ENABLING BIOECONOMY RELATED NEW BUSINESS DEVELOPMENT IN CENTRAL FINLAND

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Master's Thesis
March 2015

International Business Management Degree Programme
School of Business and Services Management

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Description

Author	Type of publication	Date
Poranen, Nina	Master's thesis	09.03.2015
		Language of publication: English
	Number of pages: 109	Permission for web publication: x

Title of publication

ENABLING BIOECONOMY RELATED NEW BUSINESS DEVELOPMENT IN CENTRAL FINLAND

Degree programme

Master's Degree Programme in International Business Management

Tutor

Akpinar, Murat

Assigned by

JAMK Centre for Competitiveness

Abstract

In May 2014, the Ministry of Employment and the Economy published the Bioeconomy Strategy of Finland. The strategy highlights the importance of bioeconomy for the overall economy of the nation, currently representing a yearly revenue of 60 billion euro, 16% of the GNP. The strategy aims at increasing the bioeconomy output to 100 billion euro by the year 2025 and the creation of 100 000 new jobs. On the contrary, the manufacturing industry has been decreasing heavily, many jobs have been lost, and the forest sector is in need of a renewal and a structural transformation. The need for new business development is evident.

The aim of the research was to find ways to enhance new business development. The research context was the bioeconomy of Central Finland. The research phenomenon was addressed by a qualitative case study approach. The Gap Model (Lindqvist, Ketels and Sölvell 2013) was applied as the main theoretical framework. This allowed the identification of regional innovation gaps in relation to companies, government, public agencies, research centers, educational institutions, capital providers, and other clusters and global market. Fourteen region relevant bioeconomy experts were interviewed for the research.

The research suggests that the overall forest sector value chain related skills and knowledge are the main strength for the regional bioeconomy. Lack of early stage financing was seen as the biggest obstacle. The research results show that the organizations in the regions should share ideas more openly, network across regional borders, and focus heavier on customers and markets. Several organization specific practical implementations were also recommended. The recommendations encourage, for example, the government to enhance the bioeconomy brand of Finland, companies to focus on positive mindset, opportunity recognition, and high value products, educational institutions to cooperate more effectively with each other, research centers to enhance commercialization of research results, and public agencies to initiate common bioeconomy vision for the region. Several future research avenues, such as the identification of concrete products, services and business models, were also recognized. In addition, a regional cluster map was presented and an extension of the Gap Model was suggested.

Keywords/tags (subjects)

bioeconomy, cluster, collective business development, internationalization, Central Finland

Miscellaneous

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Kuvailulehti

Tekijä	Julkaisun laji	Päivämäärä
Poranen, Nina	Opinnäytetyö	9.3.2015
	Sivumäärä 109	Julkaisun kieli Englanti
		Verkkojulkaisulupa myönnetty: x

Työn nimi
Enabling bioeconomy related new business development in Central Finland

Koulutusohjelma
Master's Degree Programme in International Business Management

Työn ohjaaja
Akpinar, Murat

Toimeksiantaja
JAMK Centre for Competitiveness

Tiivistelmä

Toukokuussa 2014 Työ- ja elinkeinoministeriö julkaisi Suomen biotalousstrategian. Strategia korostaa biotalouden merkitystä koko Suomen taloudelle. Biotalous edustaa nykyisellään 60 miljardin vuosituotosta eli noin 16% BKT:sta. Strategian tavoitteena on kasvattaa vuotuinen tuotos 100 miljardiin ja luoda samalla 100 000 uutta työpaikkaa. Samanaikaisesti valmistava teollisuus on vähentynyt voimakkaasti, lukuisia työpaikkoja on menetetty ja metsäteollisuus on uudistumisen ja rakenteellisen muutoksen edessä. Uuden liiketoiminnan syntymiselle on ilmeinen tarve.

Tutkimuksen tavoitteena oli löytää keinoja uuden liiketoiminnan syntymisen tehostamiseksi. Tutkimuksen kontekstina oli Keski-Suomen biotalous. Tutkimus toteutettiin kvalitatiivisena tapaustutkimuksena. Tutkimuksen analysoinnissa hyödynnettiin The Gap Model -mallia (Lindqvist, Ketels ja Sölvell 2013). Mallin avulla tunnistettiin alueellisia innovaatioaukkoja eri organisaatioiden, kuten yritysten, julkisten toimijoiden, tutkimuslaitosten, koulutuslaitosten, rahoittajien, toisten klusterien ja maailman markkinoiden välillä. Tutkimusta varten haastateltiin neljätoista alueelle merkittävää biotalousasiantuntijaa.

Saadut tulokset osoittavat, että metsäsektorin koko arvoverkkoon liittyvät tiedot ja osaaminen ovat alueen biotalouden merkittävin vahvuus. Ensivaiheen rahoituksen puute nähtiin merkittävimpänä puutteena. Tutkimus osoitti myös, että alueen organisaatioiden pitäisi jakaa ideoita avoimemmin, verkostoitua myös alueen ulkopuolelle sekä keskittyä entistä enemmän asiakas- ja markkinalähtöisyyteen. Tutkimuksen perusteella annettiin useita toimijakohtaisia toimenpide-ehdotuksia, joiden mukaan esimerkiksi hallituksen tulisi vahvistaa Suomen biotalousimagoa. Yrityksiltä kaivataan myönteisempää asennetta ja keskittymistä mahdollisuuksien arvioimiseen sekä korkean lisäarvon tuotteisiin. Koulutuslaitosten tulisi lisätä yhteistyötä toisten koulutuslaitosten kanssa, tutkimuslaitosten tulisi vahvistaa tulosten kaupallistamista ja julkisten toimijoiden tulisi kutsua eri biotalouden toimijat yhteen alueen yhteisen biotalousstrategian luomiseksi. Jatkotutkimukseksi ehdotettiin mm. konkreettisten tuotteiden, palvelujen ja liiketoimintamallien tunnistamista. Lisäksi tutkimuksen aikana syntyi kuvaaja Keski-Suomen biotalousklusterille ja The Gap Model –mallia ehdotettiin laajennettavaksi.

Avainsanat (asiasanat)
Biotalous, klusteri, kollektiivinen liiketoiminnan rakentaminen, kansainvälistyminen, Keski-Suomi

Muut tiedot

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1 INTRODUCTION

This research is about collective business development in the field of bioeconomy in Central Finland. Business development is often thought to be more effective if done in cooperation with other companies and public organizations in the field. The field of bioeconomy in Central Finland includes a few big companies as the driving force of the bioeconomy in the area, several small and medium sized companies (SMEs) offering bioeconomy related products, technologies and services, universities providing bioeconomy related knowledge and skills, and research organizations doing world class research in the field and funding organizations. The research explores what these different organizations think of bioeconomy and the related opportunities for new business development.

1.1 Environments and Challenges

The world is running out of natural resources. According to the Global Footprint Network (2014) by 2025, three globes would be needed to fulfill the resource needs of the population. This will become a reality should all the people living on earth continue using natural resources in the same way as they are being used in industrialized countries nowadays. Currently, it takes the earth one year and six months to regenerate the resources people consume within one year. In 2014, August 14 was the date when all the resources for the year had been used. For the remaining four and half months the needed resources were taken “out of the local resource stocks causing the world to be operating on overshoot”. In addition to the diminishing natural resources, more challenges are coming from the on-going climate change and population growth. (Global Footprint Network, 2014.)

According to the Organization for Economic Cooperation and Development (OECD) (2011), Green growth aims at enabling economic growth and development while making sure the natural resources essential to our well being will not be used to extinction. In order to succeed in realizing the aim green growth needs investments

to be able to turn new innovations and business opportunities into sustainable growth. Continuing business as usual is not seen as an alternative as the risks that are involved would be promoting economic growth on human expense. The most likely results would be “increasing water scarcity, resource bottlenecks, air and water pollution, climate change and biodiversity loss which would be irreversible”. (OECD 2011, 9.)

OECD (2011) has identified challenges for green growth related innovations. A significantly low carbon price is one of them. It will be hard for green and environmental solutions to compete with it even if incentives would be generated to enable innovations to tackle the climate change. Green innovations will also need support to be able to compete with the existing technologies. The related incentives should have to focus on efficient technology creation, market entry and scaling up, and at the same time on stimulating competition and private investments. It will also be very important to decrease barriers to trade and investment and at the same time concentrate on intellectual property right (IPR) protection. IPRs are needed to be able to “encourage the development and diffusion of technologies and the facilitation of foreign direct investment and licensing”. (12.)

The scarcity of natural resources and needs to adapt to the climate change, have forced the European Union to recognize the need for Europe to make the transition to a post-petroleum economy. It is seen necessary to start using renewable resources increasingly. The European Union is aiming at the transition from a fossil-based to a bio-based society with the help of research and innovation. This is believed to be beneficial for environment, food and energy security, and for Europe's competitiveness. In 2012, the EU's bioeconomy sectors resulted in 2.0 trillion euro in annual turnover, 22 million jobs and approximately 9% of the total workforce. (European Commission 2012, 2.)

Finland has also recognized the great possibilities of bioeconomy within green economy. In May 2014 Ministry of Employment and the Economy published the Bioeconomy Strategy of Finland. According to the document bioeconomy is

significantly important for the overall economy of the nation. Currently bioeconomy accounts for 16% of the Gross National Product (GNP) meaning a 60 billion euro yearly revenue and more than 300 000 jobs. The strategy aims at increasing the bioeconomy output to 100 billion euro by the year 2025. At the same time it is aimed at creating 100 000 new jobs. (Ministry of Employment and the Economy 2014c, 9.)

In October 2006 the Finnish forest cluster published a strategy, which aimed at doubling the value of Finnish forest cluster products and services by the year 2030. Only a few years after, the strategy was found to be in need of significant re-evaluation. During the years 2008 and 2009 the Finnish forest cluster went through such a severe restructuring that no one could have seen coming in 2006. (Gabrielsson et al. 2010, 4-6.) The global recession dramatically affected the value of forest cluster products and services decreasing the revenues significantly as shown by Figure 1 below:

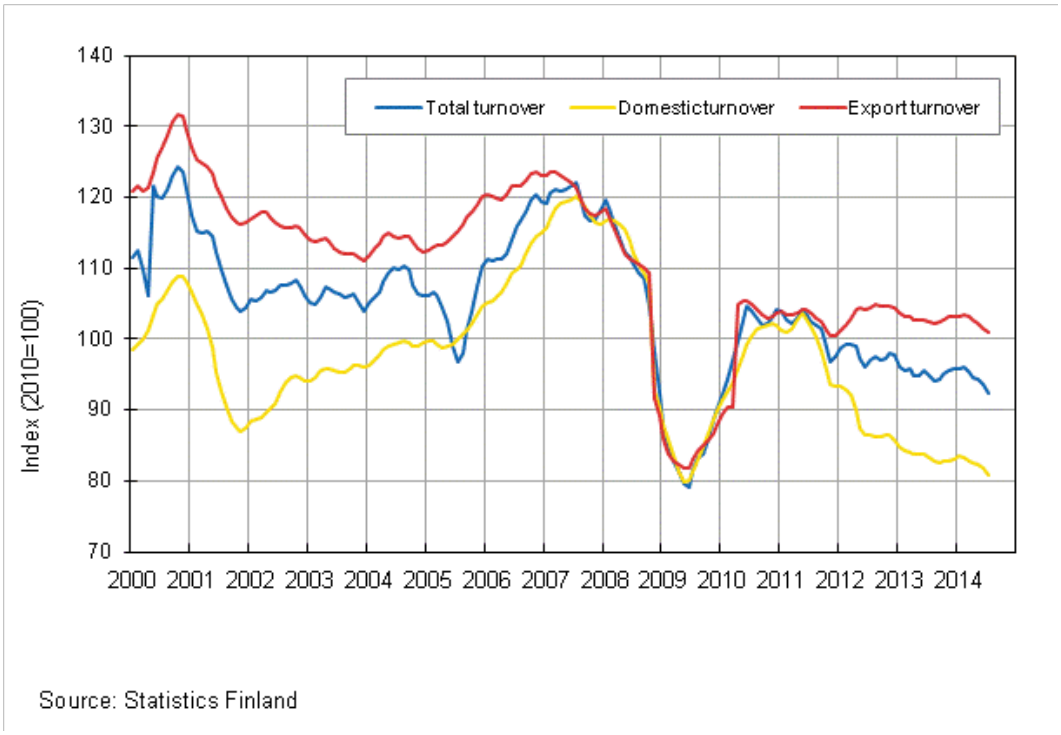

FIGURE 1: Trend series on total turnover, domestic turnover and export turnover in the forest industry

(Official Statistics Finland 2014b.)

After 2009 the forest cluster revenues started to increase again, but only for a short period of time. After mid 2011, the export turnover has been somewhat steady while the total turnover began to diminish again because of the heavily decreasing domestic turnover. In addition to world economy, Figure 2 below also shows the other change factors affecting the forest sector.

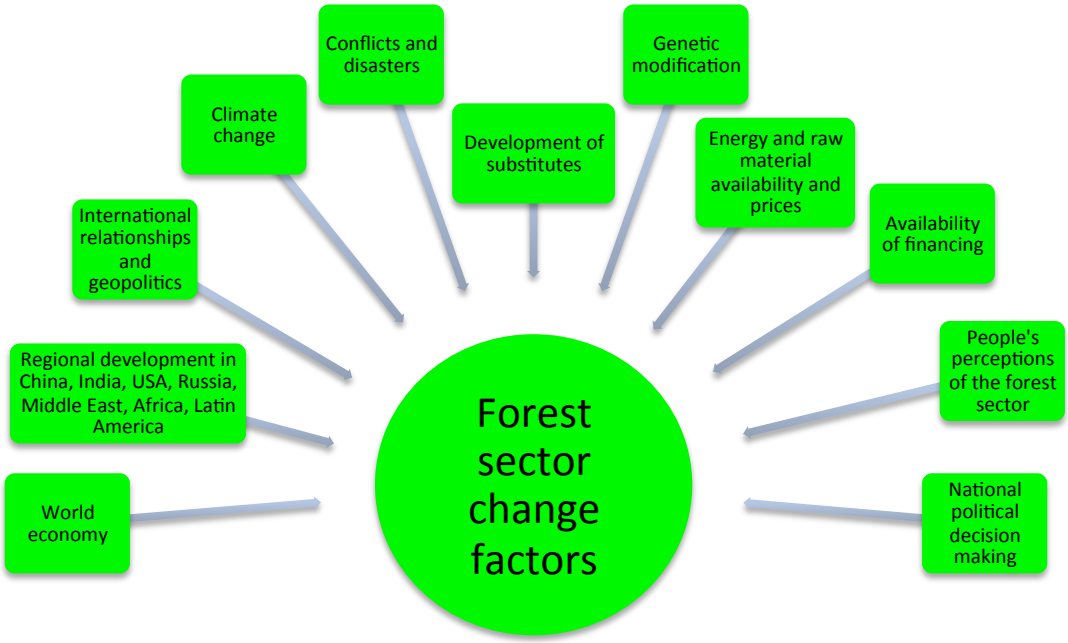

FIGURE 2: Forest sector change factors

(Gabrielsson et al. 2010, 8.)

To be able to cope with the changes the change factors reveal, the Finnish Forest Cluster has prepared four alternative scenarios according to which the cluster can be developed. Recognition of the offered opportunities will be enabled, by utilizing its strengths to the full potential. According to the Finnish Forest Cluster the strengths are the existing forest cluster network, the forest related knowledge and skills, and

the continuously growing forests. (Gabrielsson et al. 2010, 8-9.) The four scenarios are as follows:

1. **Global bioeconomy**, where both the consumers and the industry are committed to the development of a carbon neutral society. (ibid., 9.)
2. **Forests as a bioenergy source**, where the forest assets value continues to stay low because of the high energy prices and the energy use of wood competing with other uses. (ibid., 9.)
3. **Business as usual**, where Europe continues to be the forest cluster capital and leader in the sustainable use of forests. (ibid., 9.)
4. **Self-sufficient society**, where forests are significantly damaged by climate change pushing food production northward and a notable biomass production more southward. (ibid., 8-9.)

1.2 The motivation for the research

Finland's strategy for the bioeconomy aims at doubling the current bioeconomy output and at the same time making bioeconomy one of the future pillars of the Finnish economy. Jan Vapaavuori, Minister of Economic Affairs stated that this means bringing down the traditional boundaries between different sectors and on the contrary focusing on the intense collaboration of the forest, energy, technology, chemical and construction industries. To be noticed in the international market, Finland must be building a strong brand of a bioeconomy country. (Laakso 2013, 65.)

According to Liikanen (2014, 24) bioeconomy has potential but it takes long time to develop it into a profitable business. He quotes Häggblom (2014) the chairman of the board of Vision Hunters who claims that product innovations alone cannot save the current industry. Challenge for the bioeconomy is therefore "the time between the old and new". Quoting Haarla (2014) Doctor of Science (Technology) and experienced business executive, Liikanen presents three strategic challenges that the traditional forest sector has to concur. First, the traditional business must be made competitive and creating profits for the new product innovations. Second, they must

find ways to participate in the transfer process from traditional to new, and third, to enable simultaneous development of new business. Continuing quoting Haarla, Liikanen then presents three possible models for new business development 1) Big companies who have steady cash flow would lead the industry renewal with the expertise and cooperation with SMEs and start-ups, 2) Big companies would need more entrepreneurial attitude and for example start their own venture unit again, and 3) Big companies ought to increase the number of cooperation projects with for example Master level students and enable transfer of excess knowledge to potential developers. (Liikanen 2014a, 24-25.)

According to Liikanen (2014b), Petri Vasara from Pöyry Management Consulting Oy has said that compared to the gold rush of the 18th Century currently there is a on-going biorush. Many actors are rushing in to capitalize on the bioeconomy related opportunities with no factual knowledge, instead having only heard the claims of the huge potential. Many new innovations are needed, as only a few of them will succeed. In EU and global level, however there have been notable over acting and even waste in bioeconomy related innovations. There is a lot of potential in bioeconomy, but there are also as many risks. According to Vasara the most interesting issue is, how to manage risks in a situation where there are not necessarily any existing products or even market. That is anyhow the description of the skills and attitude needed from the companies competing in the current global market. What matters the most is not the money but the right attitude. It must be learnt and it must be learnt fast. Big companies and other countries have been preparing their bioeconomy strategies for years. Finland is considered as one of the key countries in bioeconomy, but a lot of effort is needed to keep the position. If nothing is done the risks do not matter, but at the same time the opportunities of the future will be missed. (Liikanen 2014b, 28-29.)

