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NCE Micro- and Nanotechnology

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Preface

Innovation Norway has commissioned Samfunnsøkonomisk analyse to evaluate the Norwegian Innovation Clusters program. The program is organized by Innovation Norway in joint effort with Siva (The Industrial Development Corporation of Norway) and The Research Council of Norway. The Norwegian Innovation Clusters (NIC) program was launched in 2014 and aims at increasing growth by promoting and improving collaborative activities in the clusters.

Seven cluster projects were completed in 2016. These are evaluated as part of the commissioned program evaluation. The seven projects consist of four Norwegian Centres of Expertise (NCE) projects and three Arena projects.

We would like to thank everyone who has willingly taken the time to answer our questions. We would also like to thank members of the reference group for interesting discussions and useful feedback.

The evaluation was conducted in the period March - October 2017. Samfunnsøkonomisk analyse is responsible for all content in this report.

Oslo, 02.03.2018

Rolf Røtnes
Project manager
Samfunnsøkonomisk analyse AS

Summary

NCE Micro- and Nanotechnology (MNT) is centred on the production of ICT systems, microsystems and the usage of micro- and nanotechnology in miniature.

The companies in the cluster have a leading role in microsystem technology and electronics/ICT in Norway, mainly within the manufacturing of electronic and optical products industry, but some firms also operate within manufacturing of electrical equipment and machinery. Several cluster companies are international leaders in their product areas through market, commercialisation, production and technology expertise within their niche areas.

The cluster originates from four companies that settled in Horten in the early 1960s. Most of the companies in the cluster originated from one of these four. The business environment grew with several new establishments from the 1970s onwards.

The cluster was part of the NCE programme from 2006 till 2016. Formal contract partner and project leader in NCE MNT has, since 2009, been MicroTech Innovation (MTI). MTI is an innovation environment that offers advisers, activities and several services to companies. In addition, they host the industry network Electronic Coast.

Most cluster projects divide their members into four groups; core members, other active companies, R&D and educational institutions and public development actors. We have narrowed the range of core members in the individual cluster projects to joint-stock companies located in the Horten region. For analytical purposes, we have excluded research institutes from the core members group. With our definition, NCE Micro- and Nanotechnology has 33 core members.

Many members have common roots, technology and value chains, and have continued to work within similar technology areas today. From interviews, we have learned that the commonalities in technology are strong enough to provide a basis for collaboration in development of both technology and products, but that this differs somewhat between the members. Overall, our understanding is that there are moderate complementarities in the cluster, despite a relative lack of common markets or products today.

There are several supplier-customer relations in the cluster project, and the competition between suppliers can be strong at times. There is however relatively little competition between the larger firms in the cluster.

It is our understanding that initiated activities to a large degree have been aimed at developing the project's potential synergies, and that the cluster has invested sufficiently in the development of its relational basis (trust among members and cluster identity). Further, we believe that the activities to a large degree have been designed to lead to appropriate project results and long-term value-added effects.

The objectives of the last project period can be divided into two groups, those pertaining network collaboration and network building, and those pertaining innovation, competitiveness and attractiveness.

We believe that the cluster project has been relatively successful in developing the cluster, with a stronger relational basis and an increased degree of collaboration. It is our belief that they have a moderate to large degree of achievement within their objectives related to collaboration and network building.

Results from innovative activities led us to conclude that the cluster has a large degree of achievement within their objectives related to innovation.

While it is hard to measure, we also believe that the cluster is developing in the right direction when it comes to furthering international cooperation to strengthen the competitiveness of companies and support them in new markets.

We find that the core members are, on average, larger than comparable firms, and that they mainly have had a better development in average number of employees and value added. After 2014, these numbers have declined within core members, and approached the levels of comparable firms. However, when looking at total value added, the core members of NCE MNT have performed better than comparable firms since 2008, also when we consider the negative development after 2014. Whether this is an effect of cluster participation is beyond the scope of our analysis to conclude on.

