfigurations in the value creation logic, but it seems that the strategic sustainability narrative is not consistent with the actions. This has led to a conflict hampering both the sector's transformation and the stabilisation of the adapted value creation logic. The sustainability of the value-creating activities has especially been contested, as the environmental and social aspects are currently covered mainly only in the MNEs' communication activities and in many corporate responsibility initiatives; thus, it seems that holistic sustainability is not sufficiently implemented in the value creation logic. It remains debatable as to whether the value creation logic can be considered as following the ideas of strong and holistic sustainability, as the business case and creation of economic value are emphasised. Resolving these misfits related to the differing perceptions of the forest sector's and bioeconomy's sustainability between the actors within the forest sector, political decision-makers, different stakeholders and the general public will be of crucial importance if the sector wants to remain as a central actor in the new sustainable economic model aiming at creating common good.

Optional reconfigurations for the forest sector's future value creation logic

The third research question of this dissertation focuses on what kind of optional reconfigurations does the forest sector's value creation logic have in responding to the identified change drivers within the business environment. The findings of Articles III and IV indicate that the forestry service companies and forest owners seem to be ready to reconfigure their perspectives and value creation logic to respond to the change drivers originating from the business environment. The findings of Article III indicate that new types of forestry services with reconfigured value co-creation logic could be introduced to the forest sector. The change drivers within the business environment related to changing forest ownership and digitalisation, along with the theoretical implications of the increasing importance of collaboration and intangible resources for companies' value-creating activities, provide seeds for reconfiguring the mindsets of forestry service companies. The findings of Article IV indicate that forest owners and their climate change attitudes and readiness to change could act as drivers for optional reconfigurations in the forest sector's value co-creation logic, thus enabling, for example, the provisioning of novel forestry services and introducing new forest management practices.

Collaborative value co-creation in forestry services

In Article III, a potential new type of forest holding management service, forest leasing, with a focus on wood production, was used as a case to investigate whether new value creation logic of operating in a collaborative value network, where an integrator acts as an orchestrator, could be introduced to the forest sector. Due to changes in the business environment, the traditional forestry service mindset to maximise the amount of bought

timber, being a separate part of a value-adding chain and seeing forest owners merely as timber producers, might not be enough. For example, the changing forest ownership will result in changing objectives for owning and managing forests. Similarly, the forest owners' attitudes and behavioural intentions to change the forest management activities (Article IV) will have an impact on the future provisioning of forestry services.

The findings of Article III proposed two potential value networks for the forest leasing service, illustrating the key roles that are needed for organising the service (Figure 10). When analysing the networks through the ARA-framework, the actors in the value network are the integrator, forest owner, roundwood purchaser, forest management actors, forest management support actors, forest leasing service support actors, public expert organisations and portal. The integrator is either a tenant or a consultant, and its role in the network is to coordinate and manage the leasing service towards other actors. Key resources are mainly intangible, such as the competence of the actors. Expertise, know-how and professional skills related to the actor's own field of business and activities were seen as essential resources for value creation. Key activities are related to organising, planning and conducting the actual leasing activities, such as forest management and roundwood sales. In addition, interaction and information sharing between actors are important activities that enable linking the forest owner's and roundwood purchaser's objectives to the forest management and roundwood sales activities.

According to the findings, the forest leasing service's value creation logic would be based on a reliable long-term collaborative network (Table 3), which would guarantee professional and efficient wood production and openness of all forest management activities. The key attributes of the service would be an explicit long-term leasing contract, considering the objectives of both signing parties: the forest owner and the tenant. A digital system, or a portal, would work as an important channel for interaction and planning the leasing service and forest management activities together with up-to-date (digital) forest resource information. These findings highlight that digitalisation, and its possibilities, would be utilised when organising the leasing service. An interesting finding is that the leasing service could be operable with the existing forestry service actors, resources and activities with only minor adaptations. Thus, no major changes, for example, in the existing forestry service operations would be needed. The biggest reconfiguration would be needed in the mindset of how to operate as a part of a collaborative value network, where one's own intangible resources and assets are openly shared with others. Nevertheless, there seems to be a readiness for such new thinking, as the interviewees used words such as trust, openness and transparency while talking about business collaboration.

The findings in Article III also contribute to the sustainability of forestry services. Economic sustainability is especially highlighted, as operationalising the forest leasing service could enhance value creation from forests, compared to the current situation, because it could activate absentee forest owners to bring more forest holdings under efficient management and usage. In addition, the supply of forest-based services and other business opportunities could increase, and thus also contribute to social sustainability, as rural areas would gain more work possibilities. Nevertheless, the most interesting finding related to holistic sustainability and new value co-creation possibilities is that besides wood-production-related forest ecosystem services and ways of managing and using forests, other things could also be leased. The interviewees especially mentioned issues such as tourism, hunting, non-wood forest products, carbon sequestration and landscape leasing, as well as other nature-based services that do not necessarily exist or have a monetary value yet.