The key personal motivation for the research has been the increasing personal concern towards the economical decline and growing unemployment of Central Finland, and also the strong personal interest towards saving natural resources and

enhancing sustainability. It is my passion to do my own share in trying to find ways to overcome the current challenges.

I chose the field of bioeconomy because of my own roots in Central Finnish forests. My father was a nature lover and used to spend a significant amount of his spare time in the forests. Very regularly he took me with him to see trees, birds' nests and swamps among other forest wonders. From ever since being a child I have also been following closely a Central Finnish origin log house manufacturer due to my father's over 30 year long career in the company. The company was a significant employer in my former hometown and also internationally well known operator. I grew into understanding the value of forests to Finland both from the economical and the recreational point of view. Both of them are included in the concept of bioeconomy.

The motivation for looking at the subject from cluster perspective develops from a strong personal belief in the power of cooperation. Already during my Bachelor level studies business related teams and teamwork became a reality instead of just being some popular terms. I experienced in real life the power of shared vision and will to work hard in enabling its realization. Through out my working life I have experienced many times the value of finding the right partners to enable more effective overcoming of challenges. From the background it was very natural to focus on the regional collaboration through studying so called cluster members' views in the field of bioeconomy in Central Finland.

1.3 The research questions

As described earlier, the world is facing serious challenges because of the diminishing natural resources, the climate change and the population growth. Green economy and bioeconomy are ways to tackle the challenges and enable simultaneous economic growth. Operators around the world have recognized that. The EU and the Finnish government have stated in their strategies the will to become well known operators in bioeconomy. The opportunities are there, in Finland and also in Central

Finland. At the same time the manufacturing industry has been decreasing heavily, a lot of jobs have been lost, and forest sector is in need of a renewal and a structural transformation. It is evident that it is essential to start doing something.

New businesses are needed to be able to provide workplaces and maintain over-all welfare of the inhabitants. In Central Finland there are many key organizations needed in new business development. It would be interesting to find out, what these organizations could do to enable new business development better. Starting from the assumption that competitiveness of a geographical area can be increased through joint efforts of different organizations, the research is continued by presenting the following research questions, main research question and four sub-questions:

How can new business development be enabled in the field of bioeconomy in Central Finland?

- What are the strengths of bioeconomy in Central Finland?
- What organizations or structures are possibly blocking new business development within the field of bioeconomy in Central Finland?
- How can different organizations in the area collaborate to enable new business development?
- How can international business be enabled?

1.4 The structure of the thesis

After the introduction to the research in Chapter 1 the research is continued by a literary review in Chapter 2. The literary review presents firstly the research relevant key concept definitions and secondly explores collective business development through different perspectives given on the basis of the current literature. Thirdly, the theoretical framework for the research is presented. Chapter 3 deals with the research methodology. The chapter includes descriptions of the research philosophy, research approach and the case study, and an explanation how the empirical data for

the research was collected and analyzed. Verification of the results is also described. Chapter 4 defines the context for the research describing the region of Central Finland, the bioeconomy within the region, and finally presenting regional projects and studies that were taken in account for the research. Chapter 5 is a presentation of the results of the empirical research. And, Chapter 6 includes discussion in relation to the research overall.

2 LITERATURE REVIEW

The chapter defines firstly the key concepts of the research. Secondly, collective business development is explored through various perspectives from the current literature. Thirdly, the chapter is concluded with a presentation of the theoretical framework for the research.

2.1 The key concepts

The key concepts in the research are bioeconomy, sustainability, clusters, business development as a collective process and internationalization. The concepts are defined in the following sections.

2.1.1 Bioeconomy

Bioeconomy does not have one specific definition. Instead it can be elaborated through several different aspects. Bioeconomy is regarded as green economy. According to the European Environment Agency (EEA) green economy can be defined according to the United Nations Environment Programme's (UNEP) (2011) definition, which is the most commonly used definition, as follows:

> *A green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. The concept of green growth stresses the importance of integrating economic and*

environmental policies in a way that highlights the opportunities for new sources of economic growth while avoiding unsustainable pressure on the quality and quantity of natural assets. The transition towards a green economy involves a mixture of measures ranging from economic instruments such as taxes, subsidies and trading schemes, through regulatory policies including the setting of standards to non-economic measures such as voluntary approaches and information provision. The green economy can also be viewed as a set of principles, aims and actions, which generally include:

- *Equity and fairness, both within and between generations;*
- *Consistency with the principles of sustainable development;*
- *A precautionary approach to social and environmental impacts;*
- *An appreciation of natural and social capital, through, for example, the internalization of external costs, green accounting, whole-life costing and improved governance;*
- *Sustainable and efficient resource use, consumption and production;*
- *A need to fit with existing macroeconomic goals, through the creation of green jobs, poverty eradication, increased competitiveness and growth in key sectors.*

(European Environment Agency, 2012.)

According to the European Union bioeconomy combines “sustainable production of renewable resources from land, fisheries and aquaculture environments and their conversion into food, feed, fiber, bio-based products, bio-energy as well as the related public goods”. It includes “primary production, such as agriculture, forestry, fisheries and aquaculture, and industries using / processing biological resources, such as the food and pulp and paper industries and parts of the chemical, biotechnological and energy industries”. In the EU the bioeconomy market is estimated to be worth over 2 trillion euro, providing about 20 million jobs. In 2009 bioeconomy represented 9% of the total employment in the EU. (European Union, What is the Bioeconomy?.)

In Finland bioeconomy means an economy “that uses renewable natural resources in production of food, energy, products and services.” It includes sustainable care and use of renewable resources, use of biological processes in production (biotechnology), broad utilization of nature related resources as a source of wellbeing (for example nature in recreational use) and the related know-how. It aims at reducing use of fossil resources, preventing deprivation of ecosystems, while simultaneously promoting economic growth and creation of new jobs. Bioeconomy also means resource efficiency. The most important renewable resources in Finland are biomass from the forests, ground, fields and water, and also fresh water. (Ministry of Employment and the Economy in Finland, 2014c.)

2.1.2 Sustainability

The Bruntland Commision (1987) was the first one to define sustainability. Their definition is said to be the most quoted one and states that it is the “development that meets the needs of present without compromising the ability of future generations to meet their own needs.” (United Nations, Sustainable development - concept and action.)

Carroll and Buchholtz (2014) broaden the concept of sustainability from the solely natural environment respecting view to consider also economic and social criteria. The economic aspect of the concept emphasizes material wealth creation of companies, social aspect quality of lives and equality among people, and environmental aspect preservation of natural environment. (Carroll and Buchholtz 2014, 21-22, 55.)

Webster-Merriam dictionary defines sustainability as the ability “to be used without being completely used up or destroyed; involving methods that do not completely use up or destroy natural resources”; and an ability “to last or continue for a long time”. (Merriam-Webster, Sustainable.) In the research sustainability is understood as a synthesis of the previous three definitions.

2.1.3 Clusters

Porter (1998) defines clusters as "geographic concentrations of interconnected companies and institutions in a particular field." (98.) According to Sölvell (2009) a cluster commonly includes the type of actors as follows:

1. *Upstream and downstream firms involving both large firms and SMEs. Private industry includes competitors, suppliers of goods (e.g. machinery and input components) and services (e.g. consulting, legal and business services), buyers, and firms in related technologies sharing common factors, such as labor skills or technologies.*
2. *Financial institutions, involving traditional banks, commercial banks, venture capital, private equity and angel networks.*
3. *Public actors including: National ministries and agencies involved in: industry and economic, development policy (SME, entrepreneurship, networking, cluster, and investment attraction), regional policy (e.g. readjustment funds, infrastructure, and cluster programs), science and technology policy (innovation, incubator, university-industry cooperation and technology transfer, and technology cluster).*
4. *Regional agencies and regional units of national bodies (e.g. county administrative boards), and regional public bodies based on federative initiatives from local communities.*
5. *Academic actors including universities and colleges, research institutes, technology transfer offices and science parks.*
6. *Private and public-private organizations for collaboration (NGOs, chambers of commerce, formal networks, cluster organizations, etc.).*
7. *Media of different kinds creating "stories" around the cluster and building a regional brand. "Being part of the cluster allows companies to operate more productively in sourcing inputs." Companies that are part of a cluster have better access to employees, suppliers, specialized information, complementarities, better motivation, and measurement.*

(Sölvell 2009, 17.)

Cluster initiative

A cluster initiative is “an organized effort to increase the growth and competitiveness of a cluster within a region, involving cluster firms, government and/or the research community” (Sölvell, Lindqvist and Ketels 2003, 31).

Cluster Management

Cluster Management defines how to organize clusters and cluster organizations. It includes the determination of cluster objectives, cluster governance, cluster manager/facilitator and cluster evaluation. (European Cluster Organization, On Clusters - Cluster Management, Part 1.)

Cluster Policies

The European Cluster Organization defines cluster policies as policies that fit in one of the following three categories:

- *Cluster development policies directed at creating, mobilizing, or strengthening a particular cluster, e.g. a national funding competition for the best life science cluster strategies.*
- *Cluster leveraging policies that use a cluster lens to increase the efficiency of a specific instrument, e.g. an R&D subsidy provided only to companies in regional clusters where the subsidy is likely to incur spill-over effects beyond the recipient firm.*

Cluster facilitating policies directed the elements of the microeconomic business environment to increase the likelihood of clusters to emerge, e.g. regional or competition policies that remove barriers for competition between locations.

(Europe Innova Cluster Mapping Project 2008, 5-6.)

To be able to fully understand policies the following three concepts are also elaborated separately:

- *Policy; Often, governments set out their strategic intentions in a specific document, a policy (or white paper). This document does not have to define specific tools, allocate funding, or create responsibilities. But it does set the political objectives and present the motivation concerning why specific activities in the direction described are deemed important.*
- *Programme; To move from intent to real action, governments then design specific programmes that allocate funding, create organisational responsibilities and define specific conditions under which funding can be made available.*
- *Implementing agency; It will be the responsibility of a government agency or ministry to implement each programme. The programme might be their main activity, or it could be a small part of their overall responsibilities.*

(Europe Innova Cluster Mapping Project 2008, 6.)

Cluster Dynamics

Cluster dynamics determine the level of dynamism within a cluster. Dynamism is assessed according to the amount and quality of connections between the cluster members and the global market. Clusters are different in terms of networking activity, labor or capital movement and dynamism in general. There are also differences in production sophistication. While one offers low-cost goods, another can be producing highly differentiated ones “including R&D, design, branding and other strategic functions”. Dynamism is affected by resource quality differences within a region. Too much difference disturbs flexibility. Productivity of the resources available is important to keep under constant evaluation. Dynamic clusters understand which components fit together and which need to be rearranged. (Sölvell 2009, 18.)

2.1.4 Business development as a collective process

As said in the very beginning of this report, the research is about collective business development, meaning that there are several different organizations taking part in the business development process. At this point it is important to understand what the concept overall means. Below are given definitions for the sub-concepts that are included in the concept of business development as a collective process:

Collective development

Within a region there are different organizations that are involved in business development process. In this research the organizations can be described to be the ones that can be seen in the Figure 3 as follows:

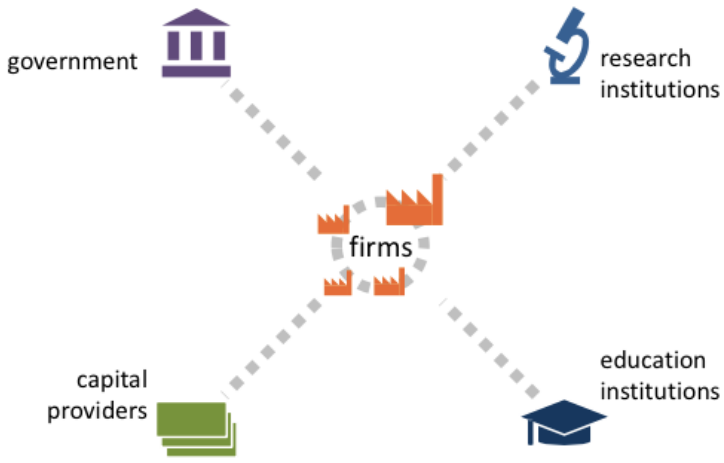

FIGURE 3: Types of actors in a cluster

(Sölvell, Lindqvist and Ketels 2003, 37.)

Firms are the ones doing the actual business development. It is from their innovations that the development processes start evolving. Research institutions cooperate with the firms in research and development projects, educational

institutions provide the workforce, capital providers provide financing and the government maintains the infrastructure and provides for example several policies and funding instruments.

A business development process does not need just any group of organizations to advance an innovation. It is essential to assess the potential ones and decide who are the best partners for the business development. It is about finding the right partners who together form the type of collaboration that is the most valuable for the business development. In the research it is believed that in order to enable such collaboration it is essential to understand the concepts of value network and business ecosystem.

Value network

Porter (1985) defined value chain as being embedded in a large set of different activities of a company. The value for customer was determined by activities performed by a set of economic players involved in the company's value chain. Norman and Ramirez (1993) suggested a change of focus to the Porters definition. Instead of focusing on the company or industry value chain as a value creator they emphasized value co-production of a value system as a whole. Parolini (1999) broadened the concept from a set of economic players to set of activities, which are involved jointly in the value creation. (Parolini 1999, xxi-xxii.)

A detailed definition for the value network, as it is understood in the research, includes a list of value network characteristics. The characteristics are listed below:

- A set of value network activities is creating the value for its customers.
- Human, tangible and intangible resources are needed in realization of the activities.
- The activities are connected by "flows of material, information, financial resources" and they have influence on relationships.
- The value perceived by the customer depends also on the way the customer uses the value.

- Customers are not only users of value. They can participate in value creation.
- The activities involved in value creation may be controlled by the market, a hierarchy, or by the company networks.
- Different economic players (for example companies, public agencies, non-profit organizations) are responsible for performing the activities.
- One economic player can be responsible for one or more activities and can be involved in several value networks.

(Parolini 1999, xxiii-xxiv.)

Business Ecosystem

According to Peltoniemi and Vuori (2004) a business ecosystem is a dynamic structure of organizations that interact with each other. The organizations consist of SMEs, big companies, research organizations, and public organizations. They claim that a business ecosystem should be self-sustaining, without a need for government to aid survival in the operating markets. Business ecosystem is not formed by anyone instead it is developing on its own through self-organization, emergence and co-evolution. The independency enables the business ecosystem to become flexible and well adjusting. Both competition and cooperation are present simultaneously within a business ecosystem. (Peltoniemi and Vuori 2004, 13.)

Open innovation

In the very center of business development is innovation. In the research innovation is understood through open innovation concept introduced by Chesbrough (2006). He defines open innovation as “paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology”. Open innovation paradigm requirements are defined company specifically according to the business model, which utilizes both internal and external ideas in value creation. (Chesbrough 2006, xxiv.)

Co-creation

Gröönroos (2011) defines co-creation of value “as joint activities by parties involved in dyadic direct interactions aiming at contributing to the value that emerges for one or both parties (or all parties in a larger network)”. (7.)

Co-opetition

Oxford dictionaries define co-opetition as “collaboration between business competitors, in the hope of mutually beneficial results”.

(Oxford Dictionaries, Co-opetition.)

Business model

In addition to finding the right partners the business development needs a business model. In the research the concept of business model is adapted from Österwalder and Pigneur (2010) as follows. According to their definition “a business model describes the rationale how an organization creates, delivers, and captures value.” In order to create a successful business model it is essential to describe it in an understandable way and to be able to create shared understanding of the business model in reality. The business model canvas is a logical tool one can use to determine the value a business is creating for its customers. (Österwalder and Pigneur 2010, 14-15.) Figure 4 in the following page shows a detailed illustration of the model.

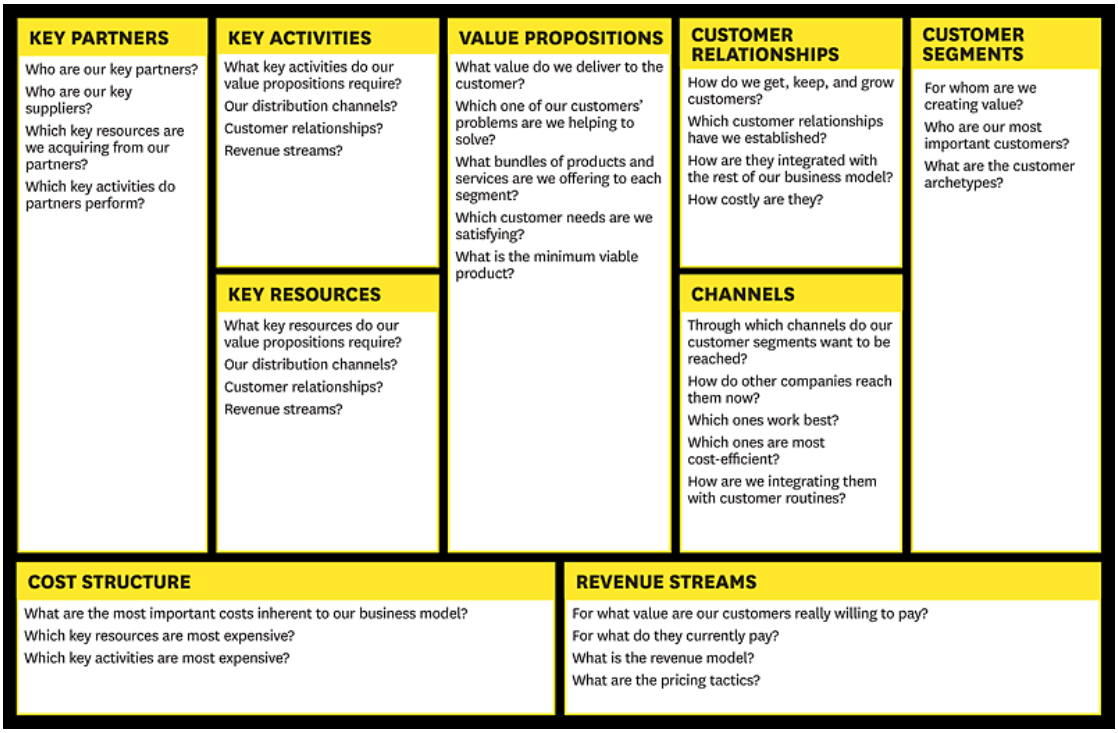

FIGURE 4: The business model canvas

(Osterwalder 2013.)