Contents

Preface	IV
Summary	V
1 Introduction	9
1.1 Norwegian Centres of Expertise	9
1.2 Theoretical justification for cluster support	10
1.3 Cluster mechanisms	11
1.4 Evaluation of the project	12
2 NCE Micro- and Nanotechnology	14
2.1 NCE Micro- and Nanotechnology	14
2.2 Objectives and strategy	15
2.3 Potential synergies	17
2.4 Relational basis in the cluster	18
2.5 Earlier evaluations	19
3 Activities	20
3.1 Activities	20
3.2 Relevance of activities	22
4 Results and objective achievement	24
4.1 Cluster and network development and collaboration	24
4.2 Competence and knowledge development	25
4.3 Innovation	25
4.4 Internationalisation and market access	26
4.5 Cluster-to-cluster collaboration	27
4.6 Objective achievement	27
4.7 Economic effects	31
5 Overall assessment	33
6 References	35

1 Introduction

The program Norwegian Innovation Clusters (NIC) was launched in 2014. The program is a continuation of the Arena program launched in 2002 and Norwegian Centres of Expertise (NCE) launched in 2006. With the introduction of NIC it was also introduced a third, and new level, Global Centres of Expertise (GCE) targeting mature clusters with a global position.

Norwegian Innovation Clusters aims to promote and enhance collaborative activities in clusters. The objective is to increase the cluster dynamics and attractiveness, the individual company's innovativeness and competitiveness.¹

Norwegian Innovation Clusters is a collaborative project and jointly owned by the funding agencies; Innovation Norway, the Research Council of Norway and Siva. Innovation Norway has the main responsibility for managing the program. The program is funded by the Ministry of Trade, Industry and Fisheries and the Ministry of Local Government and Modernisation.

Innovation Norway, the Research Council and Siva² have commissioned an evaluation of the Norwegian Innovation Clusters program as well as an evaluation of the following seven completed cluster projects:

- Arena Biotech North
- Arena Lønnsomme Vinteropplevelser
- Arena Smart Water Cluster
- NCE Instrumentation
- NCE Micro- and Nanotechnology
- NCE Raufoss
- NCE Systems Engineering

This report addresses the final evaluation of NCE Micro- and Nanotechnology. For a more detailed introduction to the cluster program Norwegian Innovation Clusters, we refer the reader to our main report for the evaluation of the program.³

The following sections provide a brief introduction to the purpose of Norwegian Centres of Expertise (NCE), the theoretical justification for a cluster program, and how to understand the cluster mechanisms. Chapter 2 gives a description of NCE Micro- and Nanotechnology. The project's activities are presented in Chapter 3, while results and achievements are discussed in Chapter 4. We summarise the project in Chapter 5.

1.1 Norwegian Centres of Expertise

Norwegian Innovation Clusters support cluster projects on three levels. These levels differ from each other in two important areas; (i) *target group* and (ii) *duration of support*. Arena targets immature clusters and the projects are supported for a period of three to five years. NCE targets mature clusters with a national position, whereas GCE targets mature clusters with a global position. NCE and GCE supports projects for 10 years.

Norwegian Centres of Expertise (NCE) was established in 2006 based on prior analyses and inspiration from other countries. NCE is intended to focus, improve and accelerate already on-going development processes in clusters that have established systematic collaboration, with potential for growth in both national and international markets.

NCE has supported 15 cluster projects since 2006, of which 11 are currently active (a list of projects and

¹ <http://www.innovationclusters.no/english/>

² The Industrial Development Corporation of Norway

³ Samfunnsøkonomisk analyse (2017) *Evaluation of Norwegian Innovation Clusters*, Rapport 76-2017

their features are presented in the evaluation's main report).

1.1.1 The purpose of the projects

NCE targets clusters with an established organisation with well-developed services, partners with experience and achieved results from collaborative projects, well-established national position and further national and international growth potential.