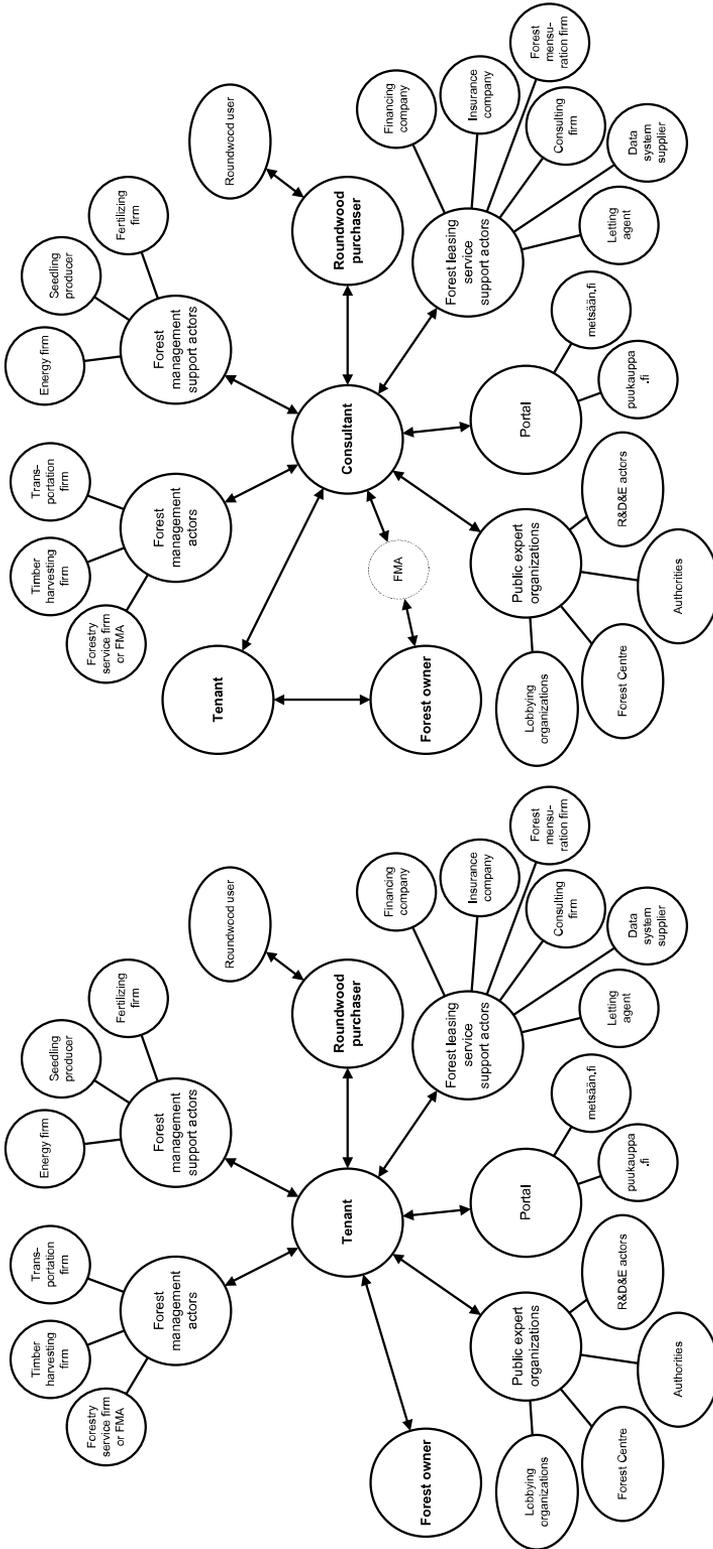


Figure 10. Two potential value networks of the forest leasing service. Left Tenant's and right Consultant's. Source: Article III Laakkonen et al. 2019.

Forest owners' climate attitudes and narratives imply a readiness to change and adopt new forest management practices

Even though, in Article IV the focus was on forest owners' climate change attitudes, the findings can provide seeds and perceptions for understanding what kind of attitudes forest owners could have on other environmental change drivers, such as biodiversity loss and sustainability, as these will have tremendous effects on forests and on the ways forests will be managed in the future. According to the findings of Article IV, forest owners have different opinions and perceptions related to climate change. Although most of the interviewed forest owners were aware of climate change, and the potential effects it could have on forests, they did not report a strong readiness to change their forest management behaviour due to climate change. There were also forest owners who reported having taken action in their forest management. This readiness for change was motivated more by objectives than concern over climate change. Monetary incentives, e.g., related to carbon capture was especially mentioned as a motivation to change behaviour. Many forest owners reported a deep trust in forest professionals for providing advice on how to manage forests, and thus the professionals' knowledge and attitudes can either support or hamper the forest owners' behavioural change. In general, forest owners' forest-management-related attitudes and behaviour were affected by actual observations of change in their forests combined with personal beliefs, social pressures, financial barriers and knowledge base.

To gain a more comprehensive understanding of forest owners' attitudes towards climate change within their own forests, the forest owners were divided into five positions based on their climate change narratives (Figure 11). The theory-based attitudinal positioning of forest owners was done according to forest owners' strength of belief regarding behavioural control (perceived control and subjective norms) and strength of belief towards climate change (cognitive and affective components) in their own forests. The five positions were pragmatists, purists, deniers, fatalists and ponderers. The pragmatists (A, D and H) can be sceptical or uncertain about climate change being a problem, but they might perform climate-change-responsive actions if they gain something from it, as a precaution, or to meet other forest management goals. The purists (E) change their behaviour and act because they are concerned about their forests due to climate change. The deniers (C) deny climate change as a phenomenon and the role of forests in it. The fatalists (I and J) are aware of and understand climate change as a problem and the role of forest management therein, however, they think that their actions do not matter in mitigating climate change. Between these rather extreme positions, there was an intermediate position of ponderers who were either unconcerned (B, F, G and L), as they are aware of climate change, but not sure whether it is a problem and thus they are passive; or concerned (K), as they are concerned about the effects of climate change to their forests but cannot choose how to respond.

These five attitudinal positions of forest owners' narratives on climate change could act as a base for understanding and finding those forest owners who would be more willing and ready to change their forest management behaviour according to the forest sector's reconfiguring value creation logic. For example, the provider of the forest leasing service (Article III) could utilise the attitudinal positioning when targeting the forest leasing service to the forest owner with the right kind of attitude. Similarly, the forest owners' deep trust in forest professionals' expertise in advising forest management should be considered when planning and operationalising sustainable forest management activities with the reconfigured value creation logic.

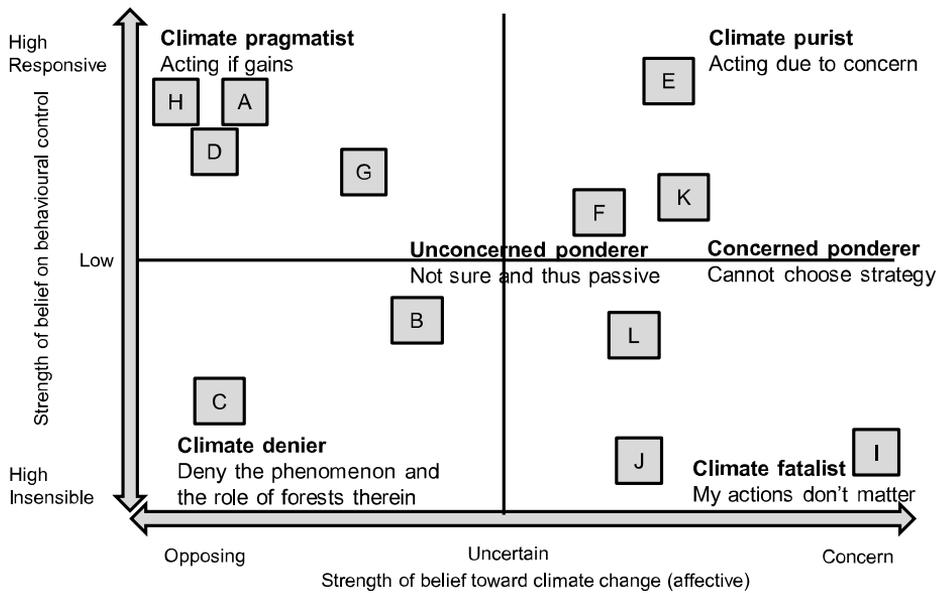


Figure 11. Forest owners' narratives on climate change according to theoretical orientations towards climate change in their own forests. Letter symbols in the picture depict an example forest owner. The positions are based on the qualitative interpretation of quotations translated from the interview data of the study. Source Article IV Laakkonen et al. 2018. See the article for more details and example quotations.

DISCUSSION

In this chapter, I will discuss the gained knowledge on the phenomenon introduced in the dissertation's research framework (Figure 1). The knowledge on the sustainability-related phenomenon was obtained from four individual studies, where the reconfiguring value co-creation logic of the forest sector was investigated from the meso level (pulp and paper industry) and the micro level (forestry service companies and forest owners). The findings are discussed and reflected to consider the whole forest-based sector at the macro level. First, I will discuss the main findings of the dissertation by providing answers to the research questions and the main objective. Second, I will give theoretical implications, and thus provide contributions to closing the identified research gaps related to the theoretical positioning of the dissertation: research on value co-creation logic. Third, I will provide managerial and political implications to give practical suggestions for business and political decision-makers when planning holistically sustainable business activities and policies within the forest sector. Last, I will evaluate the scientific quality of the dissertation and provide suggestions for future research.

Discussion on the main findings

The main findings of the dissertation are discussed by answering the three research questions; how the forest sector's value creation logic has previously adapted, how it is currently adapting and what kind of optional reconfigurations there might be. In addition, an answer to the main objective will be provided by discussing it through the empirical and theoretical findings on how the forest sector's value creation logic is changing due to a sustainable circular bioeconomy.