2.1.5 Internationalization

In this research internationalization is understood from a network perspective. According to the perspective a company's internationalization is not dependent only on the company itself. Instead, it is claimed that the company's level of internationalization is relative to the level of internationalization of its business context. In the description the company is understood as a loosely connected group of changing interest groups. By internationalization of the company, it is meant that not only products move abroad. Instead, the company forms business relationships with foreign networks. The resources on which the internationalization is based on consist mainly of "technological and other relationships with customers, suppliers, and so on." (Björkmann and Forsgren 2000, 8-14.)

2.2 Collective business development

In the early 1990's, Michael Porter conducted a four-year study on ten important trading nations with about 30 researchers mostly from the researched nations. The nations were: Denmark, Germany, Italy, Japan, Korea, Singapore, Sweden, Switzerland, the United Kingdom and the United States. The study consisted of two parts in each of the nations. The first part of the study identified the industries where the nation's companies were internationally successful. The second part of the study looked into the competition history of the industries to find out how the industries had created competitive advantage. The national samples consisted of more than 100 industries or industry groups. On the basis of the research they formed the Diamond of National Advantage including the determining factors for competitive advantage. Figure 5 below presents the factors:

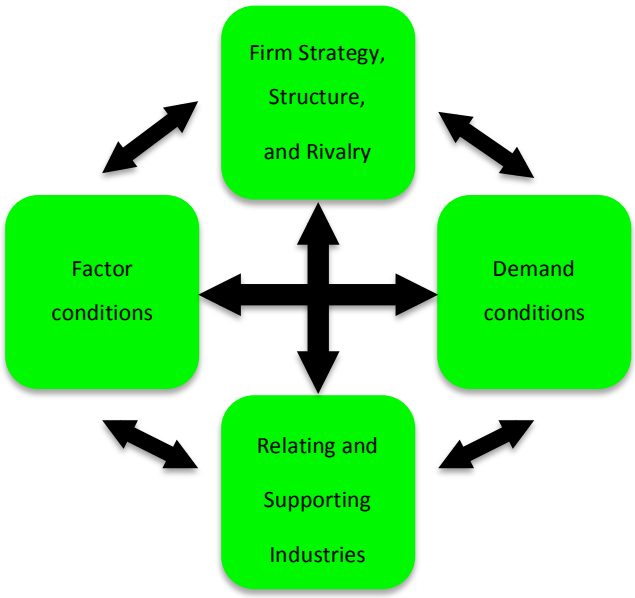

FIGURE 5: Determinants of National Competitive Advantage

(Porter 1990, 78.)

The determinants form the national business environment where each nation's companies are established and learn to compete. Competitive advantage is gained in an environment, compelling companies to innovate and make investments. (Porter 1990, 74-79.) Companies are the key players in forming their home environment to be more supportive for international success. They must have an active role in creating clusters of organizations in the field to enhance their own competitive advantage. (Porter 1990, 90.)

Competitive advantage also depends on the ability to be different. An organization must choose different ways of delivering unique value to its customers compared to its competitors. Strategy means defining the strategic positioning of an organization. The positioning can be based on the production of a variety of products, serving the customers' needs, or targeting customers who are accessible to an organization's products in different ways. Strategy is not only about combining unique activities. It is also about making trade-offs i.e. deciding what not to do. The chosen activities must fit together and form a strong chain of activities. The establishment of such strategic fit leads to profitability and to sustainable competitive advantage. (Porter 1996, 64-70.)

Later Porter argued, that location is significant to competitive advantage. In the times of global competition, competitive advantage can the most often be gained on the basis of very local and immaterial assets such as knowledge, relationships, and motivation. The assets are hard to be copied by global competitors. In addition to local assets competitive advantage formation needs significant productivity. This means that companies have to be increasingly productive in their operations. Clusters are a way to increased productivity allowing companies an easier access to specialized information, technologies, research and educational institutions, and collective benefits. (Porter 1998, 81-83.)

According to Porter (1998), clusters enhance companies' ability to innovate. Due to close relationships within a cluster companies are provided with increased market knowledge, knowledge about new evolving technologies, component and machinery availability, service and marketing concepts. In addition cluster companies can perform lower cost experiments and therefore postpone larger investments. Clusters also improve new business development. A cluster offers a better view of new business opportunities and lowers barriers to entry. It is easier for individuals who are working inside the cluster to notice shortages in the product and the service base of the cluster and hence detect new business opportunities. The barriers to entry are lower because for example the needed assets, skilled employees, and an established market are often readily available within a cluster. Funding may also be more easily available through existing relationships and cluster familiarity to local financial institutions. (Porter 1998, 83-84.)

Starting from the Uppsala model, Nordic researchers have greatly affected in the formation of the Network theory. In contrast to the Uppsala model, Network theory elaborates the business context of a company instead of a single company itself. The focus is on existing companies within the context and how they influence a company's internationalization. It was developed to enable the understanding of behavior in general rather than addressing specific research questions. The theory enables the understanding of business reality. Its focus is on often long term business relationships and ongoing interaction among companies in industrial markets. The theory enables descriptions of the business reality, but can only limitedly be used in predictive research. (Björkman & Forsgren 2000, 13-14.)

Sölvell (2003) continued the extensive cluster research initiated by Porter. There was a lot of evidence that clusters had become part of the national economic development strategies of many nations. Governmental cluster initiatives had been launched all over the world, but there was a notable lack of a systematic knowledge on them. Sölvell approached this research gap by providing research data regarding more than 250 cluster initiatives (online survey response from 233 cluster initiatives and a case study on 24 cluster initiatives) on cluster initiative development,

structures and best practices. Also a Cluster Initiative Performance Model was developed. Figure 6 below describes the model:

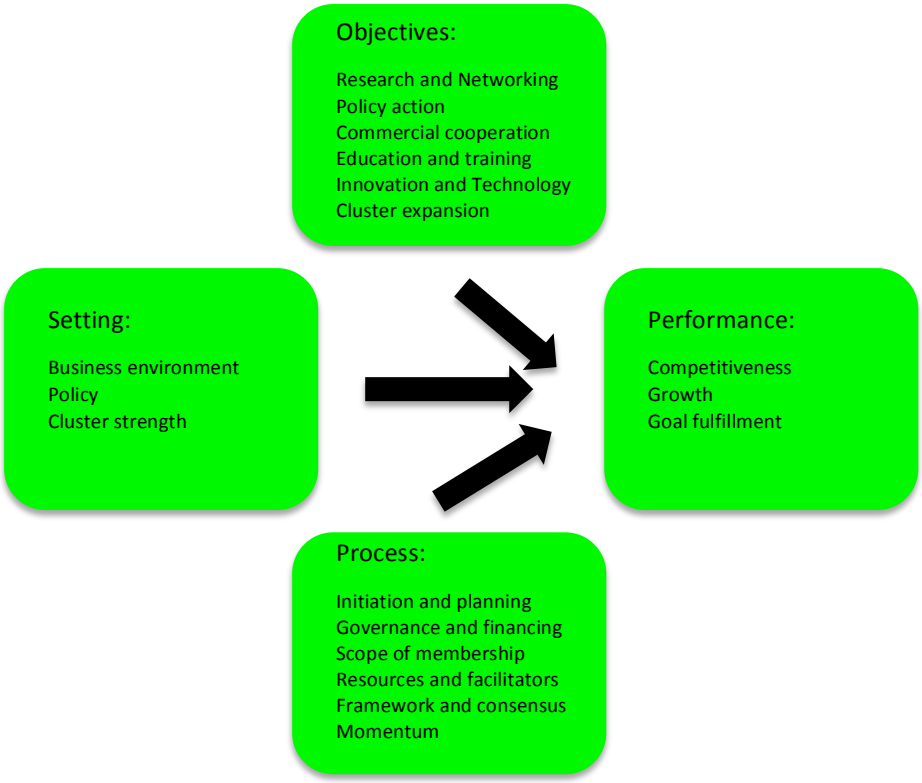

FIGURE 6: The Cluster Initiative Performance Model

(Sölvell, Lindqvist and Ketels 2003, 9.)

The research data backs up three broad issues that the cluster initiative practitioners need to take into consideration. Firstly, cluster initiatives need clear strategies for selecting their objectives and monitoring the impact the cluster initiative achieves over time. Secondly, cluster initiatives need to develop their organizational and operational approach by considering the generic elements for all the successful cluster initiatives. And thirdly, cluster initiatives have to be embedded in broader efforts in upgrading the microeconomic business environment to develop their full potential. (Sölvell, Lindqvist and Ketels 2003, 81-82.)

There research identified several characteristics for successful cluster initiatives. The clusters initiatives varied greatly according to their setting, objectives and organization. Success of the initiatives was analyzed according to their ability to improve cluster competitiveness, achieve cluster growth, and fulfill cluster initiative goals. The cluster setting was seen affecting the cluster success positively on the basis of the following three dimensions: the quality of the business environment, the structure and content of an economic policy, and the strengths of the cluster. (Sölvell, Lindqvist and Ketels 2003, 46.) Below the dimensions are presented in more detail:

Business environment

- Presence of a advanced scientific community and strong clusters
- High level of trust between companies and between the public and private sector (ibid., 46.)

Economic policy

- Policies that secure high levels of competition and promote science and technology.
- Policy processes, which support stable and predictable decisions and allocate important decisions to the regional and local level.

(ibid., 46-47.)

Strengths of a cluster

- Clusters of national or regional importance
- Clusters with long history, many companies, internationally competitive buyers and suppliers, and tight networks of buyers and suppliers

(ibid., 47.)

The most significant sign of a non-successful cluster initiative is related to the common cluster initiative framework. Failure is strongly related to an inability to

create consensus and to form common vision or quantified targets for an initiative. A framework has to be adapted to the cluster's strengths. Disappointing cluster initiatives often have no office or have an insufficient budget for significant projects. Limiting the membership scope to only large companies, one level in the value chain, or only domestic companies are examples of other process issues that have a moderate relationship to disappointing outcomes. (Sölvell, Lindqvist and Ketels 2003, 51-52.)

Cluster initiatives need to look beyond the short-term interests of their current members and include the interest of potential future members, such as foreign investors and newly started companies. More current cluster participants need to realize that company formation and investment from outside the region are not only a sign of a cluster's attractiveness but can also improve the competitiveness of the existing businesses. (Sölvell, Lindqvist and Ketels 2003, 86.)

Vargo and Lusch (2004) describe a service-centered view to marketing that highlights the importance of a customer as a co-producer. Instead of just selling products companies create value to customers by selling customized services. The customers' involvement in the customization enables better understanding and fulfillment of the customers' needs. Knowledge and skills are identified as the core competences in enabling obtaining of competitive advantage. Marketing's role, according to the view is identified as one of the organization's core competencies. The purpose of marketing is to ensure initiation of the customer centric and market driven attitude through out the whole organization. (Vargo and Lusch 2004, 12-13.)

Chesbrough (2006) introduced the concept of Open Innovation to enable better answering to the global knowledge environments' challenges of the 21'st Century. Table 1 on the following page presents the principles of both open and closed innovation. (xxvi.)

TABLE 1: Contrasting Principles of Closed and Open Innovation

(Chesbrough 2006, xxvi.)

Closed Innovation Principles	Open Innovation Prinsiples
The smart people in our fieldwork for us.	Not all the smart people work for us. We need to work with smart people inside and outside our company.
To profit from R&D, we must discover it, develop it, and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
It we discover it ourselves, we will get it to market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to market first will win.	Building a better business model is better than getting to market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our IP, so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

Open innovation demands companies to look outside their own company and enhance their own business on the basis of the ideas from the surrounding environment. Open innovation is not only about growing ones current business. It is also about finding ways to expand own company beyond its current business. The companies of the 21st Century have to work hard and identify alternative business models that can create profits to their technologies even if they are not necessarily planning on using the models themselves. The functions that need to be determined in the open innovation business model include value proposition, market segment, value chain, cost structure, value network, and competitive strategy. (Chesbrough 2006, 64.)

Gnyawali and Park (2009) argue, that by adopting a co-opetition strategy SMEs enhance their ability to advance technological innovations. By co-opetition they mean simultaneous focus also on competition, not only cooperation, with other companies within an industry. They claim that companies will benefit for example from the competitors resources, as the resources are likely to be useful without major development or adaptations because of the similarities in the markets and the needed resources. Competitors are also facing equivalent external challenges and can benefit from combining own resources with the competitor's resources in order to tackle the challenges. (323.)

Launonen's and Viitanen's (2011) two-year research regarding innovation ecosystem best practices included seven in-depth case studies on the world's leading innovation environments and 25 international expert interviews about innovation ecosystem development. On the basis of more than 200 visits to international innovation environments they first drafted an outline for a framework, describing the elements that were always present in innovation environments. The framework was then used in designing the research and as a starting point for the interviews. (15-16.)

On the basis of their research it is argued that future innovation will be found in the most globalized and collaboration enabled business environments. This requires free movement and exchange of information, resources and talents between the home base and complementing global innovation environments in form of co-operation or competition. At the best the mutual benefits would be based on "open innovation principles, leveraging trusted relationships for maximum global impact". (ibid., 16.)

Implementation of such conceptual efforts is not a simple process. Understanding the challenges in transferring them into concrete practices the authors present a four principal approach for innovation ecosystem development. The principals are described on the next page:

1. Adoption of systematic ecosystem-level master plans.

   "All key decision makers in both the public and private sectors must be brought together to design a shared future vision for regional development in a wider global context." The parties are to agree on responsibilities regarding the implementation of the shared vision: investments needed and the policies and targets required. (ibid., 334.)

2. Use of empowered core hub organizations

   A separate regional management organization ought to be established to take over the key responsibilities in facilitating, directing and managing the local collaborative process including program planning, value network development and maintenance, securing and upgrading the required human resource pool for global engagements, and managing the information and resource flows. (ibid., 334-335.)

3. Management of advanced public-private partnerships

   The most challenging aspect of innovation ecosystem development is often related to the differing stakeholder interests. In order to succeed in mutual strategy and benefit creation the stakeholders need to be brought together in open forums. This will enable collective learning and information sharing between the parties, and coordinated efforts for joint business platform creation. At their best such efforts can lead to new system integration business model, where the entire value system is reorganized, and an integrated business model is formed instead. (ibid., 335-336.)

4. Extensions of strategic alliances

   Significant potential of collaboration within an ecosystem arises from utilizing the specialized regional advantages in global settings. Missing ecosystem competencies can be gained by forming strategic alliances with external talents (i.e. by hiring global experts and/or actively outsourcing product,

process and service know-how), and front-runner ecosystems through joint programs. (ibid., 336.)

Porter and Kramer (2011) addressed later the concept of creating shared value. According to them, companies create shared value “by building clusters to improve company productivity while addressing gaps or failures in the framework conditions surrounding the cluster”. Shared value means policies and operational practices launched in order to increase companies’ competitiveness, and at the same time improving the overall welfare of the surrounding society. It connects economic improvement with societal improvement, including value creation through benefits, while considering also the relative cost. Shared value creation is possible through three different ways: by finding new ways to develop products and markets, by re-analyzing the productivity of its value chain, and by stimulating regional cluster development. (6-12.)

Delgado, Porter and Stern (2012) suggest that, “regional economic performance depends crucially on the cluster composition across nearby regions rather than within narrow political boundaries”. Policies that enhance complementarities across jurisdictions, such as a supporting infrastructure and institutions that facilitate access to demand, skills or suppliers in neighboring clusters, are important tools for regional development. (36.)

In August 2012 the European Cluster Observatory initiated a completely web-based research on cluster initiatives around the world. The questionnaire was sent to the cluster organization managers. The total of 2580 individual links that were sent resulted 356 completed responses from managers from 50 countries, the response rate being 14%. The response rate was notably lower compared to the response rate of the 2003 research, which was 47%. The low response rate was believed to reflect survey tiredness of the cluster organization managers. (Lindqvist, Ketels and Sölvell 2013, 10-12.)

Lindqvist, Ketels and Sölvell (2013) used the European Cluster Organization research data to carry out their own research on cluster initiatives. On the basis of the research they argue that their former definition of cluster initiatives still is accurate. Cluster initiatives are about promoting growth and competitiveness of a region. In addition however, the newer concept of cluster initiatives includes also promotion of innovation. On the basis of their vast research the gentlemen concluded that clusters are significantly important for the innovation processes of companies within a region. The reason why clusters are significant for innovation is, that clusters have within the industry or sector location, the critical mass needed in enabling the innovation processes to become successful. There different members of a cluster can support one another and new ideas develop in organized meetings, and more naturally in non-organized meetings and interactions. (3.)

According to Lindqvist, Ketels and Sölvell (2013), most of the cluster initiatives are connected with government policies. Some cluster initiatives have been established as a result of such policies. This means that government efforts have initiated the clusters' formation. Other clusters can be using government funding in their activities and therefore have a linkage to government policies. Also a cluster that lack direct relationship to government i.e. is not using any type of government funding or have not been established as a result of government effort, is affected by the policies as economic policy decisions affect their operational environment. (43.)

It is claimed that for a cluster policy to be beneficial, it should rather be focusing on leveraging existing clusters instead of creating new clusters. Governments are claimed to be lacking the knowledge needed in foreseeing if their policy intervention would result in formation of welfare improving clusters. Instead, governments ought to work with the existing clusters and help them to respond better to market changes. There has also been evidence of cluster effort and regional policy integration. Such specialization approach is said to require structural change and turning focus on region specific strengths. (ibid., 45-47.)

The research highlights the importance of the policy context to cluster initiatives and states that the context has changed significantly during the past decade. Figure 7 below presents the effects of the changed policy context on cluster initiatives.

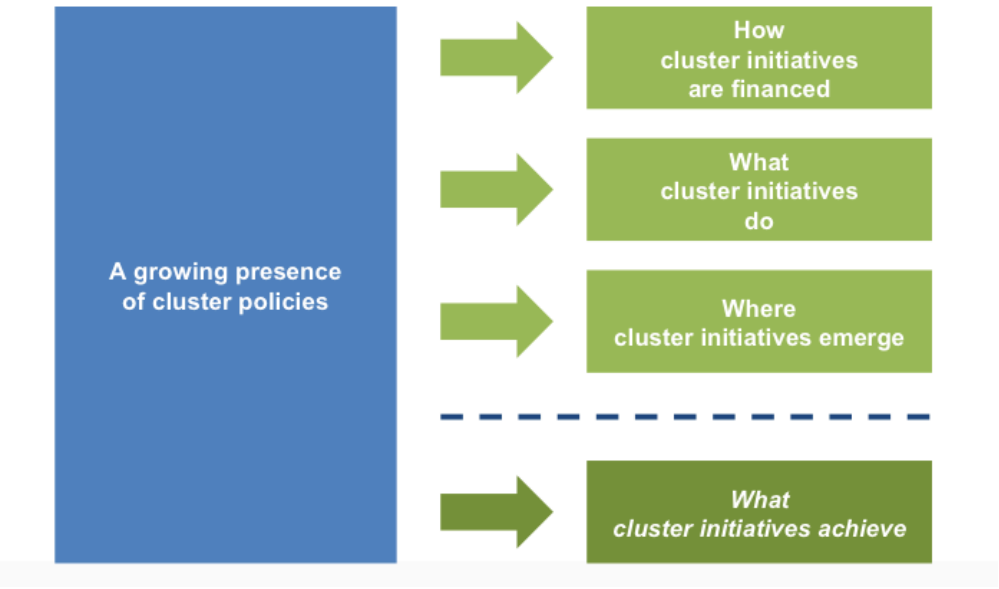

FIGURE 7: Implications of a new cluster policy context

(ibid. 52.)