Table 1.1

Objectives for Norwegian Centres of Expertise

Impact targets	
Increased value creation within the cluster	
Output targets	
Innovation skills	Increased innovation activity through systematic collaboration between firms and R&D institutions
International orientation	Increased collaboration with international partners
Access to competence	Better access to relevant competence through strategic collaboration with educational institutions
Attractiveness and visibility	Increased recognition as a nationally important environment for innovation and growth
Interaction and collaboration	Increased targeted collaboration internally and externally

Source: Program description Jan. 12th, 2015

Each cluster project establishes its specific objectives, based on the clusters established position and prerequisites for further development and the specific objectives for the individual program level (cf. table 1.1).

1.1.2 Selection and funding of projects

There are no restrictions on who can apply for admission in the cluster program. But, applicants must meet a set of requirements for how the cluster project is organised, e.g. a legal entity as formal applicant, a defined partnership between actors in the cluster, a board representing the partnership and an operational management.

NCE offers financial and professional support to cluster projects with a duration of five years. If the cluster project is recruited directly into NCE (not following an Arena project), it may apply for a second contract period of five years. If the cluster started out as an Arena project, the years in Arena is deducted, so that the project period does not exceed 10 years. A status assessment is conducted after two years, and after seven years if the project is extended. NCE projects are subject for external evaluation after five years to assess the grounds for extension, and at the end of the project period.

NCE clusters may apply for participation at the next level (GCE) during the project period. Approval of the application implies that the current agreement is terminated and replaced by a new agreement in accordance with requirements at the new level.

The size of the annual grants is determined by the cluster project's format, level of activity and the program's financial resources. NCE projects can receive annual grants between NOK 4 and 6 million.

1.2 Theoretical justification for cluster support

A precondition for public intervention, such as the cluster programme, is the existence of one or more forms of market failures that limits firm's or industries' ability and will to reach their value creation potential.

Cluster theory states that the value creation potential of a cluster is affected by positive collaboration and localisation externalities. Such externalities are not always obvious to the individual actor and is therefore not considered in their investments. That is, production is lower than what is economically optimal if the market failure is not corrected. Public involvement in cluster development can thus be justified by market failures limiting firm's ability and willingness to carry out necessary investments in collaboration.

Examples on market failures can be:

- Production of public goods: Goods that does not yield direct or exclusive benefits for any single individual entity
- Knowledge externalities: Knowledge is diffused and used by other parties' than the party whom developed it
- Asymmetric information: Firms have limited information on potential benefits of collaborating with other businesses or R&D actors
- The free-rider problem: The risk that collaboration partners may reap the benefits of the collaboration without contributing themselves

The free-rider problem is especially challenging in situations where there is low level of familiarity and trust between the companies in the cluster.

Causes of market failures such as public goods production, knowledge externalities or asymmetric information lead to the fact that the production and development of common goods and knowledge, as well as the degree of cooperation will be lower in an economy without public intervention than what is optimal. The reason is that businesses does not internalise the benefit (or disadvantage) of these market failures in their profit maximisation. The free-rider problem is especially a problem in situations

where there is a low level of familiarity and trust between the cluster members.

The cluster program, including NCE, can contribute to higher quality of and more research and innovation than what would have been without public intervention, thereby realizing the potential effects of cluster formation on value creation and innovation. The program can contribute to this, for example, by providing necessary technical and financial support for the clusters to initiate new, or to strengthen and accelerate ongoing, collaborative projects. By formalising collaboration in cluster projects, the risk of single companies reaping unfair advantages can be reduced. This will minimize challenges associated with the free-rider problem.

The program's main objective shows both why and how NCE supports cluster development:

NCE should contribute to increased value creation through the release and amplification of collaboration based innovation and internationalisation processes in clusters with clear ambitions and growth potential.

1.3 Cluster mechanisms

Jakobsen and Røtnes (2011) analysed how public cluster support could be understood within a formalised framework and developed a conceptual model for cluster-based development to illustrate typical cluster characteristics and how they lead to improved performance (see figure 1.1 **Error! Reference source not found.**). The solid lines in the figure illustrate direct effects, whereas the dashed lines illustrate long-term effects generated by system dynamics.