How has the forest sector's value creation logic previously adapted to meet the changes in the business environment?

The first research question of this dissertation was how the forest sector's value creation logic has previously adapted to meet the changes in the business environment. According to the findings, the forest sector has been able to reconfigure its value creation logic due to changes in the business environment. First, critical external and internal events occurring in the business environment have affected the forest sector's network and resulted in reconfigurations. Sometimes the sector has been proactive with the reconfigurations, for example, when it has been concerned about securing key resources, it has actively influenced the decision-makers and the establishment of forest management organisations. But most often the reconfigurations have happened out of necessity, for example, when the sector's sustainability had been contested, especially by the public and NGOs, it reluctantly adopted sustainability practices. Therefore, it can be said that the developments in the forest sector have been rather reactive, and adaptations have occurred after critical events, which demonstrates that the business network can be seen as an emergent structure (Håkansson and Snehota 1995). Similarly, the framework of change in business networks introduced by Halinen et al. (1999) is supported, because on the one hand, network inertia restrains change in the network, and on the other hand, critical events trigger a change in the network (Halinen et al. 1999).

Second, the maturity level of the sector has played an important role in reconfiguring the value creation logic. When the sector was still establishing itself, the changes were more proactive. After reaching maturity and being an established sector, the responses to changes became more reactive. This finding is in line with the notion that, in mature sectors, developments tend to be incremental and aim at maintaining the industry's established ways of operating and creating value (Prahalad and Bettis 1986; Möller et al. 2020). Reaching maturity has made the sector path-dependent and locked-in to chosen technologies, as stated also by, e.g., Näsi et al. (2001) and Luhas et al. (2019). In addition, after the forest sector had reached maturity, the role of institutions as both enablers and conditioners for the occurring developments increased, which is consistent with previous studies (North 1990; Matthyssens et al. 2013). Similarly, the sector has gained a strong institutional position within Finnish society, a finding that is in line with a previous study (Lamberg et al. 2017).

Third, the sector has always been concerned about securing its key resources of cheap raw materials, energy and labour with a varying focus; thus, ensuring the economic sustainability of business activities. As a capital-intensive, natural-resource-based industry (Andersen et al. 2018), it has made sense to secure the supply of raw materials. However, an interesting finding is that the importance of intangible resources of competence and relationships in the value creation logic has increased over time. The interactions and resource integration within the business network have especially enabled the construction of the forest cluster's competence system. This competence system has become a crucial factor in the competitive advantage of the forest sector, which highlights the role of actors' social capabilities (Tate and Bals 2018) and knowledge and expertise (Mouzas and Ford 2012) in the value creation logic.

Fourth, co-operational formal and informal activities and related actors have been important for the forest sector even though the companies were also competitors. During the first three development periods, the sector's actors co-operated through the whole production chain, from the forests to the mill sites and foreign markets. Similarly, co-operation was present in RDI activities, especially related to technological developments. This finding supports earlier studies stating that co-competition will have positive outcomes related to innovation, knowledge sharing, firm performance and relationships (Bengtsson and Raza-Ullah 2016). However, it contradicts with Guerrero and Hansen's (2018) review, where they state that cross-sector collaboration is difficult for the forest sector.

How is the forest sector's value creation logic currently adapting to the changes occurring in the business environment?

The second research question of this dissertation was how the forest sector's value creation logic is currently adapting to the changes occurring in the business environment. The findings indicate that the forest sector's value creation logic is incrementally adapting due to the economic, environmental and social change drivers originating from the business environment. First, it can be stated that the forest sector has indicated a readiness to reconfigure its value creation logic even though previous studies have noted that the sector's path-dependency and strong institutional position can hinder the reconfiguration (Lamberg et al. 2017; Luhas et al. 2019). However, the occurred adaptations in the value creation logic have been only incremental; thus, the sector is trying to sustain the traditional and stabilised capital-intensive value creation logic based on logics of economies of scale and integration, where renewable wood-based biomass is utilised for manufacturing B2B bulk-products in integrated mills.

Second, cross-sectoral collaboration in RDI activities is increasing within the sector, as the three MNEs are collaborating with other bioeconomy-related actors. This is an important development within the sector's strategic narrative and value creation logic, because cross-sectoral co-operation between business and non-business actors related to sustainability innovations is important. This has been acknowledged in previous studies considering the circular forest-based bioeconomy (Weiss et al. 2020; Guerrero and Hansen 2021) as well as other industrial sectors (Todeschini et al. 2020; Fontoura and Coelho 2022). Due to these RDI activities, the MNEs within the forest sector have started to manufacture new pulp-based products with new processes, where the pre- and post-manufacturing side-streams are especially utilised. This has been made possible by manufacturing large amounts of traditional products of pulp and paper. This finding is in line with two previous studies that have a different perspective on the new produce of the sector. The first study states that the future product portfolios of the sector's companies are expected to become more diversified with new and possibly more value-added products (Näyhä 2021), while the second study estimates that large parts of the sector's manufacturing might be lower value-added products (Hietala and Huovari 2017). The findings of this dissertation confirm the findings of both previous studies: the sector is increasingly manufacturing new and more value-added products with the help of traditional lower value-added products.

Third, even though sustainability is considered as an essential part of the forest sector's strategic narrative and value creation logic, it is especially contested by many stakeholders stating that the social and environmental dimensions are not sufficiently implemented and not consistent with activities. Despite that, the findings of this dissertation show that the sector is actively communicating its strategic sustainability narrative and vision of being a forerunner in a sustainable circular forest-based bioeconomy. In addition, the sector's MNEs have implemented corporate responsibility initiatives intending to increase environmental and social sustainability. This finding confronts the findings of previous studies contesting the sector's environmental and social sustainability (Lehtimäki et al. 2011; Myllylä and Takala 2011; Eyvindson et al. 2018; Temmes and Peck 2020; Gonzalez-Porras et al. 2021). In addition, the dissertation's findings indicate that, to some extent, the sector is starting to understand what holistically sustainable value co-creation means: sustainable value is co-created among different stakeholders also including natural ecosystems and society (Matthies et al. 2016; Evans et al. 2017; Tate and Bals 2018). However, the currently occurring incremental adaptations in the forest sector's value creation logic might not be enough for the needed transition to a sustainable circular bioeconomy. The scarce and limited biomass from forest ecosystems should be utilised in a cascading manner to the longest-lasting and highest-value products, while also recognising forest ecosystems' role in mitigating climate change and halting biodiversity loss.

What kind of optional reconfigurations does the forest sector's value creation logic have in responding to the identified change drivers within the business environment?

The third research question of this dissertation focused on what kind of optional reconfigurations does the forest sector's value creation logic have in responding to the identified change drivers within the business environment. The findings suggest that forestry companies are ready to offer forest management services with reconfigured value co-creation logic due to change drivers originating from the business environment. In addition, a portion of forest owners who would possibly be ready to use forest management services with the new value co-creation logic can be identified. First, new types of forestry services could be

introduced to the forest sector without major changes in the existing actors and forestry activities within the value-creating networks, thus merely alterations within the value creation logic and business model are needed. Reconfiguring the value creation logic to one that is sustainable, collaborative and cross-sectoral could lead to offering differentiated forestry services that would respond to the different customer needs and decision-making behaviour of different forest owners, which has been suggested in previous studies (Hujala et al. 2013; Häyrinen et al. 2017; Andersson and Keskitalo 2019; Snyder et al. 2019).