On the basis of the research it is stated that unexpectedly cluster initiative growth financing is still heavily dependent on public financing. A decade ago after their former research they had predicted that the share of public financing would decrease over time and the share of member-financed operations would grow steadily instead. (ibid., 52.)

Lindqvist, Ketels and Sölvell (2013) use the Gap Model to describe clusters as "organizations whose fundamental task is to facilitate cooperation". In an ideal situation cooperation within a cluster is perfect between the different cluster members including companies, research centers, educational institutions and

government. In the ideal situation government recognizes the needs of the companies to their full extent, researchers interact with business regularly, educational institutions talk to companies about the ways to provide the cluster with the skills needed, and capital providers provide the companies the capital needed. (37.)

In real life cooperation is not perfect. Many different kinds of challenges are present and creating obstacles for cooperation. The disrupted cooperation then disrupts the innovation processes within the cluster creating gaps between the cluster members. A need arises to bridge the gaps in order to better the interaction and improve the performance of the cluster. Also the two cluster external gaps, gap between the cluster and other clusters, and gap between the cluster and global markets need to be bridged. (Lindqvist, Ketels and Sölvell 2013, 37.) Figure 8 below illustrates the cluster internal and external gaps that form the Gap Model:

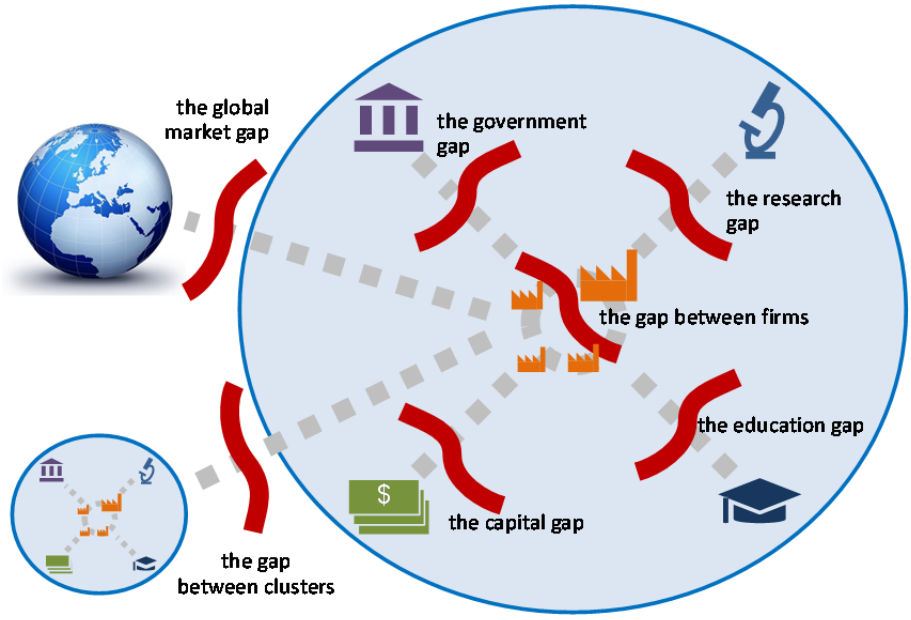

FIGURE 8: The Gap Model

(Lindqvist, Ketels and Sölvell 2013, 38.)

According to Carroll and Buchholtz (2014), sustainability is closely linked to corporate social responsibility. Table 2 below defines the concept through characteristics, which have been given by people to describe a socially responsible company:

(Carroll and Buchholtz 2014, 38.)

TABLE 2: Top 20 Characteristics of Socially Responsible companies

(Carroll and Buchholtz 2014, 38.)

• Makes products that are safe	• Shows no past record of questionable activity
• Does not pollute air or water	• Responds quickly to customer problems
• Obeys law in all aspects of business	• Maintains waste reduction program
• Promotes honest or ethical employee behavior	• Provides or pays portion of medical costs
• Commits to safe workplace ethics	• Promotes energy conservation program
• Does not use misleading or deceptive advertising	• Helps displaced workers with placement
• Upholds stated policy banning discrimination	• Gives money towards charitable or educational causes
• Utilizes environmentally friendly packaging	• Utilizes only biodegradable or recyclable materials
• Protects employees against sexual harassment	• Employs friendly or courteous or responsive personnel
• Recycles within company	• Tries continually to improve quality

According to the characteristics socially responsible companies are responsible not only in respect to their employees, customers and legislation. They also consider the environmental (effective waste management, recycling, pollution banning, and avoidance of toxic or hazardous production materials) and societal aspects (giving money to charity).

Benn, Dunphy and Griffiths (2014) demonstrate the urgent need for businesses to change and take more serious stance towards the corporate sustainability in order to enable healthy and fulfilling life for the people in the future. They suggest that sustainability of businesses must not be seen only as an ecological issue. Instead, it has to be seen as a people issue as well. To elaborate the concept they present a sustainability phase model that includes the six developmental stages a company has to distinguish to become an ecologically and humanly sustainable company. The six stages are the following: Rejection, Non-responsiveness, Compliance, Efficiency, Strategic proactivity and The Sustaining Corporation. On the basis of the stages were then developed the waves of sustainability presented in the Table 3 below.

(Benn, Dunphy and Griffiths 2014, 6; 22.)

TABLE 3: Waves of sustainability

(Benn, Dunphy and Griffiths 2014, 22.)

First wave		Second wave			Third wave
Opposition	Ignorance	Risk	Cost	Competitive advantage	Transformation
Rejection	Non-responsiveness	Compliance	Efficiency	Strategic proactivity	The sustaining corporation
Highly instrumental perspective in the employees and natural environment	Financial and technological factors have primacy	Focuses reducing risk of sanctions for failing to meet minimum legal or community standards	HR systems seen as means to higher productivity and efficiency	Focus on innovation	Reinterprets the nature of corporation to an integral self renewing of the whole society in its ecological context
Culture of exploitation	More ignorant than oppositional	Little integration with HR and environmental functions	Environmental management seen as a source of avoidable cost for the organization	Seeks stakeholder engagement to innovate safe, environmentally friendly products and processes	
Value destroyers	Value limiters	Value conservers	Value creators		Sustainable business

The table is continued on the next page.

Table 3 is continued from the previous page.

First wave		Second wave			Third wave
Opposition	Ignorance	Risk	Cost	Competitive advantage	Transformation
Rejection	Non-responsiveness	Compliance	Efficiency	Strategic proactivity	The sustaining corporation
Opposition to government and green activists	Seeks business as usual, compliant workforce	Follows route of compliance plus proactive measures to maintain good citizen image		Advocates good citizenship to maximize profits and to increase employee attraction and retention	
Community claims seen as illegimate	Environmental resources seen as free good				
Value destroyers	Value limiters	Value conservers	Value creators		Sustainable business

The table presents the stages as part of a series of three waves. It can be seen how the developmental stages shown in the first row go together with the corporate changes in the rows 4-7. A company is not expected to proceed through the stages one by one. They are rather, expected to be used to enable understanding of own position, and the development needed. A company can either be leapfrogging or regressing by ending some of the already established sustainability practices. A new company can by understanding the stages aim at value creation and corporate sustainability already when establishing the company. (Benn, Dunphy and Griffiths 2014, 15; 22.)

The concept of circular economy describes an industrial economy aiming at utilization of renewable energy, avoidance of toxic chemicals, and enabling minimal waste production. It defines a restorative industrial economy. The originating study regarding the circular economy is based on “non-linear, particularly living systems” focusing on optimizing systems more than components. This means managing two types of material flows: biological materials, designed to re-enter the biosphere and technical materials, designed to circulate at high quality and not to enter the biosphere. The operating system changing concept was established to tackle the

global challenges of the diminishing resources and the fossil energy dependency. The circular economy aims at decreasing consumption of material goods. Instead of selling a product the focus of the model is in selling the use of the product. In practice the model means rethinking of the straightforward take-make-waste process. The rethinking means stimulating services. The model encourages leasing or renting instead of buying, and refurbishing instead of manufacturing new products. (Ellen MacArthur Foundation 2012.)

2.3 Theoretical framework

On the basis of the current literature reviewed in Section 2.2 it can be concluded that well functioning clusters enhance a region's competitiveness. Clusters are proven to improve companies' productivity by addressing the surrounding framework related gaps. The cluster members together are expected to enhance companies' innovation abilities. This can be enabled through close relationships between the organizations. Competitiveness increasing policies and operations help in tackling the framework gaps and also improving the overall welfare of the surrounding society.

An open innovation model enables utilization of company external ideas in the new business development. It is not only suitable for a growing business but also to expanding an existing business. In order to enable internationalization, the open innovation model can be used in enhancing collaboration through enabling the free movement of information, resources and talents.

A government can stimulate the cluster capabilities by creating successful cluster initiatives. Such initiatives focus on the quality of the business environment, the structure and content of economic policies, and the strengths of the cluster. The ability to form successful cluster initiatives is highly dependent on the quality of its framework i.e. its capability to form clear strategies about the targets and their measurement, and the ability to develop the business environment of the cluster to

its full potential. Business environments that can be characterized as being the most globalized and collaborative will enable the development of future innovations.

The Gap Model helps in identifying cluster internal and external innovation gaps. The cluster internal innovation gaps are gaps in the innovation processes between different cluster members. The cluster external gaps are gaps in the innovation processes between cluster and other clusters, and also between the cluster and the global market as presented in Section 2.2.

Theoretical framework development means placing the research phenomenon within a certain theoretical viewpoint and specifying the central concepts for the research. A theoretical framework describes the theoretical understanding in relation to the research phenomenon. (Hirsjärvi, Remes ja Sajavaara 2013, 140-141.) It defines the theories that are important for the research and how the theory will be used in the research. Hypothesis development is also part of the theoretical framework development if it is meaningful for the research. (ibid., 124.)

The research process can be described according to the hermeneutic circle, which suggests that the understanding of the researcher is achieved through the continuous process of moving back and forth from interpreting one part of the research, to interpreting the research as a whole. The researcher's prior knowledge and the subjective interpretations are recognized to affect the research process. (Myers 2013, 171.)

Figure 9 below presents the theoretical framework for the research:

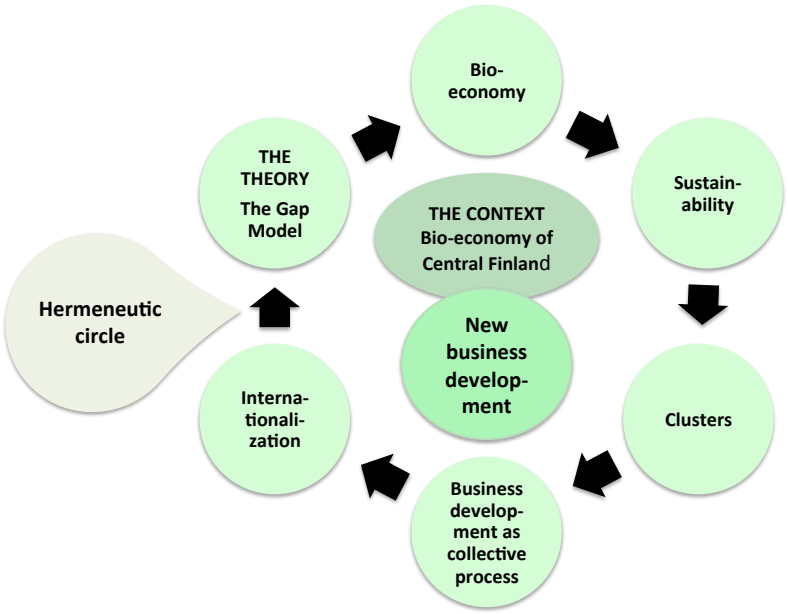

FIGURE 9: The theoretical framework

Collective business development is examined within the field of bioeconomy in Central Finland (the context). The key concepts (bioeconomy, sustainability, clusters, business development as collective process, and internationalization) are defined in Section 2.1. Hypotheses were not stated for the research, as the research is not about testing theoretical hypotheses. The theory in the research, The Gap Model, is used practically. It is used in defining what to look from the data i.e. identifying ways to bridge the cluster internal and external innovation gaps between the different organizational groups within the cluster.

3 METHODOLOGY

The purpose of this research is to increase understanding of different aspects of the business development within the field of bioeconomy in Central Finland. A starting point for the research is the assumption that competitiveness of a region can be increased through collaboration of different organizations. The assumption is defined through the literary review in Chapter 1. From there the research process proceeds to empirical data collection, concept formation and finally explanation of the phenomenon overall.

The research process involved several cycles of reviews in developing the ideas, the research questions and the concepts on the basis of the prior research, the theoretical approaches and the empirical data. The research questions, the used theories and the prior researches were specified in the course of the research process. (Eriksson and Kovalainen 2008, 22-23; 43-44.)

In the research the Gap Model is used in identifying the existing gaps between the members within the bioeconomy field in Central Finland, and to aid in determining ways to bridge the gaps.

3.1 Research Philosophy

The research is based on hermeneutics in its philosophical base. This highlights the importance of interpretation and understanding of the research process. The research is interested in the way the different members of a cluster define the context of bioeconomy and the related opportunities for new business development. The empirical data itself does not enable understanding. Instead, interpretation and analysis are needed in transforming the data into understanding and knowledge. As

the research process advances, also the knowledge increases, and the position towards the prior knowledge change. A meaningful interpretation of the results is aimed and therefore corrective measures are allowed in answering the research questions. (Eriksson and Kovalainen 2008, 13-21.)

3.2 Research Approach and Case Study

The research approach is based on a subjective ontology. This means that a social reality is produced through a social interaction i.e. the reality for the researcher is formed through interpretation of a social process. Ontology explains what there is in the world. Also the epistemological view of the research is subjective which means that access to the existing world is gained only through observations and interpretations. Epistemology describes how knowledge is created. (Eriksson and Kovalainen 2008, 13-14.)

Both qualitative and quantitative research should be based on what the researcher wants to know. (Kovalainen and Ericsson 2008, 4.) A case study may well be chosen because of the researcher's own personal interest and desire to understand what the phenomenon is all about. (Simons 2009, 29.) It is also claimed that qualitative research can well be used in research that aims at interpretation and understanding of the research phenomenon within a context. (Kovalainen and Ericsson 2008, 6.) On the basis it was decided the research to take qualitative approach to the research.

The research aims at understanding socially constructed reality. The research phenomenon was chosen because of the researcher's personal interest to understand bioeconomy related business development in Central Finland.

According to Myers (2013), Yin's (2003) definition of a case study includes two parts. Firstly, case study is defined as an empirical study that examines current and complex phenomenon in its real-life context. By complex it is meant that the boundaries between the phenomenon and the context are not clearly identifiable.

The phenomenon is studied in its context, not separately, and therefore the context is part of the study. Secondly, instead of concentrating on just on data points, case study is defined to address multiple variables. Therefore also usage of multiple sources of evidence is recommended. Also theoretical propositions from the research literature are recommended as framework for data collection and analysis. (77.)

Myers (2013) specifies Yin's case study definition in business research by stating that empirical data is collected almost always from one or more organizations mainly through interviews and documents within the research context. While Yin's definition is narrowed to mainly positivist research approach Myers gives more freedom allowing case study to take positivist, interpretive, or critical approach and still to be good research. Case study was chosen as the research strategy. (78-79.)

The research is an intensive case study research. It aims at thorough description of a one single case by giving clear meanings for the case uniqueness. By describing the case thoroughly, it is aimed at increasing understanding of the research phenomenon. The most important purpose of the intensive case study research is to construct a good and interesting story worth reading. This is enabled, by exploring the case in its business context. (Eriksson and Kovalainen 2008, 120.)

3.3 Data collection and analysis

The empirical data was collected from semi-structured interviews. Semi-structured interviews are suitable for studying both what and how questions. (Eriksson and Kovalainen 2008, 82.) They are also the most used data collection method in business research. The other interview types are structured interviews and unstructured interviews. In qualitative research the number of interviews is not specific. Instead, it is important that it is considered how many interviews are sufficient for the current research. (Myers 2013, 122-123.)

The persons interviewed were chosen from the different organizations in the field of bioeconomy in Central Finland. The organizations were chosen according to the common members of a cluster as presented in the concept definition of a cluster in Chapter 1. The persons interviewed were among the top management of the organizations. The number of interviews and the persons to be interviewed were specified in the course of the research process. In most cases one interview led to another interview on the basis of the content of the discussions. A total of 14 interviews were conducted between 22 January and 17 June in 2014. Appendix 2 shows a list of the persons interviewed.

An outline for an interview consisted of themes that were sent to the interviewees beforehand. The aim was to enable informal and highly interviewee relevant interviewing session by letting also the interviewees bring up topics they thought were meaningful for the research themes. (Eriksson and Kovalainen 2008, 82.) The topics varied some between the interviews but each of them consisted at least the following five themes:

1. The most important organizations in the bioeconomy field in Central Finland
2. The strengths of bioeconomy in Central Finland
3. Organizations and/or structures possibly blocking new business development
4. Ways to enable new business development
5. International business development
6. Innovation gaps according to the Gap Model

The themes were planned according to the literature review in Chapter 2 to cover the research topic broadly. A list of the questions used in the interviews is as Appendix 1. The interviews were conducted by the researcher herself and the lengths of the interviews varied from 22 minutes to one hour and 11 minutes. The interviews were recorded with a mobile phone to enable the researcher to focus on the interview and allow presentation of possible probing and follow-up questions. The interviews were carried out in Finnish, Finnish being the native language of all the interviewees, and the researcher herself.

The interpretive nature of the research and the personal interest of the researcher had the researcher considering taking narrative approach to the data analysis. Familiarizing oneself with the narrative analysis would have however been very time consuming and it was decided to use more familiar data analysis method instead. Therefore content analysis was chosen as the main analysis method. It was considered a well-structured method to enable clear frame for the analysis thus helping in managing the research material and the time needed in the analysis. Content analysis is also widely used in the discipline relevant for the research. (Myers 2013, 175.)

According to Tuomi and Sarajärvi (2009) there are three different types of content analysis: content based, theory based and theory assisted. Content-based analysis aims at producing theoretical knowledge as a result of the analysis. In theory based content analysis the starting point is the theory, which then guides the data collection and the analysis aiming at theory testing. The research resembles the third described type of content analysis, theory assisted analysis. In theory assisted analysis theory is used in guiding the analysis procedure. As in the research the interviews were organized on the basis of the preplanned research themes and the gap model was used in the analysis. (95-98.)

The data was analyzed according to content analysis procedure presented in the Figure 10 below:

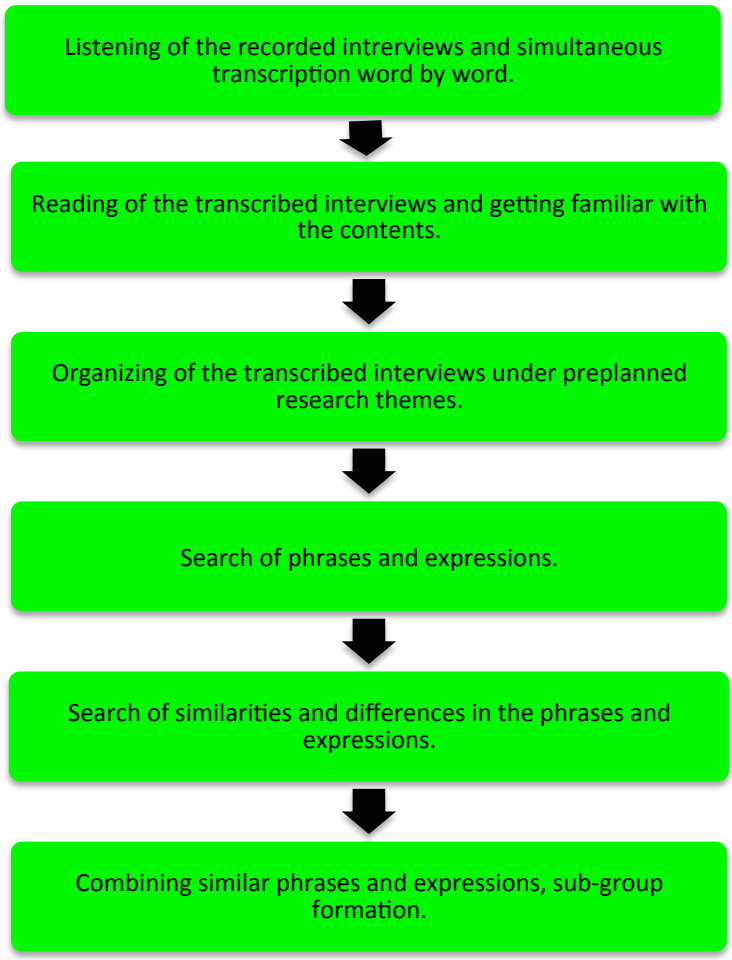

FIGURE 10: Content analysis procedure

(Modified from Tuomi and Sarajärvi 2009, 109.)

The recorded data was transcribed including all the words mentioned and also the pauses in between. This is a commonly used accuracy in business research. (Eriksson and Kovalainen 2008, 85.) The interviews produced a total of nine hours of recorded audio and nearly 100 pages of transcribed text. The researcher transcribed the interviews personally as it was considered to increase subject created understanding, research credibility and ability to develop the research themes and interviewing technique in the course of research. The interviews were aimed at being transcribed

shortly after the interview itself and before the next interview. In all the cases this was not possible since at times there were more than one interview during one day and several during one week.

In the analysis the focus was on what was said about the different themes. Each transcribed interview was first copied to Excel as transcribed. In Excel the transcriptions were divided under the preplanned research themes one thematic entity in one column. Next the meaning of each research relevant thematic entity was compressed into plain statement in the column beside the original thematic entity. In addition another set of columns was added beside the columns including the plain statements. In the columns was written the interviewee given reasoning for the original thematic entity, if available. For example, when looking the theme regarding the most important organizations in the field of bioeconomy in Central Finland. The plain statement would include the name of an organization and the reasoning would tell why the named organization was thought to be important. Table 4 below shows an example of the columns including the original citation, the plain statement and the reasoning.

Table 4. Data Analysis, From original citation to plain statement

The most important organizations		
Original citation	**Plain statement**	**Reasoning**
"Well from these public agencies...I think the Regional Council of Central Finland is in key position because it can influence the political decisions what the municipalities...and maybe also on governmental level...are making."	The Regional Council of Central Finland	Because it can affect the political decisions on municipality and maybe also on governmental level

Next the themes were highlighted with different colors. Each research relevant thematic entity was then highlighted with the same color as the relevant theme. This was necessary, as some of the thematic entities were not under the relevant themes

in the original transcriptions. The persons interviewed had for example when discussing one theme remembered something important about the previous theme, thus making the thematic entity to be relevant to other research theme as the one right above it in Excel. After having finished connecting the thematic entities, plain statements and reasoning with the relevant research themes the themes and plain statements were collected in a separate sheet in Excel. Table 5 below shows an example of the Excel sheet.

Table 5. Data Analysis, Themes and plain statements combined

The most important organizations	Enhancing cooperation	Strengths	Obstacles	Business development	International business development
Companies	Cooperation will be improved the best by common product development or other collaborative action between companies.	The very long tradition of forestry, forest as the natural resource, forest related product development, and the related machine and equipment manufacturing	Development projects are lead by public organizations.	Companies and their product development units would need the kind of operational environment that would support the development.	Home market is not enough for forest industry or technology industry.

Next each interview was analyzed on the basis of the Gap Model. In a third Excel sheet were written the names of the different innovation gaps and each gap was highlighted with different color. Columns that included the names of the gaps that had been identified by the interviewees were marked by adding texture to the highlighted topic columns. Next all reasoning related to bridging any of the gaps was copied into the columns under the relevant gaps. The table 6 on the next page presents an example of the different gaps and the related reasoning.

Table 6: Data Analysis, Innovation gaps and the given reasoning

The research gap	The capital gap	The gap between firms	The education gap	The government gap
Research cooperation ought to be tighter on national level.	Financing for product development is easily available. When entering to new markets, without a steady cash flow and with big risks, its not.	More open and constructive cooperation between companies	Education is not up-to-date.	Creates prerequisites for operation. Bioeconomy related political decisions ought to be long term and consistent.

After each of the transcribed interviews had been analyzed according to the steps as described in the previous columns each analysis resulted a three-sheet (Plain statements, Clustering, The Gap Model) Excel document where each step of the analysis was clearly visible and traceable to the original transcription. In the next phase, all the fourteen Clustering named sheets were copied into new Excel worksheet where the corresponding themes were combined. These summaries where then analyzed by carefully evaluating the meanings of each thematic entity. Similar comments were listed underneath one another and sub-groups were formed. The same steps were repeated in relation all the nine different themes. Final step of the analysis was to combine all the 14 Gap Model analyses.

3.4 Verification of the results

According to Myers (2013) research rigor and relevance are constant issues in business research related discussions. Business research is expected to be less rigorous and more relevant practically than academic research. The differences between rigor and relevance are described in the table 7 on the following page.

TABLE 7: Rigor and relevance

(Myers 2013, 12.)

Rigorous research	**Relevant research**
Scientific research	Relevant to business practitioners
Emphasis on meeting scientific standards, such as validity and reliability	Emphasis on being immediately relevant to practice
Subject to academic peer review	
Published in academic journals	Published in consulting reports or industry magazines
Academic contribution	Practical contribution

The research is aimed to be relevant to business practitioners. The results are aimed at being immediately relevant and the research resulting more a practical contribution. In addition to practicality emphasis is given to validity and reliability.

According to Eriksson and Kovalainen (2008) business research quality can be assessed through reliability, validity and generalizability. Reliability defines the consistency of the research i.e. the extent to which the research can be repeated if done by another researcher step-by-step. In qualitative research, validity aims at convincing the reader of the correctness of the report i.e. the ability to describe the phenomenon correctly. This can be achieved by "analytic induction, triangulation and member check. (Eriksson & Kovalainen 2008, 292.) Triangulation in case study can be done by using both qualitative and quantitative research methods or by combining data from documents with data from interviews. (Myers 2013, 9.)

Research can also be evaluated by proving its trustworthiness through: credibility, transferability, dependability and conformability. Credibility is assessed, by thinking whether it is possible for another researcher to make the same interpretations of the research material as the researcher herself. Transferability means ability to connect the research results with the results of some previous research. Dependability means

ability create logical, traceable and well-documented research. And, conformability describes an ability to connect research results with the interpretations in an easily understandable way. (Eriksson and Kovalainen 2008, 294.)

Eriksson and Kovalainen (2008) claim that the epistemological position should determine how the reliability and validity of a qualitative research is assessed. For example research that relies on relative ontology (several realities exist) and subjectivist epistemology (researcher and interviewee together create understandings) it is recommended to assess reliability and validity of the research by proving its trustworthiness. It is also claimed that use of triangulation can be questioned in research including interpretation and meanings. (293-294.)

Yet another set of criteria that can be used in evaluation of qualitative research with constructive perspective is included in the concept of authenticity. The criteria focus is on evaluating research fairness, respecting the participant's perspectives and ability to empower them to act. (Simons 2009, 128.)

The main aim of an intensive case study is not to produce statistically generalizable data. The aim is to understand how the case works and what is characteristic to the specific case. The case uniqueness is the key issue of the research and justifies the case study approach. Stake (1995) describes the generalization ability of the intensive case study through its meaningfulness for a research reader and its ability increase the reader's understanding. Understanding is increased when the reader's former knowledge base connects with the research and starts making associations. It is understood that such process is very natural to people and does not require use of any formal propositions or variables. (Eriksson and Kovalainen 2008, 121-122.)

There are also case study specific evaluation criteria. First of all case study has to be significant. It can for example be "unusual, unique or of general interest". The research phenomenon should be theoretically or practically interesting and relevant, and the case research should be continued until being able to conclude it with

conclusive results. The case study quality can be increased by evaluating the research evidence from more than one perspective, by presenting controversial evidence, and by writing such an interesting case report the reader must read it all the way through. (Eriksson and Kovalainen 2008, 133.)

Credibility is considered to be the most important evaluation criteria of a case study research. As the research nature is subjective, the research credibility is assessed through its accuracy in “reflecting the situation, relevance, timeliness and utility”. (Simons 2009, 128.)

Tuomi and Sarajärvi (2012) claim that sufficient number of interviewees in qualitative research is not explicit. To evaluate the research representativeness and generalizability in terms of the number of interviewees is in the end in the hands of the report reader. It is however important that in the research the sufficient number of interviews for the research is considered even if the aim in qualitative research is not to present statistical results. (85.)

4 THE RESEARCH CONTEXT

Central Finland is one of the 21 regions of Finland. The location of the region is illustrated in Figure 11 below:

FIGURE 11: Municipalities and Location of Central Finland

(Regional Counsil of Central Finland 2014a.)

Central Finland can be described as a region of lakes and forests. The region is also regarded as a region of extensive transportation and logistics as it is located in the center of road and railway network. (Regional Counsil of Central Finland, Keski-Suomi.) The table 8 below presents the key figures of Central Finland in the end of the year 2013:

TABLE 8: Key figures of Central Finland

(Päivänen, Valkeinen and Patrikainen 2014, 4.)

Inhabitants	275 320
Number of workplaces	107 800
Gross National Product (million euro)	7 828
Number of company offices	14 100
Company revenues (million euro)	11 600
Exportation (million euro)	2 500
Number of personnel	92 800

According to Official Statistics Finland there are 275 320 inhabitants in Central Finland within an area of 16 703 square kilometers. The GDP of Central Finland is 7 828 million euro and represents 82% of the national average GDP. (Statistics Finland, 2013.) In the end of September 2014, the unemployment rate in Central Finland was 15.4%. In the end of December the rate had increased into 17.9%, representing 23 008 unemployed persons. The unemployment rate has been increasing for the last three years. It is only in the Kainuu province that the unemployment rate is higher than in Central Finland. (Keski-Suomen elinkeino-, liikenne- ja ympäristökeskus 2015.)

In Central Finland the biggest decrease has affected employment in paper and cardboard manufacturing. (Statistics Finland 2014a.) Keskisuomalainen wrote on 20 January 2015 that the cooperative negotiations of UPM had been concluded and that they had decided to close one papermaking machine in their Jämsänkoski factory in

Jämsä, Central Finland. The decision affected the unemployment of Central Finland by 138 new unemployed persons. (Laatikainen 2015.)

4.1 Bioeconomy of Central Finland

In Central Finland the most significant biomass resources are forests, totaling in nearly 1.4 million hectares (14,000 km2). The strongest forest industry sectors in are "pulp and paper, wood products, forestry and production of machineries and equipment". Central Finland is known for the significant bio-energy usage and the related national top representing research, development skills and education. Currently, the local biomass covers half of the total energy consumption in the region. Central Finland aims at being fossil fuel free (use in transportation not included) by 2020. (Knuuttila et al., Central Finland research agenda 2020 for sustainable use of biomass, 4.)

Yearly, the use of wood is nearly 6 million solid m3 in Central Finland. The amount is less than the annual growth and more than the annual harvest. The harvested wood "is processed into paper and timber products, or converted into bioenergy or higher value products. The forest industry produces by-products and residues that are considered to be valuable materials for other internal and external processes". Also significant amount of energy, more than 6 TWh (21.6 PJ), is produced from wood-based materials "such as forest chips, black liquor and saw dust". The produced energy is used mainly "in large-scale heat and power generation, in industrial processes and in district heating". Peat is also used as a source of energy in Central Finland where the annual peat production is "2 million loose m3 (1,8 TWh, 6,5 PJ) and it covers about 3⁄4 of the regional peat consumption".

(Knuuttila et al., Central Finland research agenda 2020 for sustainable use of biomass, 5.)

According to the Jyväskylä city statistics the big bioeconomy companies in the region employ about 8000 persons and result in about 2.0-3.0 billion euros in terms of export turnover. The turnover of the region's bioeconomy SMEs was 150 million euro in 2011 and they employed about 1000 persons. Energy companies had 510 offices in Central Finland in 2012. The companies' turnover was 1.1 billion euro and the number of personnel was 3700. The regions strength in bioeconomy is claimed to be the development and commercialization know-how. It is also claimed that the region has extensive skills and know-how in relation to the bioeconomy value chain and an international partner network. The region is also said to be a well-accepted operator in national level bioeconomy development projects. (Andersson and Mäkinen 2013, 7.)

Regional Council of Central Finland elaborates Central Finland's focus on forest industry related manufacturing by comparing the proportional number of Central Finnish workplaces within certain industries to the corresponding national proportions. On the basis of the comparisons, the proportions of the production of machinery and equipment, paper industry, wood industry, and forest economy related jobs in Central Finland are nearly twice the national proportions. Manufacturing of machinery and equipment means production of forest industry related machinery and equipment. In addition to the mentioned specialty fields of Central Finland also education related proportion of workplaces is significant in the region. (Päivänen, Valkeinen and Patrikainen, 5.)

The significant decrease in the forest industry revenues seemed to be over in the late 2012. During the year 2013 the revenues started however decreasing again and ended up being more than 1% less than during the previous year. The reason for the continued decrease was the weak development of export. Since the 2009 recession the value of the forest industry export has come up by only about 5%. The number of personnel in forest sector companies has decreased by about 10% at the same time. During 2013, the forest industry revenues were 1700 million euro, export 1100

million euro and the number of personnel 3400 man-years in Central Finland. The number of forest industry offices was 150. (Päivänen, Valkeinen and Patrikainen, 9.)

According to Jyväskylä Innovation, which was formerly one of the area competiveness development organizations in the area, Central Finland has all the elements needed in becoming an expert in bioeconomy related know-how. There are several significant bioeconomy related companies in the area. These include for example Metso, Valtra, Vapo, Metsä Group, CP Kelco, and UPM. There are also many SMEs that have the needed production, growth and technology potential to grow international. VTT Jyväskylä is a nationally and internationally respected research organization in bioeconomy related applied research. Jyväskylä University together with Jyväskylä University of Applied Sciences have the capabilities to provide the area with increased knowledge and skills in relation to bioeconomy. These organizations and companies together are thought to possess the expertise needed in enabling bioeconomy related business development and business growth. (Ryyppö 2013, 9.)

Regional Council of Central Finland states that forests and sustainable forestry are the strengths of bioeconomy of Central Finland. They are also the great possibility for the field. New business can be formed through tightened cooperation of biotechnology companies, universities and research centers. Local companies must grow in cooperation with other companies and work with the public organizations to develop an operational environment, which supports the development of strong bioeconomy in the area. (Regional Counsil of Central Finland 2014b, 12-13.) The most important industries as well the operators included in the bioeconomy of Central Finland are presented in the cluster map, Figure 12 on the next page.

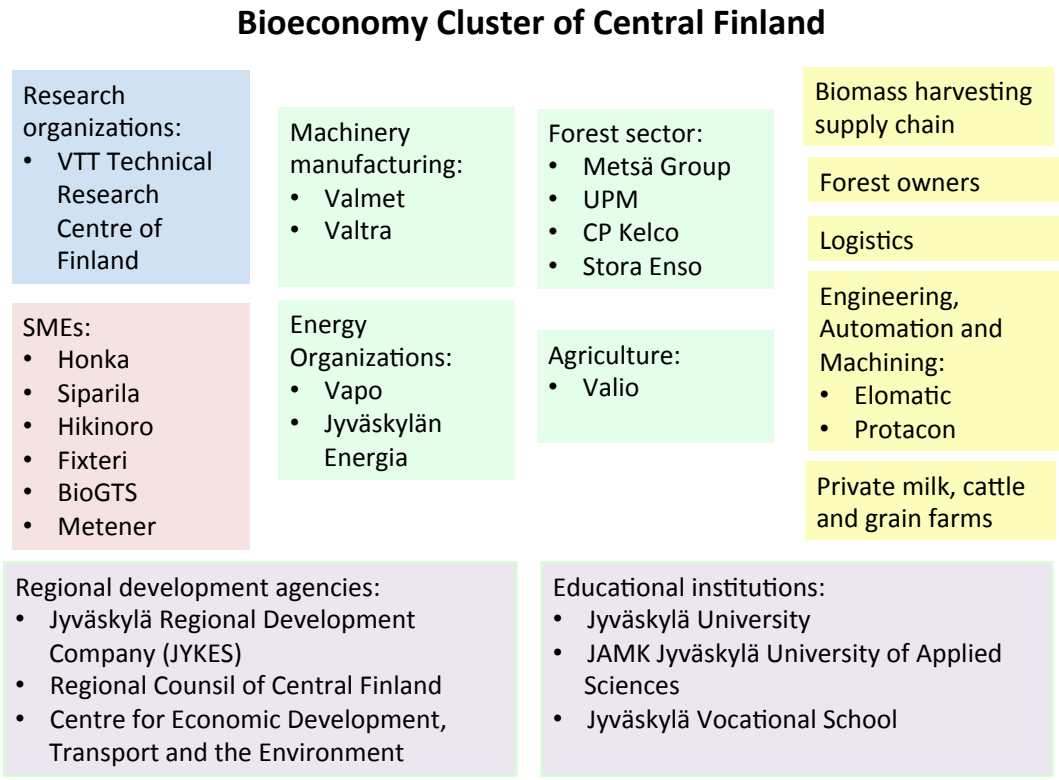

FIGURE 12: Bioeconomy Cluster of Central Finland

(Modified from Harvard Business School, What are Clusters?.)