Second, changing forest ownership and digitalisation are among those identified change drivers that will cause optional reconfigurations in the forest sector's value creation logic. This finding supports previous studies on changing forest ownership (Viitala and Leppänen 2014; Weiss et al. 2019) and the impacts of digitalisation and digital platforms on the forest sector (Hetemäki and Hurmekoski 2016; Watanabe et al. 2017). However, probably the most influential change drivers causing reconfigurations in the value creation logic are related to sustainability and circular bioeconomy. The findings suggest that the provisioning of forestry services can be diversified to also include more than wood-production-related forest ecosystem services, such as maintenance and regulating services. In addition, it can meet the needs of those forest owners who are not happy with the current forestry services, as previous studies have pointed out that there is an increasing amount of these kinds of forest owners (Pynnönen et al. 2018; Takala et al. 2022). This notion widens the traditional perspective of forestry services and the forest sector to forest-based services and forest-based sector, where forest ecosystems as a whole are considered.

Third, the role of intangibles in the value creation logic will increase. The investigated potential forest leasing service indicated that considering intangible exchanges, that is serving each other with skills and knowledge, within the value-creating network might be the required potential reconfiguration that will make the forest sector's value creation logic holistically sustainable. This finding is in line with previous findings investigating the forest sector's strategies, stating that services and collaborative value co-creation by sharing information and knowledge are increasingly acknowledged (Pelli et al. 2017). According to strategic and network management theories, the intangible exchanges within value-creating networks both enable and enhance the collaborative and long-term activities, creating trust and transparency between actors (Allee 2003), while also operating as that little extra something that creates the novel added value in products or services (Kothandaraman and Wilson 2001; Allee 2008). This theory-based notion is consistent with the empirical findings of the investigated forest leasing service, stating that to be operable, the leasing service's value-creating network requires time, trust and collaborative activities between the actors. This finding has also been confirmed in another study investigating collaboration in forestry service and non-wood forest product companies (Hamunen et al. 2022).

Fourth, the forest owner's climate change attitude and readiness to change could act as an indicator for adopting forest management practices with the reconfigured value co-creation logic. Even though the findings indicate that forest owners are aware of climate change and its potential effect on forests, they are still not ready to change their forest management behaviour. This might be because they do not know how to adapt, as it has been pointed out in a previous study (Blennow and Persson 2009). However, the findings strongly suggest that one main reason for not adapting forest management practices is related to the forest owners' strong trust in forest professionals, which emphasises their important role in either supporting or hampering forest owners' behavioural changes. This supports previous studies acknowledging the forest professionals' role in affecting forest owners' decision-making

(Hujala et al. 2007, 2009; Hujala and Tikkanen 2008; André et al. 2017), for example when adopting more sustainable forest management practices.

Fifth, forest owners' have different perceptions and attitudes related to climate change, and based on those, forest owners can be divided into five attitudinal positions. These positions differ to some extent from different forest ownership types identified in previous studies (Karppinen et al. 2020; Koskela and Karppinen 2021); nevertheless, the positions identified in this study could guide the targeting of forest-based services and advice to forest owners with the right kind of attitude. For example, a new holistically sustainable forest-based service with some monetary compensation could be offered to pragmatists, as they seem to act if there is the possibility of gaining. This suggestion is in line with studies conducted in Norway and the USA, reporting that monetary compensation increases carbon program participation among forest owners (Håbesland et al. 2016; Latta et al. 2016; Khanal et al. 2017). In addition, purists, acting due to concern about their forests, or ponderers, not acting due to uncertainty or not knowing how to act, could be possible attitudinal positions to whom new kinds of forest-based services are targeted.

Sustainability perceptions in the forest sector's value creation logic over time

The main objective of this dissertation was how the value creation logic of the forest sector is changing when entering the sustainable circular forest-based bioeconomy. According to the findings, the forest sector's value creation logic is slowly and incrementally changing towards holistically sustainable, collaborative and cross-sectoral value co-creation logic. First, the forest-based sector has always tried to ensure **the economic sustainability** of its value-creating activities. Economic viability has been ensured by following the logics of economies of scale and scope, where efficient and large-scale manufacturing is practised. For the forest-based sector, being sustainable has always meant that the supply of wood-based raw materials is secured now and in the future. The constant flow of raw materials for the forest industry, which is considered as the forest-based sector's key actor, has been ensured by influencing the political decision-makers, forest-based service companies and forest owners by highlighting the importance of the whole forest-based sector to the Finnish economy and society. In addition, value-creating networks and collaboration have been important aspects in ensuring the forest-based sector's economic sustainability. Especially in the past, they were extremely important because all value-creating activities, from forests to manufacturing and selling abroad, as well as RDI activities, were done in collaboration with actors inside the forest sector and later in the forest cluster. Currently, cross-sectoral collaboration, especially in the forest industry's RDI activities, is gaining importance. In forest-based services, collaborative value-creating networks and value co-creation seems to be gaining a foothold as a new mindset for actors.

Second, since the 1990s **environmental sustainability** has become an important factor in the forest-based sector's value creation logic, especially due to the rising environmental awareness of stakeholders and the public. To a large extent, environmental sustainability has been implemented through sustainable forest management practices, with the main aim to secure the supply of wood-based raw material where, e.g., biodiversity-related issues have been 'the necessary evil' to consider. There have been many improvements in the sector's manufacturing processes, making them more environmentally friendly. Global change drivers, such as climate change and biodiversity loss, and current developments in the business environment, such as a transition to a sustainable circular bioeconomy, are putting

intense pressure on the forest-based sector to alter its thinking about environmentally sustainable value co-creation. To respond to these pressures, the sector has adopted a narrative of being a forerunner in sustainable circular forest-based bioeconomy. Similarly, the MNEs in the sector are increasingly implementing initiatives to increase the environmental sustainability of their operations. Furthermore, forest-based service companies and forest owners have an undeniably important role in ensuring the forest-based sector's environmentally sustainable value co-creation from forest ecosystems. Because forest-based service companies operate in forest ecosystems, their views on more diversified and holistically sustainable value co-creation are important. Thus, the finding that the forest leasing service could work as a way to manage forests for all forest ecosystem services is a promising development in the mindset of forest-based service companies. Forest owners own and control forest ecosystems and the tangible and intangible resources provided by them. Therefore, the finding that a portion of forest owners seem to be ready to adapt their forest management practices due to concern about their forests under a changing climate is encouraging.

Third, **social sustainability** has played an important part in the forest-based sector's value-creating activities in the past. Up until the Finnish independence, the forest industry companies had an important social role in the mill regions, because they were providing many social well-being-related issues, such as work, healthcare, accommodation and leisure-time activities, to the employees and their families, as well as the whole mill region. When the Finnish government took over many of these activities, the socially sustainable value-creation for the sector started to relate only to the provisioning of work opportunities in the rural regions and bringing tax money to the national economy. After the forest industry expanded its operations to the Global South, it faced, and is still facing, new social sustainability-related issues, which have not always been handled decently. However, it seems that the industry has learned its lesson, and currently the MNEs are implementing many social sustainability initiatives, where the local communities and indigenous people are involved, and their perspectives are considered in the decision-making. In Finland, the forest-based sector has long seen forest owners as needing to be advised on how to manage and utilise their forests. However, the findings of the dissertation are challenging this perspective. There are forest-based service companies that aim at creating services that meet the needs of the forest owners, and not only the forest industry, and there seems to be a portion of forest owners that are ready to adopt forest management services based on a new value co-creation logic.