In the center of the cluster map are the industries and the related big companies that are considered to be also among the engines of the regional economy. Below are the public operators including regional development agencies and educational institutions. On the left side are the research center and the SMEs, and on the right side the most important suppliers for the big companies.

On 24 April 2014 Metsä Group announced its intention to build a new bioeconomy product factory to Central Finland. (Metsä Group 2014d.) The investment was noticed very widely in the Finnish media since the investment size was historically remarkable even in the national level not only from the Central Finland point of view. The largest investment in the Finnish forest sector ever would mean yearly revenue

of 0.5 million euro and more than 2,500 new jobs in its value chain. (Metsä Group 2014c.)

The business model of the new factory is based on partner network formation. In such business model new products are developed in cooperation with different organizations in the factory's value chain. The new factory is expecting different sized biomaterial and bioenergy companies to join in its value chain, and also companies in different developmental phases. Especially the small and medium sized companies are believed to be benefitting from the new opportunities in relation to producing high value bio-products. (Metsä Group 2014b.)

The plans are to build the factory on the same site with the company's current pulp mill in the City of Äänekoski. In the press release from 9 October 2014 Metsä Group announced that the demolition of the existing factory was starting. The demolition would take about six months and the final investment decision was to be made in the spring 2015. The operations of the new factory would be starting on 2017 should the investment decision be positive. (Metsä Group 2014a.)

4.2 Regional programs, projects and studies

4.2.1 The Strategic Centres for Science, Technology and Innovation (SHOK)

The Strategic Centres for Science, Technology and Innovation (SHOK) is a national level program providing cooperation opportunities for research institutes and companies using research data. In 2008-2012 Tekes granted a total of 372.5 million euro to finance the research programs run by the centers. The centers are responsible for implementing long-term research plans that businesses and research institutes have prepared in cooperation. Each of the centers is coordinated by a non-profit limited company where the shareholders consist of companies, research

institutes and universities. One of the named centers is Finnish Bioeconomy Cluster FIBIC coordinated by public-private cooperation Forestcluster Ltd.

(Ministry of Employment and the Economy 2014a.)

FIBIC aims at being the world's leading forest cluster by 2030. The strategic focus areas of FIBIC are Intelligent, Resource-efficient Production Technologies, Future Biorefinery and Sustainable Bioenergy Solutions. The key research areas of the cluster are the following:

- Customer and user as the drivers of development
- Possibilities offered by new materials, services and business models
- The forest cluster as a builder of a sustainable bioeconomy

(Gabrielsson et al. 2010, 4.)

FIBIC's strategy highlights the importance of skilled people and an effective education system for the success of the Finnish forest cluster as a whole. New skills are required to assess the entire value network in search of new business opportunities. Networking skill arises as one of the most important ones in the value network establishment. The skill is essential in gaining understanding of the end-user needs and being able to find the right partners to be able to fulfill the needs. (Gabrielsson et al. 2010, 14.)

Small companies are often lacking the needed resources to launch new innovations effectively. Cooperation with bigger companies can for example allow small companies to focus on innovation process itself while bigger companies can improve the competitiveness of the innovation by offering extensive accompanying services for the innovations. Partnering within the cluster is not enough in today's world. Effective networking has to cross cluster boundaries as well to enable new business opportunities and creation of stronger value networks. Forest cluster cooperation with the health cluster is an example of a cluster boundary crossing cooperation. To succeed in effective networking and partnering development and application of

functional open innovation principles is needed from the forest cluster. (Gabrielsson et al. 2010, 14-15.)

4.2.2 The Innovative Cities Programme (INKA)

The Innovative Cities Programme is a national level program initiated on February 2014. The program is funded by the Finnish government, the urban regions participating in the program, and the EU Structure Fund. Ministry of Employment and the Economy in Finland has approved bioeconomy as one of the five national themes within the program. The aim of the program is to create new jobs from new business and new company development with the aid of high-quality competence. The program focuses on close regional cooperation and sharing resources between science, education, companies and the government. The concrete actions of the program include development of new innovation environments, creation of pioneering markets, and leveraging of expertise in national and international cooperation. (Ministry of Employment and the Economy 2014b.)

Joensuu was named to be the leading city within bioeconomy and Jyväskylä and Seinäjoki were chosen as partner cities. A steering group including representatives from the Ministry of Employment and the Economy, the Ministry of Social Affairs and Health, the Ministry of Justice, the Ministry of Transport and Communications, the Ministry of the Environment, Sitra and Tekes was formed to take the responsibility of the strategic steering and program evaluation. Operative management and administration of the program will be the responsibility of Tekes. (Ministry of Employment and the Economy 2014b.)

In Jyväskylä region bioeconomy was chosen as one of the three targeted knowledge areas. The other two are cyber safety and well being of the people. The aim is to develop Jyväskylä region as a center of innovation to enhance the regions global competitiveness. It is believed that this can be achieved by bringing together people

from different organizations globally to participate in development of humane new products. (Andersson and Mäkinen 2013.)

4.2.3 Centre of Expertise Programme (OSKE)

Centre of Expertise Programme started already in 1994. The program aimed at connecting companies with public actors and research. By forming such networks it was targeted to enhance collaboration and regional viability. For the period of 2007-2013 the already enhanced regional collaboration was being developed further. Thirteen viable clusters with growth potential were chosen to participate in the program. The aim was to stimulate innovations and development of new companies and products, thus enhancing regional appeal and enabling attracting of international investments and experts. (Ministry of Employment and the Economy 2013.)

One of the OSKE cluster programs was Renewing Forest Industry (Uusiutuva metsäteollisuus). The participating regions in the program were Joensuu, Jyväskylä, Kajaani, Kokkola, Mikkeli, Lappeenranta and Turku, Lappeenranta being the center of the cluster program. Jyväskylä region area of expertize was Enabling Technologies (Mahdollistavat Teknologiat). (Appelgren, Uusiutuva Metsäteollisuus – klusteriohjelma 2007-2013.) The program focused on improving development of research and SME based innovations and their utilization in cooperation with VTT Technical Research Centre and other research organizations. The aim was to enhance technology initialization and commercialization. (Nyberg 2008.)

Jyväskylä Innovation, a subsidiary of Jyväskylä Regional Development Centre (JYKES) was manager of the program. The program ended in the end of 2013. Jyväskylä Innovation Oy was closed down in the end of 2013. One of the last projects of the Jyväskylä Centre of Expertize program was to start focusing on the new Innovative Cities program and thus to develop a roadmap for Jyväskylä bioeconomy. The roadmap describes the needed actions in relation to the following themes:

1. High value products from biomass – value chains in production of new biomaterials and bio-chemicals
2. Efficient biomass logistics – Biomass in use effectively from the production site
3. New high value bioenergy products and services – Significantly higher value products in addition to wood burning
4. Business from wide scope resource efficiency – Development of industrial symbioses

(Ramboll Management Consulting 2013, 3.)

In addition to the themes the roadmap describes actions needed in improving innovation, education and collaboration. (ibid., 3.) Also targeted actions enabling company growth are presented as targets of the new Innovative Cities (INKA) program: first customer pilots, first references, demonstration platforms, business network formation. (ibid., 22.)

4.2.4 Bioclus

Bioclus aka Developing Innovation and Research Environment in five European Regions in the field of Sustainable Use of Biomass Resources was an international development project funded by the FP7 Knowledge Regions EU program and aiming at enhancing competitiveness and growth of five European regional biomass clusters. Central Finland was one of the regions. The other regions were Navarre (Spain), Western Macedonia (Greece), Slovakia, and Wielkopolska (Poland). The project was coordinated by JAMK University of Applied Sciences. The projects final event was held in Brussels in October 2012. (Bioclus 2014.)

During the project many researches were carried out to assess biomass related business potential and the innovation environment of each of the regions. The project aim was to find out possibilities to build local sustainable business from biomass through collaboration of research communities within Europe. The project

increased regional knowledge and knowledge on cooperation possibilities with the other project regions. In Finland the project realized as several different regional publications. Table 9 below presents the names of the publications and the publishing dates available. (Bioclus 2014.)

TABLE 9: Regional publications of the BIOCLUS project in Finland

(Bioclus 2014.)

Central Finland Innovation Development Track	September 2012
Mentoring and Mutual Learning Plan: Central Finland	February 2012
Regional Action Plan 2020, Central Finland (in Finnish only)	October 2011
Central Finland Research Action Plan 2020 for Sustainable Use of Biomass	May 2011
Strategic Research Agenda of Central Finland	March 2011
Central Finland Regional Research Agenda 2020 (in Finnish only)	May 2011
Review of Biomass Related Programs and Initiatives	April 2011
Two SWOT analyses in relation to biomass research and development, business development and biomass users	
Biomass resources, production, use, processing and logistics in Central Finland 2010 and future prospect for year 2020	Updated in autumn 2012
Analysis of biomass potential in Central Finland (in Finnish only)	September 2010
Analysis of biomass present use and potential in Central Finland (Summary of the Finnish language analysis)	
Mapping of operational context in Central Finland: Legislation, strategies and policies related to sustainable use of biomass resources	
Analysis on innovation environment in Central Finland (Summary of the Finnish language analysis)	
Analysis of biomass related research facilities in Central Finland	
Education in Central Finland related to sustainable use of biomass resources in Jyväskylä University and JAMK University of Applied Sciences	
Presentations of the professionals of the sustainable use of biomass in Central Finland.	
New Business Potential in Sustainable Use of Biomass Resources in Central Finland. (Summary of the Finnish language analysis)	
Review of biomass related programmes and initiatives on regional, national and European level and research & technology platforms	

According to the BIOCLUS project, new business opportunities in relation to biomass in Central Finland will the most likely be found from bioenergy. More specifically from “forest chip and peat use in heat and electricity production, and in the new biorefinery planned by Metsäliitto and Vapo to Äänekoski forest industry mill complex”. Other significant opportunities were identified to be arising from production of pyrolysis oil, larger scale bioethanol, and torrefied and pelletized biomass. Smaller opportunities were identified in replacing heating oil with pellets in building specific boilers and small heat plants, feed-in tariffs and new technology in small-scale wood and biogas CHP-production, and small-scale bioethanol production from municipal and industrial biodegradable waste. (Penttinen 2010, 1.)

4.2.5 New Value Networks of Bioeconomy

The New Value Networks of Bioeconomy (Biotalouden uudet arvoverkot) was a project, which aimed at improving regional abilities to enable bioeconomy related business and cooperation possibilities, and new business development from new value networks. The project was funded by TEM and managed by Jyväskylä Innovation. During the project several demand based and viable value networks were identified and a few of them taken into closer inspection. The special interest was towards value networks that cross cluster borders. Value networks that were identified were mainly related to distributed bioenergy production, biofuels, nutrient recycling, and forest sector new business opportunities. Below the identified value networks are listed in more detail:

- Enhanced biomass collection by first thinning
- Biogas production related value networks
- Utilization of biogas mill recycling nutrients
- Bioetanol value networks
- Extraction technologies (hemi cellulose, lignin)
- Ash utilization, nutrient restoration
- CO2 collection and utilization

- Excess heat utilization in indoor tank fish farming
- Torrefication
- Seaweed farming in forest industry waste waters for bioenergy and recycling nutrient raw material
- Integrated energy terminal aka RDF (refuse-derived fuel), biofuel logistics and terminal operations
- Energy entrepreneurship
- Pyrolysis oil
- Combined production of biodiesel and biogas from grease containing waste

(Pakarinen 2013, 5-6.)

In addition to identification of the value networks the project aimed at distributing the value network related knowledge and best practices within all the three participating cluster programs: the energy, the environment and the renewed forest industry.

(Pakarinen 2013, 5.)

5 RESEARCH RESULTS

In this chapter the research questions presented in Chapter 1 are being answered. As the research approach is descriptive and interpretive, the intention is not to provide solely numerical statistics or proportional percentages. It is not important, how many respondents have said certain things. Instead the following paragraphs provide an interpretation of the current issues in relation to bioeconomy in Central Finland through a synthesis of the opinions of different actors in the field. Numbers are not however completely forgotten. They are used at some points to highlight the similarities between the respondent's opinions.

5.1 Strengths

The strengths of bioeconomy in Central Finland were addressed first by identifying the most important organizations within the field of bioeconomy in Central Finland, and second by looking straight into the strengths. The most important organizations according to research are the following:

- Companies
- Regional development organizations
- Educational institutions
- Research organizations
- Energy corporations
- Public sector
- Financing

All the 14 respondents mentioned companies to be among the most important bioeconomy organizations in Central Finland. They are the ones to create the revenues, new jobs and possess the growth potential. Regional development organizations were seen important additional resources for SMEs. JAMK University of Applied Sciences and Jyväskylä University were recognized as the most important educational institutions for the area. Jyväskylä University was noted because of the basic research especially in its Faculty of Chemistry. JAMK was noted because of the Institute of Bioeconomy and the entrepreneurial education. VTT was recognized as the strongest research organization in Central Finland. Other significant organizations according to the research were energy corporations, the public sector, and financing. Energy corporations were considered important because of their power to choose to utilize biomass in their energy production. Appendix 3 presents a more detailed table of the most important organizations.

Secondly, the respondents were asked to name the strengths of the Central Finnish bioeconomy. The following concepts were named as the strengths.

- Forest resources and the related knowledge and skills
- Natural bioeconomy orientation
- World-class research skills
- Bioenergy related knowledge and capabilities
- Cooperation readiness
- Agriculture
- Valmet; its local manufacturing site and international connections
- City of Äänekoski; its traditional forestry industry and the related investment potential

Forest resources and the related knowledge and skills

Thirteen respondents considered forest to be the greatest strength of bioeconomy in Central Finland. Forest is seen as a strength, not only because of being an important raw-material, but in the sense, that Central Finland has knowledge and capabilities in relation to the whole forest industry value chain, starting from the long industry tradition, and leading to extensive processing and high value products. From sapling to harvesting, the related machine and equipment manufacturing, and also the internationally well known big companies that utilize wood as pulp, wood products, paper, board, end products, and produce by-products such as wood chips and saw dust for utilization of other companies.

Natural bioeconomy orientation

The second strength according to the research is the natural bioeconomy orientation of Central Finland and also the whole Finland as a nation. Finland was said to have a brand of a country of forests and clean environment. Bioeconomy was said to be very characteristic for Central Finland. Jyväskylä region was recognized as having a strong orientation towards bioeconomy and sustainability, and the people in Central Finland were said to have a strong natural connection to nature.

World-class research skills

Central Finland was said to have a strong research tradition and capabilities both in basic research and applied research. VTT and especially its Jyväskylä office was recognized for having long tradition and world class research skills in forestry related research. Also the innovation cooperation between the research center and companies was recognized.

Bioenergy related knowledge and capabilities

According to the research Central Finland has knowledge and capabilities also in relation to the whole bio-energy value chain. Bioenergy was seen being widely utilized in the area, and having expertise in relation to smaller scale bioenergy plants, wood based materials, and their utilization in energy production. A notable concentration of biogas operators was also recognized within the area.

Other named strengths were **cooperation readiness, agriculture, Valmet with its local manufacturing and international connections, and the city of Äänekoski**. Good cooperation was identified between different biomass processes and different organizational operators in the area. Central Finland as a whole was also said to have a strong cooperation culture. Agriculture was considered important because of its notable share of workplaces and revenues in the area including meat production, milk production and Valio milk processing plants. Valmet is seen significant for the area due to its local machinery-manufacturing site and international operations, and the city of Äänekoski due to its current forest industry operations, and especially due to its future potential through the Metsä Group investment intentions.

5.2 Obstacles to new business development

The respondents were asked to name organizations or structures possibly blocking new business development within the field of bioeconomy in Central Finland. The respondents identified the following obstacles:

- Financing
- Legislation, policies, directives
- Outdated attitudes and procedures
- Economical uncertainty
- Missing common strategy
- Promotion one's own interests
- Administrative structures
- Big companies
- Lack of resources
- Research far from business

The following paragraphs present the reasoning behind each of the identified obstacles:

Financing

According to the research bioeconomy is seen as extremely investment intensive field. Financing is needed in realizing the investments, however there are difficulties in obtaining financing for example for growth where there are greater risks present. Small companies have financing available for many kinds of preliminary investigations, but not for actual research and development in connection to first customer projects or concretely entering into a new international market. Financing requirements are said to be very strict in stating where the financing shall be used.

Public funding framework is also said to be outdated because they are still promoting mostly long-term basic research. For big companies growth financing is not available for growing their current businesses. They need to finance their own growth from their future revenues. For example, due to the economical uncertainty, future revenues cannot necessarily be foreseen and therefore the investments are often postponed.

EU funding programs are also seen problematic. One problem arises because of their periodic nature. The people working for one program do not necessarily work for the following new program. One year in between the programs is not productive as the resources are focused in wrapping up the previous program and preparing for the new one, with different people and without proper transfer of knowledge and best practices. Another problem with the EU programs is that they are focusing on very small projects and strictly restricting the usage of finance.

Legislation, policies, directives

The second obstacle according to the research is legislation, policies and directives. Especially bioenergy is heavily regulated. The regulations are seen to be creating uncertainty and discontinuation in the market. Legislation and subsidy policies affect heavily for example on wood pricing, young forest harvesting and milk production. Unclear subsidy policies can postpone investments for example in a situation when a new subsidy is replacing an older subsidy. Due to very lengthy verification process of a new subsidy it is not necessarily known weather the amount of subsidy received will be lower or completely non-existing in the near future.