For the forest-based sector, a natural-resource-based, capital-intensive industrial sector, it has made sense to secure the flow of tangible raw materials and the economic sustainability of value creation, because manufacturing products in mills ties up financial and produced capital and requires a great deal of natural capital, resulting in locked-in mechanisms. Similarly, RDI activities from an idea to technological demonstration to large-scale manufacturing with an investment decision, take a long time. In addition, there should be markets and demand for developed products before making large financial investments. Therefore, investments cannot be made within a short time span. Thus, it might seem that the forest-based sector is doing nothing to reconfigure its value creation logic.

The empirical findings suggest that the actors within the forest-based sector have made sense of the needed sustainability adaptations, while acknowledging that their behaviour and action will have impacts on the business environment (Breckler 1984; Ajzen 1991), and thus indicating a readiness to change their behaviour and actions. This can be seen in the MNEs' communication activities and many corporate responsibility initiatives related to increasing

environmental and social sustainability, the forest-based service companies' openness to offer forestry services with new collaborative value-creating activities, and the forest owners' readiness to adapt forest management practices according to the changing climate. On the one hand, the findings suggest that the forest-based sector, especially the forest industry, seems to lack the dynamic capabilities needed to sense occurring changes, seize the opportunities related to them and reconfigure operations to meet the changed needs (Teece 2007), because the industry has changed its value creation logic only out of necessity, and the same pattern can be seen currently as only incremental adaptations in the value creation logic have been made. But on the other hand, there are signs that the forest-based service companies do possess dynamic capabilities, due to an open mindset towards new forest-based services, which might affect the whole sector's value co-creation logic and value-creating networks. In previous studies, possessing the right kind of capabilities has been stated to be an important aspect of business transformations (Möller and Svahn 2009; Van Bockhaven and Matthyssens 2017). Nevertheless, the findings indicate only a behavioural intention to act, and thus it remains to be seen what the actions will be in the future. For example, the findings also suggest that the forest-based sector's strategic narrative of already being sustainable and a forerunner in bioeconomy, together with its strong global market position and historically strong role in the Finnish national economy, is hindering, and maybe even preventing, the actions and transformation of the sector and reconfiguration of the value co-creation logic.

Despite the forest-based sector is making adaptations in its value co-creation logic, the focus of sustainable business activities is still on the business case where economic shorter-term goals supersede the holistic longer-term sustainability objectives. Therefore, the theoretical findings of this dissertation suggest that in order to reconfigure the value creation logic to truly common, holistically sustainable, regenerative and cross-sectoral value co-creation logic, the creation of financial value for the company should be considered as contributions to regenerating and preserving the natural environment while enhancing the societal well-being. The change away from the traditional business case towards holistically sustainable and regenerative value co-creation logic has been suggested in previous studies (Dyllick and Muff 2016; Landrum 2018; Hahn and Tampe 2021). Similarly, value co-creation needs to happen in collaboration with all stakeholders (Möller and Rajala 2007; Lacoste 2016; Vargo and Lusch 2016) in a forest-based sector, where forest ecosystems and the resources they provide are also considered as capital and providing many different ecosystem services (Costanza et al. 1997). These issues are crucial for the forest-based sector to transition towards a circular bioeconomy.

Theoretical implications

Due to the theoretical positioning and interdisciplinary nature of this dissertation, it is difficult to provide theoretical implications related to each research tradition separately, because the theories and their concepts are intertwined. Therefore, first, the findings suggest that studying holistically sustainable value co-creation logic, value-creating networks and transition to a sustainable circular bioeconomy require extensions in actors', such as business and political decision-makers, and researchers' perspectives, where investigations are considered on different levels and conceptual frameworks are interdisciplinary. Most theories in the strategic management research stream take only a micro- and company-level perspective, where the company and its resources and capabilities are the focus of the

investigation. The perspective is that the company knows best how it can create value and a competitive advantage. The network management research stream widens the level of investigation to meso level by considering the value-creating networks, where value is co-created by network actors. To a large extent, both research streams neglect the non-business actors and natural ecosystems as someone to whom value is created. The findings suggest that to co-create holistically sustainable value, the level of investigation should be rethought: the sector and its value co-creation logic need to be considered. When all actors within a sector share the value co-creation logic, it creates more possibilities for co-creating value for the common good, for society and the planet, as no single actor would be the focus.

Second, interdisciplinary conceptual frameworks are needed in research. Perspectives from macro- and society-level transition studies are needed to understand how political decision-making, governance and strategy developments (Meyer 2017; Patterson et al. 2017; Markard et al. 2020; Rosenbloom et al. 2020) occurring in the business environment affect sustainable value co-creation logic. Meso- and network-level perspectives from network management studies are needed to understand how network structures, and relationships and interactions between actors (Håkansson and Snehota 1995, 2017; Möller and Svahn 2006; Möller and Rajala 2007) affect value creating-activities within sectors and in companies. Perspectives from strategic management studies are needed to understand how actors', individuals or companies, dynamic (Teece et al. 1997; Teece 2007) and social capabilities (Tate and Bals 2018), together with sustainable technologies (Hart 1995; Hart and Dowell 2011), contribute to co-creating economic, social and environmental value (Evans et al. 2017) and locally and globally competitive advantage (McDougall et al. 2019). In addition, psychological theories on behavioural change provide a micro- and actor-level perspective on individuals' attitudes and control beliefs and how they affect both the intention to act and actual actions and behaviour (Breckler 1984; Ajzen 1991).

Third, the change and extension in the perspectives will result in redefining the conceptualisation of the SET-system layer to also include environmental aspects; thus, it is defined as a socio-economic-technological-environmental (SETE) system layer. The developments within the nested and dynamic business environment, together with change drivers, will affect all four layers of the business environment. From micro-level daily activities at the actor layer to meso-level innovations and governance at the focal ecosystem and business field layers, and to macro-level global institutional arrangements, strategies and initiatives at the SETE-system layer. Because the economy and society are embedded in nature, and different systems are highly intertwined (Folke et al. 2016; Dasgupta 2021), the perspective on sustainable value co-creation should shift towards creating value and benefits for the common good: society, the planet and the economy (Dyllick and Muff 2016). On top of everything else, the utilisation, management and sourcing of natural resources require implementation that considers all sustainability dimensions in the manner that consequences for the natural ecosystems are minimised. This has already been suggested in previous studies relating to forest-based ecosystems and resources (Eyvindson et al. 2018; Pukkala 2021) as well as in other natural ecosystems (Neri et al. 2019; Kastner et al. 2021).