EU level directives can also realize in significantly higher costs. For example revision of directive on the sulphur content of certain liquid fuels will increase cost of logistics of the Finnish export industry early 2015. Another problem arises from the narrowness and detailed formation of the directives and policies. Strict and precise implementation of the instruments may create not wanted barriers for business

development. Sustainability for example can turn non favorable for the slow growing Finnish forests.

Outdated attitudes and procedures

Forest industry has a very long tradition in Finland and in Central Finland. The tradition is a proof of the industry expertize. According to the research the tradition is also considered as an obstacle for new business development. Bioeconomy as an industry must change and be renewed. To succeed in the renewal, a significant change is required from the people, their attitudes and the traditional procedures. There is uncertainty if these are flexible enough to be renewed.

Economical uncertainty

Economical uncertainty makes companies less willing to invest. According to the research the current economic environment in Central Finland focuses on very short-term results and profits. This realizes in short term decision making and purchases, making long-term planning required in investments very challenging.

Missing common strategy

The research suggests that Central Finland is lacking common strategy and common will in turning bioeconomy opportunities into new businesses. Several different organizations have done their own strategies to promote bioeconomy but there is not enough effort in looking for regional or national synergies or taking care of effective implementation of the strategies.

Promotion one's own interests

Networking across regional borders is limited and the organizations tend to focus too much on their own doings. There is even unnecessary competition between public organizations within the region.

Administrative structures

Administrative structures are one reason for the limited cooperation between different regions. For example national level or EU level programs focus on regional development and cooperation of organizations within the regional borders. Such programs are usually also administrated by a public organization and therefore the focus is quite far from business creation. Because of administrative structures decision making, in regional and national level is very slow.

Big companies

According to the research big companies are seen as strengths in Central Finland, but they are also seen as obstacles. It is suggested that small companies sometimes fear big companies and find them hard to be approached with business ideas. Sometimes the ideas also get lost inside big organizations without being developed into real businesses, although there is the business potential. In addition, big companies who have their head quarters outside Central Finland or Finland, have different strategies than smaller local companies. The strategies do not necessarily support local interests.

Lack of resources

Lack of resources is not an obstacle only for a small company. Also other organizations have at times trouble finding the people and time needed for different programs, projects and development works. This has been seen to realize for example in tiredness towards regional programs.

Research far from business

Lack of resources is also affecting the long distance from research to actual business development. The research organizations in Central Finland are recognized as doing high standard research. The companies paying for the research are getting accurate

research results. The time after receiving the results is considered a problem. Companies receiving the results do not necessarily have the resources needed in developing the results into actual business. Lack of resources can also be seen from the research organization's point of view. They do the research but do not have the resources needed to actively study the related business potential and aim at business development. Research is also said to be focusing too much on basic research.

In addition to identifying business blocking structures or organizations, the respondents were asked to identify so called innovation gaps according to the Gap Model presented in section 2.2. According to the research all of the model relating gaps exist in Central Finland and almost as evidently. Table 10 below presents the identification of the innovation gaps.

TABLE 10: Innovation Gaps within the field of Bioeconomy in Central Finland

Name of the Innovation gap	**Number of identifications**
The capital gap	13
The research gap	13
The gap between firms	12
The gap between clusters	11
The government gap	10
The education gap	10
The global market gap	9

(n=14)

As can be seen, all the named innovation gaps were recognized to exist within the region. The capital gap, the research gap and the gap between clusters were the most recognized gaps. The global market gap was not recognized by the respondents, which were involved in international operations already.

5.3 Enabling new business development

It is suggested that new business would be developed for example in relation to high value wood products, wood construction, and utilization of industrial waste and side streams. According to the research new business development can be enabled, by focusing on the following research recognized concepts:

- Forestry tradition utilization
- Cooperation
- New attitudes and procedures
- New financing policies and criteria
- Enhanced research result commercialization
- Heavier focus on customers and markets
- More entrepreneurship education
- Support to small companies
- Sharpened regional appeal
- Right government role

Forestry tradition utilization

Central Finland and Finland overall have long tradition in the forest sector bioeconomy and therefore an extensive knowledge and skills in relation to the whole value chain; from growing the wood to high value end products, and the related logistics in getting the products to the customers. The tradition is considered to be the real asset on which to base the bioeconomy related new business development.

Cooperation

Central-Finland and Finland overall are believed to be readily capable of cooperation. The capability should be further enhanced, by focusing on developing networking of regional organizations. Also formation of networks with region external organizations

in the field ought to be stimulated. The network formation focus should be on benefits and synergies identified in relation to organization specific capability assessments.

New attitudes and procedures

New attitude is needed in enabling focusing first on possibilities instead of obstacles. A small company's ideas are not necessarily realizable when presented the first time, but with the right partners the ideas could be developed into real products. Sharing ideas early is seen necessary for being able to succeed in the current and very demanding global competition. Traditional processes can also be renewed, by looking them from new perspectives. For example, an existing process can be divided into smaller sections and after evaluating each of the sections, re-evaluate the process overall. New perspective should be utilized also in targeting consumers as customers instead of the more custom B2B customers. It is suggested for example, that wood construction would be adapted and emphasized in the region thus enabling it becoming more familiar to consumers.

New financing policies and criteria

Financing policies should enable investments also from other bioeconomy sectors than forestry. In that way also the developed new products could find customers from other than the traditional forest industry customers. Financial support is needed in enhancing common development process of company and researcher. Also courageous experiments are needed.

Enhanced research result commercialization

Currently research is regarded as being far from actual business development. A step-by-step process from the research organizations' desk to actual business is suggested to being developed. Research is suggested also to become more closely company related. Companies could more often ask the research organizations to do specific research to advance their innovation. Companies would also need a place to

test their ideas in relation to for example pilot projects and marketing in cooperation with other organizations. Also designers and researchers would need support and a place to advance their ideas. Companies themselves are suggested to double their research and development investments.

Heavier focus on customers and markets

Bioeconomy is suggested to be focusing more on customers and markets. The way it would enable development of products the customers need and want. Also flexibility and adaptability should be among the key focus areas of the field.

More entrepreneurship education

The amount of entrepreneur education directed to young people is suggested being increased. Bioeconomy related business development is not seen to be lacking opportunities instead it is seen to be lacking doers.

Support to small companies

Small companies are seen important for new business development as they are considered to be more flexible and innovative compared to big organizations. They are however very small alone and need both regional developers and bigger companies to help them in business development. Small companies are suggested to be assisted in opportunity recognition, forming partner connections, planning investments, making agreements, doing calculations, and making professional looking presentations. Big companies are suggested to release them IPR, which they are not using themselves. Research organizations are suggested to be designing small company specific research processes. A researcher could for example work part time in few small companies managing their research and development. The company would benefit from additional resource and the researcher would return back to the original position with increased understanding of the real business life.

Sharpened regional appeal

The regional appeal is suggested to be sharpened, to attract more investments. The following means to sharpen the appeal were identified: ensuring high quality of resource base and education, securing local manufacturing, and utilization of the clean nature in marketing (an asset which cannot be copied).

Right government role

The government is suggested to stay out of the actual business. The right role for the government would be to give financial and moral support and also to secure well functioning operational environment for the companies in the field.

5.4 Enhancing regional collaboration

According to the research collaboration between the different cluster members in the field can be enhance by focusing on developing the following three concepts:

- Whole Finland together
- Development of companies as the reason of collaboration
- Regular interaction among organizations in the field

Whole Finland together

Finland is regarded as being too small to focus on collaborating only with the regional organizations. Open idea sharing is suggested to be emphasized, and to aim at finding the best synergies on national level. For example any arranged regional gathering to advance bioeconomy is suggested to include invited organizations also from outside the region. This would enhance new idea creation. Thinking what type of operators the region needs in contrary to what operators already exist is also recommended. Financing policies are suggested to be changed, to require collaboration over regional borders. It is also claimed that there is a need for an organization, which would see bioeconomy from the national level and would thus

be able to suggest potential synergies. New forms of collaboration and open-minded attitude, is demanded.

Development of companies as the reason of collaboration

The research shows that business development should be the focus of collaboration. The most beneficial collaboration is seen to be taking place within real research and development contexts of companies. A separate cluster organization is claimed to be easily employing itself. Should there be a separate cluster organization, company representatives should be the ones to lead its operations.

Regular interaction among organizations in the field

Regular meetings of different organizational members are seen important. Such meetings would enable formation of common strategy and means to its realization. In addition to organized meetings, informal meetings are also needed. A small company focused bioeconomy field gathering is recommended to being organized.

5.5 Enabling International business development

Overall internationalization is considered a big opportunity for the bioeconomy in Central Finland. It is also seen as a necessity for the new business development in the field. Without an export possibility bioeconomy products are thought not to become profitable unless the products would be direct replacements to existing fossil resources based products. The research identified the following requirements for enabling successful international business development:

- Higher value bio-products
- Functioning operational environment, home market and cooperation
- Support from the already international companies in the region
- Better market knowledge and enhanced market entry efforts
- Differentiation

Higher value bio-products

Finland is far away from the global markets. In order to enable a good profitability the aim would need to be at getting the value of products higher. Higher value increases the products' price per kilogram thus decreasing the proportional cost of logistics in the product pricing. The higher the value is the more profitable it will be to transport the products to far away markets. This would then enable keeping manufacturing of the products in Central Finland.

Functioning operational environment

To stimulate growth and competitiveness of the region the operational environment must be kept well functioning. This requires for example keeping the infrastructure in good condition at all times, providing sufficient early stage financing, and enhancing cooperation in internationalization efforts. Well functioning operational environment is seen important also in attracting new investments in the region. And, on the contrary new investments are needed to maintain the functionality of the operational environment.

In Central Finland newly established companies are usually very small. Their resources do not necessarily enable focusing on growing their business into international business. Many small companies joint resources however are much more than the resources of one single company. Also emphasis should put to finding ways for the already international companies to help in the internationalization of smaller companies.

To some companies growing international is not a necessity.

Well functioning home market may be sufficient to stay profitable. Well functioning home market is also seen important in aiming at entering international markets. Proof of product functionality, sales and profitability in the home market will help in entering international markets.

Better market knowledge and enhanced market entry efforts

It is important to manufacture products and services that customers want. Therefore it is important to understand the customers' needs. Bioeconomy of Central Finland has already global operators with an extensive market knowledge regarding the traditional industries. In the industries where bioeconomy is seen the most likely to be focusing on in the future, market knowledge and international connections are seen very limited and even non-existing. Such very potential new sector is for example the textile industry.

Market entry efforts must be enhanced. It is seen necessary to be able to find ways to better understand the potential bioeconomy customers and form connections to people who know the potential markets and can help in accessing the markets. This is though to be enabled through finding new people to advance bioeconomy. Politicians' talks would need to be transferred into actual doing i.e. finding people who are willing to do and also people who are at the international markets already. Real actions are very much hoped for instead of all kinds of preliminary investigations and reports. The real actions would include for example financing of marketing campaigns and customers' pilot projects within the new markets.

Differentiation

It is necessary to be able to differentiate own company and own products from the competitor companies and their products. Bioeconomy is considered an opportunity for differentiation. Finnish way of doing bioeconomy should be further enhanced by for example promoting the certified bioeconomy processes and turning such reliability into one of the Finnish bioeconomy strengths. Central Finnish way of doing bioeconomy could be enhanced by for example focusing on cooperation between the research centers and educational institutions.

5.6 Bridging the innovation gaps

Business development can be enabled also by identifying ways to bridge the innovation gaps i.e. finding ways to better the interaction among companies and other actors (research centers, other companies, educational institutions, financing organizations, the government, and also other clusters and global market) in the field of bioeconomy in Central Finland. The bridging suggestions according to the research are presented in the following two tables. In the Table 11 on the following page are presented the ways to bridge the bioeconomy cluster of Central Finland internal gaps.

TABLE 11: Bridging the cluster internal gaps

Bridging the research gap	Bridging the capital gap	Bridging the gap between firms	Bridging the education gap	Bridging the government gap
Less academic research and more applicable and business related research; Sharpened pathway from basic research to business development through applied research	More financing to applied research, short-term research, for big companies, and for SMEs	More courage in applying new procedures, more open information sharing, and constructive collaboration	More education in relation to business and infra development, chemical industry and chemical forest industry, surface material planning and sales	Regular contacts and conversations with companies, Letting the companies take care of business itself
Entrepreneurial attitude to research result commercialization	More early stage financing for pilot projects and market entries	Fair distribution of benefits and profits in collaboration projects	More up-dated, and enhanced bioeconomy related education	More flexibility to development project boundaries
More collaboration among research organizations and industry; and among domestic research organizations	More comprehensive, bioeconomy focused, and research organization collaboration encouraging funding instruments	Active collaboration in advancing new innovations	More company involvement in education planning, flexibility in education organization	Less bureaucracy, up-dating the governance, politics and legislation
More research on modern ways to treat wood; Utilization of foreign research	Emphasis on long-term investment productivity follow-up	Sharing of IPR		Keeping infra in good condition always, building new infra when needed
		Networking of different fields		"Walk the talk", increase ability to make long-term and comprehensive decisions and enhance implementation of the decisions
		Consideration of the value network as a whole in partnership formation		Regional strategy development, Focus on enabling investments

According to the research the research gap can be bridged, by increasing the amount of applicable, closely to business related research, and by improving research result commercialization. The capital gap can be bridged, by offering more early stage financing and by changing financing requirements to require wider collaboration of different organizations. The gap between firms can be bridged by sharing ideas more openly and by giving up outdated attitudes and procedures in general. Educational institutions can bridge the educational gap by offering more up-dated education in relation to business development and by cooperating more effectively with another education providers for example by allowing students to attend courses also in other educational institutions. And, the government gap can be bridged by for example letting the companies take care of actual business, pay special attention to implementation of decisions and interacting regularly with companies.

The Table 12 presents the ways to bridge the two cluster external gaps. The external gaps are a gap in relation to another clusters and the gap in relation to the global market.

TABLE 12: Bridging the cluster external gaps

Bridging the gap between clusters	Bridging the global market gap
Keeping the definition of bioeconomy wide, and thus enabling cooperation better on wider scale	More cooperation between different organizations, common strategy development, less inside competition
More cooperation between forestry and agriculture	Finding ways to attract more investments in the area
More experiment culture in forest and technology industries	Building strong home market first
Focus on cooperation across cluster borders	More market research and focus on marketing efforts

The table shows that the gab between clusters can be bridged for example by focusing on cooperation with different clusters and stimulating experimental culture within the traditional industries. The global market gap can be bridged through tighter cooperation and synergies of different organizations, and focusing on increasing the market knowledge.

6 DISCUSSION

The research dealt with business development in the field of bioeconomy in Central Finland. The pre assumption of the research was that, in order to increase a region's competitiveness different organizations within the region should collaborate. Therefore the research studies business development through collaboration of different organizations within the field. The organizations include companies, research centers, educational institutions, public agencies, capital providers, and the government.

Bioeconomy offers ways to tackle the current global challenges such as diminishing natural resources and climate change and at the same time enables economic growth. The opportunities of bioeconomy have been noted by operators around the world, also by the EU and the Finnish government, which aim at becoming well known actors in the field of bioeconomy. The opportunities are there, in Finland and also in Central Finland. At the same time the manufacturing industry has been decreasing heavily thus resulting in growing unemployment. Also the forest industry as a whole is facing a significant need of renewal and structural transformation.

There is a significant need for new business development. As demonstrated in Chapter 1, Central Finland has the organizations needed for new business development. The following research questions were formulated to find out, what these organizations could do to enhance new business development:

How can new business development be enabled in the field of bioeconomy in Central Finland?

- What are the strengths of bioeconomy in Central Finland?
- What organizations or structures are possibly blocking new business development within the field of bioeconomy in Central Finland?
- How can different organizations in the area collaborate to enable new business development?
- How can international business be enabled?

A case study was chosen to be the research strategy guiding the research process over all. The empirical data was collected from thematic interviews. The acquired data was transcribed word to word. Content analysis was used to give the analysis process structure and logicality. The Gap Model was used in identifying the regional innovation gaps and in finding ways to bridge the gaps i.e. to provide ways for each of the organizational groups to enhance new business development.

6.1 Answering the research questions

The research aimed firstly at identifying the regional bioeconomy strengths and also obstacles for new business development. Several strengths and obstacles were identified as presented in Section 5 of the report. There are however some contradictions regarding the results.

Regional strengths were studied through identification of the most important organizations in the field and also by addressing the strengths directly. Financing providers were identified as one of the most important organizations in the region. What is very important to be noticed, is that financing was also considered to be the biggest obstacle for new business development. Especially the amount of early stage financing is seen insufficient. Research and development projects are well financed but when it is time to for example to enter new markets, financing is not available for

customers' pilot projects or marketing campaigns at the new location. Financing is needed for actual doings, not all types of pre-investigations or compilation of preliminary reports.

Companies in the region were identified as the most important strength. Especially big companies are seen important for the region, as they are the engines of the local economy. Big companies were, however, also identified as obstacles. It is suggested that small companies sometimes are afraid of big companies of stealing their ideas. Big companies are also seen not very innovative because of their organizational size and long tradition. Ideas are suggested to sometimes get lost within the organization before being realized.

Another contradiction arising from the research is related to the long forestry tradition. The research identified the tradition to be an asset on which to base new business development. Simultaneously the tradition is considered to be an obstacle for new business development. Old attitudes and procedures are suggested to be in need to be replaced with more positive and opportunity focused attitude and flexible and innovative procedures. The tradition is also seen restricting forest industry's ability to renew as the industry is so used to the old procedures and business connections. For example, the aim of the potential new Metsä Group mill is to seek synergies with new partners. The aim is highly appreciated also on the basis of the research. It is wanted to include different kinds of partnerships with different types of companies, also from different industries. The research also revealed some concern toward another possible scenario. Accordingly, the mill would end up being only enhancement of pulp production and not being able to form different enough types of partnerships. Thus restricting development of new products to new type of customers.

World-class research capabilities and skills were also identified as regional strengths. According to the research the current research within the region is also far away from actual business development. The research is said to be too academic and lacking practical usability. To better the situation it was suggested that a step-by-step

process from the researcher's desk to actual business development would be formed. Another suggestion was to create a common testing environment for companies to enable testing of ideas, pilot projects, marketing campaigns etc. in collaboration with other organizations in the field.

University of Jyväskylä's faculty of chemistry and the related basic research is recognized to have been very important for the bioeconomy in the region. The research revealed concern towards the future of the research. It is claimed that the amount of the type of research has been decreasing during the resent years and that the future is not considered very promising. It is suggested to recognize the importance of the research for new business development and start enhancing bioeconomy related research within the faculty of chemistry.