Fourth, for the network management research stream, the findings suggest that in order to investigate holistically sustainable value co-creation and related value-creating networks, all dimensions of sustainability need to be considered. Traditionally, investigations on the sustainability of networks and supply chains consider economic, economic and environmental, or economic and social aspects (Lacoste 2016; Lähinen et al. 2016; Gliedt et al. 2018; Keränen et al. 2021). In addition, the findings suggest that the ARA-framework (Håkansson and Snehota 1995) and value network analysis (Allee 2008) can offer scientific

and practical perspectives for analysing value co-creating activities within value-creating networks. The ARA-framework captures the most important theoretical concepts for analysing real-life business cases, where actors perform resource integrating activities through reciprocal interactions in dynamic networks. Value network analysis helps in mapping and visualising how actors exchange tangible and intangible value and how this value is converted, realised and co-created by actors in value-creating networks. The ARA-framework and value network analysis enhanced the creation of new scientific knowledge in forest economics by acknowledging the role of tangible and intangible resources (Vargo et al. 2008; Löbner 2013), relationships and interactions in resource integration (Håkansson and Snehota 1995), and the importance of economic, environmental and social actors (Bondeli et al. 2018) in holistically sustainable value co-creation in the forest-based sector. The notion of intangibles, as a resource and an activity, have an especially essential role in value co-creation and conversion. As a resource, they are the capabilities with what sustainable value is co-created. As an activity, intangibles are the non-contractual extras, with which actors can create ideas, visions and narratives that are needed in constructing common, sustainable and cross-sectoral value co-creation logic.

Fifth, for the strategic management research stream, the findings suggest that extensions to the concept of value are needed to meet the needs of holistic sustainability. According to the findings, the value-in-use and value-in-context (Lusch and Vargo 2014) seem to be neglecting the temporal dimension of value co-creation related to operations in the forest-based sector, especially in forest-based services, where it is typical to deal with longer-time horizons than merely living in the present. Services related to forest management especially need a re-conceptualisation of value co-creation to consider the immediate value and benefits as well as the perceived and promised value of the future. In addition, the forest-based sector should extend the perception of value to a sustainable (Hart and Milstein 2003; Evans et al. 2017) and a system value (Dyllick and Muff 2016; Elkington 2020), where business activities are tools to achieve financial value and societal well-being, while preserving, protecting and regenerating natural ecosystems. This notion acknowledges that the value offered by and derived from natural ecosystems is only potential, and thus it is realised and/or destroyed by actors in their value-co-creating and resource-integrating processes, creating a positive or negative value-in-impact in the form of trade-offs (Matthies et al. 2016). Therefore, in the circular bioeconomy, the complexities and positive and negative trade-offs related to sustainability, and operating with natural ecosystems and resources, should be addressed more thoroughly, as it has been suggested in a previous study (Viaggi et al. 2021). Natural resources are different from tangible produced and intangible human resources. Although they are renewable, they are limited, and utilising them depletes ecosystems and affects them in good (e.g., increased financial and human well-being) and bad (e.g., biodiversity loss, carbon emissions) ways. Thus, to reach holistic sustainability, a balance should be found, where human activities are within the planetary boundaries and limits of ecosystems.

Sixth, for the strategic management research stream, the findings suggest that extensions and re-conceptualisations on how resources, assets and capabilities are comprehended within the resource-based view (Barney 1991), the natural resource-based view (Hart 1995; Hart and Dowell 2011; McDougall et al. 2019), and the social resource-based view (Tate and Bals 2018) of the firm, as well as in the dynamic capabilities framework (Teece et al. 1997; Teece 2007), are needed when transitioning to a sustainable circular bioeconomy. Theoretical findings suggest that to reach holistic sustainability, extra-financial capital, assets and resources, and the value derived from them, need to be acknowledged and captured in financial accounting. Nature should especially be considered, not only as a resource base but

as a capital and offering means for co-creating value for the common good, as has been pointed out by ecological economists (Costanza et al. 1997, 2017; Daily 1997). Ecological economics note that different capitals are nested, because the built (or produced) and human capital, that is the economy, are embedded within the social capital, that is the society; both are embedded in the natural capital, that is the biotic and abiotic nature (Costanza et al. 1997). The interaction between these capitals, together with the help of ecosystem services, creates human well-being (Costanza et al. 2017). Therefore, ecosystem services should be considered as assets and resources creating flows of ecosystem services providing value and benefits (MA 2005; Haines-Young and Potschin 2018) to the SETE-system, business sectors and companies to be utilised in their sustainable, value-creating activities. Sectors and companies operating with natural resources, such as the forest-based sector, are especially in a central role in sustainability transitions, and thus adopting this perspective can create many sustainable business opportunities in the future. In addition, social and human capital deserve more attention in the sustainable, value-creating activities. They are also intangible assets and resources (e.g., knowledge and competence) of an actor, and the actor's capability to exchange and convert tangible and intangible value flows is an essential part of value creation, as has been stated by Allee (Allee 2003, 2008). For example, in the forest-based sector, if a company is capable of utilising its knowledge in combining and considering the differing needs of forest owners (the provider of the biomass), the forest industry (the upgrader of the biomass) and customers (the utiliser of the biomass) in service provisioning, competitive advantage and sustainable value can be co-created. This implication is in line with a previous study pointing out that intangible and human-related resources are an important factor in the forest sector's transition to a circular bioeconomy (Näyhä 2020).

Seventh, for the psychological theories on behavioural change, the findings suggest that the theory of planned behaviour and tripartite model of attitudes could also be utilised when investigating the attitudes and behaviour of a whole sector, not only an individual. In the context of the forest sector, the attitudes and behaviour of individual actors has been studied related to, e.g., forest owners' forest management related decision-making (Belin et al. 2005; Nordlund and Westin 2011; Thompson and Hansen 2013; Karppinen and Berghäll 2015), public actors perceptions towards using wood in construction (Franzini et al. 2023) and young people's participation in forest policy development (Hujala et al. 2021). However, to achieve a sustainability transition a more systemic approach is needed where many different actors and relationships and interactions between them are considered. Investigating only the attitudes and behaviour of individual actors at the micro level might not be enough. The meso and business field level attitudes and behaviour should be considered to understand what kind of attitudes and control beliefs a larger group of actors have on reconfiguring activities. Therefore, the findings suggest that the forest-based sector could be considered as an actor possessing attitudes on the transition to circular bioeconomy and sustainable value co-creation logic as well as having certain control beliefs over the business environment.

Managerial and political implications

The findings of this dissertation provide managerial and political implications for the traditional forest sector on how to meet the requirements of the changing business environment, adapt to the changes in the utilisation of forest ecosystems and forest-based resources, and seize the opportunities arising from the emerging sustainable circular bioeconomy and new sustainable products, services and solutions. First, the conception of

the forest sector needs to be reconfigured. To start with, it should be a forest-based sector that also includes companies and other actors that interface with or utilise raw materials and side streams from the forest sector, as it has been suggested by Näyhä (Näyhä 2019). This allows for a more comprehensive perspective on everything forest ecosystems have to offer to the whole of creation, being it humankind, plant kingdom or animal kingdom. The offering is not only provision of biomass for producing materials, energy or nutrition, but also the maintenance and regulation of water flows, ecosystems and climate, and even providing social and cultural values in the forms of recreation, health and mental wellbeing. Thus, it should be considered as a sustainable circular forest-based bioeconomy comprising of traditional forest industry (pulp, paper and wood processing industries), energy and chemical industries as well as unconventional industries and sectors, such as natural product, food, tourism and medical industries and other sectors offering solutions based on forest-based tangible and intangible resources. Similarly, the wider and more comprehensive perspective of the forest sector creates conditions for a cross-sectoral mindset and collaboration between actors.

Second, continuing from the first implication, managers and political decision-makers need to consider the whole forest ecosystem as capital and a resource base from where value and benefits for the common good are co-created. The traditional approach to forests where the amount of wood-based biomass is maximised and the forest owners are seen merely as biomass producers might not be enough in the sustainable circular bioeconomy. Therefore, adopting an ecosystem services approach can advance social and environmental well-being and help the forest-based sector and companies in co-creating sustainable and resilient business activities. Thinking business and political activities through the three service flows of provisioning (e.g., nutrition, materials and energy), regulating and maintenance (e.g., of climate, biodiversity and water flow) and cultural (e.g., experimental, intellectual and spiritual interactions with forests) services make it possible to systematically investigate different values and benefits obtained from forest ecosystems. In practice, this could mean, for example, that different uses of forests are integrated into the same forest management plan through, e.g., wood production, recreation and nature and biodiversity protection. Each actor experiences the value and benefits created differently and from a different perspective. Forest owners benefit from wood production and personal recreation, the forest industry benefits from wood production, the general public benefit from the recreation, and society and the planet benefit from the nature and biodiversity protection. From a policy and strategy point of view, it seems that the ecosystem services approach is acknowledged (EC 2018, 2021; Palahí et al. 2020; Winkel et al. 2022), and thus the forest-based sector should also adopt it.

Third, if the forest-based sector wants to truly co-create holistically sustainable value in a circular forest-based bioeconomy, it needs to acknowledge and take into account the perspectives of all actors at different levels. According to the findings, the perspectives of forest owners, forest-based service providers, and the forest industry should especially be considered. Similarly, their readiness to change and adopt new ideas will be of crucial importance when reconfiguring the sector's value co-creation logic. For the forest industry and forest-based service companies, the sustainable circular forest-based bioeconomy offers many versatile collaborative and cross-sectoral business opportunities related to different forest ecosystem services. However, the biggest change in the mindset of the forest-based sector is probably required on the perspective of how forest owners are seen. Forest owners should be seen as active actors taking part in sustainability transitions, because they are the ones making decisions related to how forest ecosystems are managed and utilised in the

continuously changing business environment. Similarly, they are not a homogenous group of actors having similar ideas and perspectives, and thus it is important to consider the different attitudes related to sustainability transitions and the readiness to be involved in it. Political and business activities need to therefore be correctly targeted to the suitable attitudinal position of a forest owner, as has been suggested in this study and in many others (Pynnönen et al. 2018; Karppinen et al. 2020; Koskela and Karppinen 2021; Takala et al. 2022), to make sure that a forest owner feels that one's objectives are met. In addition, it is important to remember that forest owners have a considerable trust in forestry professionals and experts and on their advice as to how forest ecosystems should be managed; therefore, it is crucial to also include the forestry professionals and experts in the discussions and decision-making processes related to the forest-based sector's holistically sustainable value co-creation logic.

Fourth, to successfully reconfigure the value co-creation logic, managers and political decision-makers should acknowledge the importance of operating as a part of a value-creating network, where actors co-create value by performing resource-integrating activities. If the decision-makers understand who the key actors are, what kind of resources they possess and what kind of value-creating activities they perform, they can help the forest-based sector, the companies as well as the political actors, to co-create holistically sustainable value for society, the planet and the economy. Here, the value network analysis (Allee 2008) and the ARA-framework (Håkansson and Snehota 1995) can offer tools for actors to map, visualise and analyse value co-creation and conversion in the value-creating networks. In addition, collaborating with other actors within and outside their own sector, for example in RDI activities, can enable the creation and sharing of knowledge and competence. Involving and considering a broader range of stakeholders in business activities would help companies in supporting the construction of a sustainable value co-creation logic that produces holistically sustainable and radical innovations. Suppliers, customers and end-users should all be involved in the sustainable value co-creating activities, as suggested before by Lacoste (Lacoste 2016), to ensure the holistic sustainability of the whole supply chain. Similarly, it is important to understand the wider network and external environment and what kind of sustainability and responsibility-related expectations markets and society put on the forest-based sector, as has been pointed out in previous studies (Ranacher et al. 2017; Näyhä 2020). Equally important is to acknowledge that addressing sustainability issues in business activities can create tensions within the value-creating networks and between actors. In a previous study, it was noticed that this is especially applicable when the network is complex and actors have differing values and goals (Tura et al. 2019). Therefore, especially in purposeful strategic value networks actors should be aware of the objectives and goals of the network. This is also applicable in the more extensive value-creating networks, where a common understanding of holistic sustainability aspects should be created with an even wider group of versatile actors, because a single actor cannot determine sustainability alone. Creating a common understanding can help in avoiding conflicts, gain better societal acceptance, and increase the long-term resilience of business and political activities.

Fifth, it could be beneficial for the forest-based sector actors and political decision-makers to practise strategic foresight (Heger and Rohrbeck 2012; Vecchiato 2012) to actively prepare for changes in the business environment. Strategic foresight can help actors to create understandings and perceptions of different types of futures, the opportunities they provide and to be prepared for those opportunities and the needs of future society. Similarly, strategic foresight can be considered as a company's or sector's dynamic capability (Teece 2007; Ferngani 2022). When strategic foresight is considered as a dynamic capability, changes in the business environment are actively interpreted, possible futures based on these changes

are outlined and evaluated, and most importantly, the information from these futures for creating competitive advantage is utilised (Fergnani 2022). Being open to the change signals and opportunities originating from the business environment can help companies and sectors to alter their business activities in advance and thus be the “future-fittest” (Hansen et al. 2020).

Evaluation of the scientific quality and suggestions for future research

Following a qualitative research design brings about challenges related to evaluating the quality of the conducted research. Evaluating the quality of research has two general characteristics: first, how strong the links between the empirical and theoretical domains are, and second, how well the creation of these links, resulting from the interplay between the chosen theoretical, empirical and methodological approaches, are described and reflected (Dubois and Gibbert 2010; Dubois and Gadde 2014). The research processes of the individual studies have been described in detail in the corresponding articles. Considering the dissertation, the qualitative research approach worked well with the chosen research framework, as the purpose was to create understandings of and interpret the phenomena altering the forest sector’s value creation logic in the changing business environment. The case study research strategy, with abductive and retroductive reasoning logic, allowed the creation of new knowledge and different perspectives to investigate the forest sector from different levels. In this dissertation, the case, the reconfiguring value creation logic in the Finnish forest sector, acted as an empirical real-life subject that was investigated in its own context through theoretical and conceptual frameworks (Siggelkow 2007; Piekkari et al. 2009; Thomas and Myers 2015). Due to the non-linear, iterative and long-term research process, the abductive (Dubois and Gadde 2002) and retroductive (Fletcher 2017) reasoning logics were suitable. The conceptual framework of the dissertation evolved along the empirical observations, resulting in modifying and rejecting theory-based observations due to conflicting empirical observations (Dubois and Gadde 2002; Dubois and Gibbert 2010). Similarly, in the dissertation, social relations and structures causing events to happen in the business environment were identified (Fletcher 2017), resulting in re-conceptualising the new theoretical knowledge (Vincent and O’Mahoney 2018). The chosen research design was especially suitable because the philosophical position of critical realism acknowledges that knowledge production is theory-laden or -dependent, but theories can be fallible, and thus our knowledge of reality can be false (Fletcher 2017; Piekkari and Welch 2018).