6.2 Comparing the results with earlier literature

Earlier research suggests that the level of a company's internationalization is relative to the level of internationalization of its business context. Not only products move abroad. Instead, the company forms business relationships with foreign networks. The existing companies in the region were seen being the key influencers in the internationalization of a new organization (Björkmann and Forsgren 2000, 13.) According to the research the region has many already international companies. It is also said that small companies sometimes fear bigger companies and are also worrying that new ideas will be lost within big organizations. The big organizations ought to therefore understand their position as influencers. Development efforts would be needed in enhancing internationalization collaboration between big companies and the smaller ones.

Earlier research emphasize that a region would benefit from establishment of a separate cluster organization. The organization is suggested to be responsible for facilitating, directing, and managing the regional process including program planning, value network development and maintenance, securing and upgrading the required

human resource pool for global engagements, and managing the information and resource flows. (Launonen and Viitanen 2011, 334-335.)

The research recognizes that Jyväskylä Innovation Oy was an organization that was participating strongly in the national OSKE program, coordinating the program at the regional level. The organization did also preparation work in relation to the current INKA program that followed. The program is considered important for the regional bioeconomy, as Jyväskylä region is one of the three regions chosen to take responsibility of bioeconomy within the program. Jyväskylä Innovation was however closed down right before the start of the INKA program. The program responsibility was transferred to the parent company. The research revealed some concern towards Jyväskylä Regional Development Company Jykes Ltd. leading the program. The organization was not seen taken clear role, leadership or responsibility of the program. The need for separate cluster organization was not considered unambiguous. Such organizations were suggested sometimes being mostly employing themselves and not being enough focused on business development.

It is claimed that the key organizations in the region need to be brought together to collaboratively design common vision. (Launonen and Viitanen 2011, 334.) It is also important to develop a common strategy to define what means will be needed to enable vision realization. The research suggests a lack of a common strategy for the bioeconomy in the region. Different organizations have developed their own strategies, but a common view is missing.

A common strategy is essential as stated also by Harvard Business School:

> *Nations, regions, states, and cities all require clear economic strategies that engage all stakeholders, boost innovation and ultimately improve productivity. A collaborative strategy—which is especially critical in times of austerity or economic distress—requires setting priorities and moving beyond long lists of discrete recommendations.*
>
> (Harvard Business School, Economic Strategy.)

It is time for the regional decision-makers to develop invigorating collaborative strategy, which enables all cluster members to commit to the advancement of bioeconomy and the related innovation and new business development. And, more than that, setting priorities is needed as well as concrete actions.

6.3 Practical implications

Bioeconomy is in the very center of the current discussions among professionals around the world. The EU, the Finnish government and several other countries have compiled their bioeconomy strategies. They aim at advancing bioeconomy within their regions to address global challenges and to increase regional competitiveness. This requires commitment also from many other people than just the government officials. Because of the topicality of the research phenomenon the research is believed to be interesting and helpful for students and professionals to acquire better understanding of bioeconomy in Central Finland and also national level. By identifying ways to enable new business development better the research is believed to be beneficial also to people starting their own business or taking part in business development in similar contexts. Not necessarily in the same field but in regions having the similar type of cluster members.

The research identified several ways to enable business development better. The results are beneficial for all the cluster member groups in Central Finland. The research results can be compared to the results from possible prior organization specific research, initiate new more specific research as well as using the results as discussion openers in development discussions within organizations, in regional and even national level. Below are listed suggestions, regarding the main improvements that are needed, from all the member groups within the cluster.

All cluster member group common implications

- Aim at forming networks and seeking synergies across regional borders
- Focus on customers, markets and competitors
- Share ideas openly

Companies

- Focus on positive and opportunity driven mindset
- Aim at higher value bio-products
- Renew traditional processes by taking new perspectives on them
- Focus more on consumer products
- Collaborate actively with other companies and industries to find new opportunities and to advance innovations
- Release excess IPR for other companies to use
- Increase cooperation between forestry and agriculture

Research centers

- Enhance bioeconomy related basic research
- Focus also on applicable research
- Develop a of pathway from a researcher's desk to business development
- Focus more on research results' business potential
- Increase amount of company related research

- Design small company specific research processes
- Develop part time RD manager concept for a researcher to work in few companies simultaneously

Educational institutions

- Increase collaboration with research centers
- Increase collaboration with other educational institutions
- Organize more entrepreneurial education
- Ensure stronger company participation in education development

Financing providers

- Loosen financing requirements
- Finance more applied research
- Focus on stimulating across cluster border and national level collaboration
- Provide more early stage financing such as pilot project financing and market entry financing
- Provide risk financing also for big companies
- Enable investments also from other bioeconomy industries than forestry

Regional development organizations

- Invite all the key decision makers to participate in future vision development for regional development and its implementation
- Determine ways to enhance regional common-will formation
- Focus on stimulating trust between different organizations
- Ensure functioning operational environment
- Strengthen regional appeal by ensuring high quality resource base and education, securing local manufacturing, and utilizing the clean nature in marketing
- Collaborate across regional borders
- Find the best synergies on national level

- Focus on long-term planning and result/profit anticipation
- Help small companies in opportunity recognition, former partner connections, planning investments, making agreements, doing calculations, and making professional looking presentations

Government

- Sharpen bioeconomy brand of Finland by focusing on Finnish way of doing bioeconomy
- Keep the definition of bioeconomy wide
- Enhance bioeconomy strategy implementation with quantified targets, and ways to measure the targets and monitor the impacts
- Promote policies that secure competition, and promote science and technology
- Promote policy processes that allocate important decisions to regional level
- Loosen implementation of policies and directives
- Ensure functioning operational environment
- Keep the infra in good condition always, improve when needed
- Increase direct contacts to companies
- Do not participate in actual business

Cluster organizations

- Focus on business development
- Let companies/company representatives to lead operations
- Seek for the best synergies on a national level

In addition to practical implementation suggestions to all cluster member groups the research produced a regional cluster map. The cluster map is a descriptive illustration of the bioeconomy cluster of Central Finland including examples of the main operators. Also the main industries are included. The cluster map is presented in the section 3.4.

6.4 Theoretical contributions

The research is not a highly scientific one, aiming at significant theoretical contributions. According to Kovalainen and Eriksson (2008) an intensive case study can at the best be described as continuous interplay of theory and empirical data. In that sense the research aims at connecting theoretical concepts with empirical data in order to enable the reader to learn from them and act accordingly. (Kovalainen and Eriksson 2008, 121.)

The research is about collective business development. Early in the research process it was realized that there is not a ready and distinct definition for the concept of collective business development. The research therefore aimed also at conceptualizing the concept, and suggests it to be a synthesis of the following sub-concepts: cluster members, open innovation, value network/business economy, and business model. It is hoped that further discussion would be initiated to stimulate the concept development continuation.

According to earlier research, companies need to look outside their own company and look new business ideas from the surrounding environment (Chesborough 2006, 64). It is seen essential also to include the customers and competitors within the companies' innovation processes (Gnyawali and Park 2009, 323). The research suggests similarly, that focus should be more on customers and markets. The Gap Model described in the Section 2.4 was used in analyzing the empirical data. The theoretical model was in constant dialogue with the empirical findings. The Gap Model introduces seven innovation gaps that relate to other companies, the government, research centers, financing, educational institutions, global market, and other clusters. On the basis of the dialogue it is suggested that the Gap Model would be improved to recognize also the importance of customers and competitors for innovation processes.

6.5 Limitations of the research

In many researches access to data or getting people to agree on being interviewed has been considered limitations. In the research they are not. The research was able to utilize data of many prior regional researches, significant for the research. Also all the interviewed persons agreed to participate in the research without problems. This is believed to be due to the topicality of the research phenomenon, and also because of the broadness of the topic. Very specific and company related researches would more easily run into restricted and classifies materials.

There are, however two issues which may be considered as limitations for the research. Firstly, the research is a single case study concentrating solely on bioeconomy cluster of Central-Finland. This restricts cross case generalization i.e. identification of common issues between several cases and making interconnections accordingly. The research is also limited in its ability to provide formal propositions or be used as predictive research. However, it is important to notice that the research intention was not to provide such generalizability. The research is believed to be well generalizable as an intensive case study, providing suggestions for actions and thus enabling learning from the case. (Simons 2009, 164-165.) It was also seen important to narrow the context to enable research of a broad topic. And, by doing so it was possible to carry out the research in a decent time frame. Including other clusters would have been too demanding and time consuming. The generalizability of the research is discussed further in the following Section 6.6.

Secondly, subjectivity of the research may be considered a limitation, as a very common characteristic of a credible research is its objectivity. Subjectivity is however part of the case study framework. It cannot be detached from a case study research. Subjectivity, if monitored and disciplined appropriately, is essential for understanding and interpretation. (Simons 2009, 24.) And, the aim to understand can be considered important to any good quality research.

6.6 Reliability and validity

The research is more practical than rigorous, still emphasizing good rigorousness. It was decided early in the research process not to aim at doing highly scientific research. The literary review for example was not started from the very early times. Instead the aim was to provide review of the most current literature, thus enabling informative and knowledge improving research.

The number of interviews for the research was considered to be sufficient after having interviewed representatives of all the common cluster members (including companies, government, research centers, educational institutions, and capital providers) in respect to the field of bioeconomy in Central Finland. Companies were decided be more represented in the research than the other member groups. It was decided to interview three big companies (regional economy engines) and at least five SMEs. Totally 14 persons were interviewed including members of each common cluster member group. The interviewed organizations and the linkage to the relevant common cluster organization group are presented in the Appendix 4. It can be concluded that the number of interviews was sufficient for the research.

It was decided to assess the research validity partly through its trustworthiness (credibility, transferability, dependability and conformability) as described in the Section 3.4. Credibility is assessed by evaluating another person repeating exactly the same research i.e. by asking, how well would the person succeed. The research is subject to subjective interpretation and understanding, which cannot be repeated by another researcher. Credibility is however, increased through giving detailed and justified descriptions of the methodological choices and the research process overall. Also example tables in relation to data analysis are presented in Section 3.3. The part of the research can be replicated.

The research can be said to be dependent as the research is logical, relatively traceable and well-documented research. Transferability means ability to connect the research results with the results of some previous research. It was possible to

compare some of the results to the results of earlier research as presented in the Section 6.2. Therefore it can be concluded that the research is transferable. Research conformability is proved as the research results and interpretations are connected in an easily understandable way.

In addition the validity is assessed through describing its generalizability. The aim of the intensive case study research is not to produce generalizable knowledge. In the statement generalizability would be understood in its conventional meaning i.e. its ability to be generalized into other contexts. Mainly the generalizability of the research means comparability of the results and the ability to relate them to own context. (Eriksson and Kovalainen 2008, 121.) The research enables naturalistic generalizations as proposed by Sage (1980). Naturalistic generalization is a subjective process where the similarities and differences of the case are examined in relation to own context. It is about being able to decide personally what can be generalized and what cannot. (Simons 2009, 164-165.) The research is generalizable in contexts where there are similarities in the type of cluster members involved in collaboration. In the situations it is possible to compare results to own context, learn from the comparisons, and to get ideas on how to take action within the own context.

According to the case study specific evaluation criteria provided in the section 4.6 the research is of good quality because the topic of the thesis, enabling bioeconomy related new business development is very important not only within Central Finland, but also in national, EU and even global level as described in the beginning of this chapter. Good quality is proved also as the research was continued until being able form conclusive results and by being able to present controversial results from more than one perspective. And, the final proof of good quality is the aim to write an interesting report. Whether the report is interesting is, however left for the reader to decide.

6.7 Recommendations for future research

The research gives an overview of the bioeconomy cluster of Central Finland, both the challenges, and the opportunities. Suggestions for practical actions each cluster member group can consider to implement were also given. For future research the research phenomenon offers many interesting possibilities. Firstly, The research shows that many former studies have been carried out in the region to identify the business potential. What is needed, are concrete actions to harness the potential. An important continuation for the research would therefore be aiming at identifying concrete products, services and business models for new bioeconomy related business development.

Secondly, it is important for the regional competitiveness to secure the manufacturing industry in the region. Therefore, research is needed to find out the best synergies, which would enable the development of new products and services and the manufacturing industry to stay and grow in the region. New types of symbioses are needed with new partners, from different industries to develop new products. The planned new bio-product mill of Metsä Group can be used as an example of such partnership formation. Within the mill it is aimed at forming industrial symbioses between the mill and smaller companies utilizing its side streams. Thus enabling development of new bio-products. What would be the best partners for example for Valmet or Valio? What kind of cooperation possibilities would forestry and agriculture have?

Thirdly, the research could continue to explore the bioeconomy concentrations in the Joensuu and Seinäjoki regions. The Joensuu region is known from its bio-energy related knowledge and skills, and Seinäjoki from its agriculture. What would be the best synergies of all the three regions together to enable enhancement of common vision for the bioeconomy of Finland overall?

To be able to develop new products or business it is important to understand the needs of the customers. The research suggests that bioeconomy in Central Finland is lacking knowledge of for example the textile industry where there is great potential in forms of new bioeconomy products. There is lack of knowledge also regarding the needs of potential customers. What do consumers want and need in India and in China for example? What could Finnish bioeconomy offer there? How to increase bioeconomy products' appeal to consumers overall? Research in relation to new markets and consumer market are needed.

The research shows that competitors are also important for new business development. The research states that it is important to look outside own region to find new opportunities. Another research would be needed to compare the bioeconomy cluster of Central Finland to a few European bioeconomy clusters. In Sweden for example the Karlstad region i.e. the Paper Province could be researched. (Lane, Jim 2014.) In the Netherlands there are several possible bioeconomy clusters for future research for example BioEconomy Innovation Cluster Eastern Netherlands (BIC ON), Biobased Delta, BioDelta South Wing, and Port of Amsterdam. (Biorefinery in The Netherlands 2014.) Also outside Europe perspective would be beneficial. What would be the things to learn from them or the best synergies to connect with the bioeconomy in Central Finland, and to enable new business development?

According to the research it can be stated that Central Finland has many strengths, which can be utilized in new business development. There are also many challenges that would need to be overcome. Therefore it is suggested that the key organizations of the region would courageously aim at tackling the identified challenges and commit to building bioeconomy future on the recognized strengths. By doing so the promising future of bioeconomy would become a reality instead of just appealing opportunity.

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APPENDICES

Appendix 1. The questions asked in the interviews.

1. According to your view and experiences, what are the most important organizations (and persons) in the field of bioeconomy in Central Finland?
2. What are the strengths of bioeconomy in Central Finland?
3. How can/should these strengths be utilized in new business development?
4. What is the role of your own organization within the field of bioeconomy in Central Finland?
5. What organizations and/or structures are possibly prohibiting new business development within the field of bioeconomy in Central Finland? And, why?
6. How can/should international business be developed?
7. By looking at the picture, do you recognize the kind of innovation gaps within the field of bioeconomy in Central Finland? And, how could the gaps be bridged?

Appendix 2: List of the persons interviewed

Ikonen Matti	Plant Manager, Valio Oy	28 March 2014
Laitinen Sakari	Chief Executive Officer, NRM Oy	5 May 2014
Lappalainen Minna	Managing Director, Fixteri Oy	27 May 2014
Lehtomäki Annimari	Director, Business Development, BioGTS Oy	9 April 2014
Manninen Jussi	Development manager, Strategic Programme for the Forest Sector, Ministry of Employment and the Economy	2 June 2014
Mustonen Tuomas	VP Customer Solutions, VTT Technical Research Centre of Finland	6 June 2014
Nyberg Petri	Entrepreneur, Managing Director, Qualico Oy	7 May 2014
Mäkelä Jari	Managing Director, Hikinoro Oy	3 June 2014
Pesonen Hanna-Leena	Dean, Head of Corporate Environmental Management Jyväskylä University	9 June 2014
Päivänen Veli-Pekka	Development Manager, Regional Counsil of Central Finland	17 March 2014
Sojakka Juha	Managing Director, Siparila Oy	27 May 2014
Von Weymarn Niklas	VP Research, Metsä Fibre Oy	17 June 2014
Yli-Kauppila Jouko	VP IPR, Valmet Technologies Oy	22 January 2014
Äänismaa Pekka	Head of the Institute of Bioeconomy, JAMK University of Applied Sciences	23 March 2014

Appendix 3. The most important organizations within the field of bioeconomy in Central Finland

COMPANIES		
Big companies:	SMEs:	Other:
Valmet	Protacon	Energy application producers
Metsä Group	BioGTS	Forest sector companies
UPM	Metener	New companies
Valio	Hikinoro	Companies with an ability to renew
Vapo	CP Kelco	Product development units of companies
Stora Enso	Ariterm	Bioenergy companies
AREA DEVELOPMENT ORGANIZATIONS		
Regional Counsil of Central Finland (Keski-Suomen Liitto)		
Jyväskylä Regional Development Company (JYKES)		
Centre for Economic Development, Transport and the Environment (ELY-keskus)		
Ääneseudun Kehitys Oy		
The Central Union of Agricultural Producers and Forest Owners (MTK)		
The late Jyväskylä Innovation		
EDUCATIONAL INSTITUTIONS		
JAMK University of Applied Sciences		
Jyväskylä University		
The Vocational Education Institute of Northern Central Finland (POKE)		
Jyväskylä Educational Consortium (JAO)		
RESEARCH CENTERS		
VTT Technical Research Centre of Finland		
ENERGY CORPORATIONS		
Jyväskylän Energia		
Keuruun Lämpövoima		
Small local heating plants		
PUBLIC SECTOR		
City of Äänekoski		
City of Jyväskylä		
Municipalities		
Innovative Cities Programme (INKA)		
FINANCING		
Finvera		
Tekes		
OTHER		
Cooperation of VTT Jyväskylä and Valmet		Forest machinery companies
Forest industry		Transportation companies
New forest industry products		Farmers
Forest harvesting companies		Woodchip companies
Forest owners		Land owners

Appendix 4: Determining the sufficient number of interviews

Common cluster member group	**Interviewed organization**
Company (big company)	Metsä Fibre Oy
Company (big company)	Valmet Technologies Oy
Company (big company)	Valio Oy
Company (SME)	Hikinoro Oy
Company (SME)	Siparila Oy
Company (SME)	Fixteri Oy
Company (SME)	BioGTS Oy
Company (SME)	Qualico Oy
Company (SME)	NRM Oy
Government	Ministry of Employment and the Economy
Research center	VTT Technical Research Centre of Finland
Education	Jyväskylä University
Education	JAMK University of Applied Sciences
Capital provider	Regional Counsil of Central Finland