The data for the individual articles were collected with two kinds of methods, document selection and interviews, and the data analysis methods followed the ideas from qualitative theory-driven content analysis. The collected data and applied analysis methods both enabled creating theoretical and empirical understandings of and knowledge on the forest sector’s reconfiguring value creation logic. Context-specific documents allowed the identification of past (Article I) and current (Article II) developments within the sector’s meso-level value creation logic. The scientific quality and validity were ensured by conducting triangulations of data, where the selected secondary data consisted of many different types of documents (Article I), investigators, where authors discussed and cross-checked the interpretations and reflections derived from the data (Article I and II), and theories, where theories from different research streams were utilised in explaining and interpreting the case (Article II) (Stake 1995; Eriksson and Kovalainen 2016). Interviews enabled gaining in-depth knowledge and micro-level actor perspectives on the possible future value creation logic in forest-based services

(Article III) and the forest owner's attitudes and readiness to respond to these possible changes (Article IV). The number of interviewees in Article III (12) and Article IV (20) was relatively small but comparable with qualitative studies in general; thus, the findings of both articles should be considered as examples rather than representative results. However, as the purpose of this qualitative dissertation is to gain understandings of the investigated phenomena, the results do not need to be statistically representative (Eriksson and Kovalainen 2016). The theory-driven content analysis methods applied in all individual articles contributed to theoretically and conceptually framing the empirical findings of the reconfiguring value creation logic (Article I, II and III) and the forest owners' understandings and attitudes towards climate change (Article IV) in the context of the forest sector.

Some suggestions for future research can be made. First, it would be worthwhile to study the value capture-related aspects, that is the financial and revenue aspects, when companies' value co-creation logic is based on holistic sustainability: how a company can contribute to preserving and regenerating the natural environment and enhancing societal well-being while creating financial value. Second, it would be interesting to investigate holistically sustainable business activities based on forest ecosystem services and how to enhance the well-being of the ecosystem, the planet and society through business activities. Especially interesting would be not to only acknowledge the obvious provisioning of forest-based biomass for material, nutrition and energy but also to investigate how value can be created and captured with regulating and maintenance services as well as cultural services.

Third, as the leasing service has been introduced to the Finnish market by two companies at present, it would be interesting to examine whether their business model and value creation logic follows the one identified in Article III. If so, does the collaborative value creation logic work in real life and are the value network's roles and value exchanges similar to those identified in the study? In addition, extending the leasing service to other ecosystem services would be worthwhile to study. Fourth, it would be intriguing to conduct a follow-up study, with the forest owners interviewed in Article IV. It has been nearly ten years since the interviews, and climate change, biodiversity loss and other sustainability issues have gained increasingly more attention in policy, business and public since then. Would the attitudes and readiness to change be the same? Would the forest owners have noticed some changes in the forests? Would the attitudinal positions be the same? Fifth, related to all the previous points, it would be important to investigate the provisioning and offering of forest-based services following a holistically sustainable value co-creation logic to forest owners, because especially in Finland, the forest owners have a crucial role in deciding how forest ecosystems will be managed now and in the future.

CONCLUSIONS: THE FOREST-BASED SECTOR'S HOLISTICALLY SUSTAINABLE WAY FORWARD

To meet the demands of the even more dynamic, complex and volatile global business environment where critical events, sometimes sudden and unexpected, have unpredictable impacts on companies, sectors and whole SETE-systems, the forest-based sector should be more flexible, agile and ready to alter its networks and value co-creation logic. The global climate emergency, together with accelerating biodiversity loss, are examples of critical events that require urgent actions in the global SETE-system. The IPCC's report (IPCC 2022) recognises the interdependencies between climate, ecosystems and human societies, meaning that changes in one will have impacts on the other; thus, measures taken to adapt to climate change require interdisciplinarity, where natural, ecological, social and economic sciences and perspectives are integrated. In addition, the UN's Convention on Biological Diversity (CBD), as well as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), are both calling for immediate actions to conserve and restore biodiversity and different ecosystems with activities that understand the diverse values of nature, while also ensuring the equity, social inclusion and well-being of people and societies (Secretariat of the Convention on Biological Diversity 2020; CBD 2022; IPBES 2022). Similar developments are also seen to be evolving at the European level (Palahí et al. 2020) and in Finland (Pouta et al. 2023). It is also very likely that there will be even more unexpected events, such as the Covid-19 pandemic or the war between Russia and Ukraine, and the following financial sanctions by the EU and USA and the energy crisis, that will continue to affect the whole world where some business sectors, nations and regions will be losers and some winners.

To really make just and sustainable transitions and reconfigure value creation logic towards truly common, holistically sustainable, regenerative and cross-sectoral value co-creation logic, the concept and perception of sustainability needs redefining. The traditional sustainability framework of the triple bottom line, where the aim is to balance the three dimensions and the focus of value-creating activities, is on the business case leading to weak sustainability needs to be changed to holistic sustainability, where the three dimensions are nested, and the focus of value-creating activities is on creating common good leading to holistic sustainability (Dyllick and Muff 2016; Landrum 2018). Thus, it is suggested to adopt a system view on business sustainability, where instead of only looking at the business case and one company, the perspective is on the whole sector and how it could enhance holistic business sustainability at a system level; thus, value co-creation logic is more like a system logic leading to regenerative business strategies (Hahn and Tampe 2021), where the viability and resilience of natural ecosystems comes first. In addition, the perspectives on and order of sustainability strategies (Grunwald 2020) need to be reconsidered. First, the satisfaction of needs should be achieved by consuming and producing less, thus following the sufficiency strategy. Here, continuous quantitative growth and material prosperity are replaced with qualitative growth and development objectives and post-material values of solidarity, community and functional ecosystems. Second, renewable bio-based materials should be used according to the principles of circular economy, thus following the eco-effectiveness or consistency strategy. Here, ecologically harmful material flows are replaced with more environmentally friendly material flows and resource use to make quantitative reductions on, e.g., pollution, while reaching also qualitative improvements. Lastly, the materials that are taken into use should be used as efficiently as possible, thus following the eco-efficiency

strategy. Here the aim is to utilise the lowest possible amounts and losses of materials and energy in producing products and services with the help of new or improved technologies and processes while continuing quantitative growth.

Therefore, to meet the growing global demand for holistically sustainable and just solutions, the forest-based sector and its companies need to alter and abandon their over-consumptive and destructive value creation logic and enter a holistically sustainable circular bioeconomy, a development that has been suggested for many sectors in previous studies (Fritsche and Rösch 2020; Bocken and Short 2021). They need to develop radically new cross-sectoral innovations that respect the environmental boundaries and consider the social impacts of the business activities. The solutions need to tackle the global challenges on a large-scale but consider the local environmental and social context and ensure local security of supply. In addition, the global and local value-creating networks and supply chains should be transparent and beneficial to all actors. All of this should be done on a rather short timescale.

The possible future developments and reconfigurations on the forest-based sector's value co-creation logic and value-creating networks might follow the historical developments and pathways, as I have concluded in Article I. Will the reconfigurations result in an emergence of a new forest-based business sector with innovative outsider entrepreneurs (first phase)? Will the reconfigurations be incremental, where new raw materials and products substitute old fossil-based raw materials and products (second phase)? Will there be more collaboration with other business sectors by creating new value-creating networks (third phase)? Will the sector's established large companies go through structural changes and rearrange their operations (fourth phase)? I would like to conclude my dissertation by stating that whether or not the reconfigurations in the forest-based sector's value co-creation logic and networks will result in something that has been previously seen or something totally new, the reconfigured common, holistically sustainable, regenerative and cross-sectoral value co-creation logic should consider value-creating business activities as a means to achieve societal well-being while preserving, protecting and regenerating natural ecosystems.

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