Capability and willingness to initiate and carry out collaboration processes to realise potential synergies depend on the groups' relational basis for collaboration. If potential synergies are significant and the relational basis is in place, actual collaboration processes will result in gains such as innovation, improved productivity and/or internationalisation, and consequently growth and profitability (illustrated by the solid lines in the model).

Even though potential synergies between the actors in a cluster clearly exist, they might still not be realised. Actors might lack sufficient information about other actors' activities to know when collaboration might result in mutual benefits.

The incentives to invest in collaborative relationships might also be unevenly distributed. Trust is in

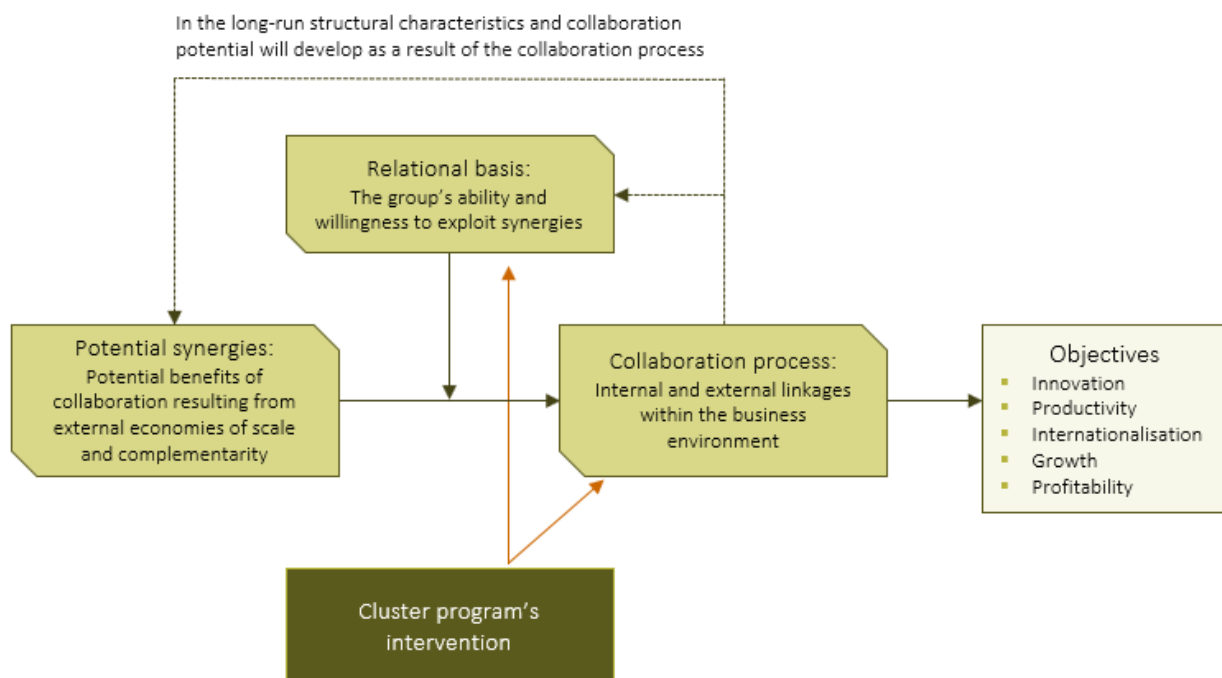
many cases the decisive factor to make collaboration work in practice, and if there is a lack of trust, collaboration may seem like too much of a risk. In other words, the actors' ability to realise potential synergies through collaboration processes depends on their relational basis for collaboration, i.e. whether they trust each other enough to be willing to share their knowledge and invest in the community.

The conceptual model is elaborated in more detail in the evaluation's main report.

1.4 Evaluation of the project

The evaluation is organised according to OECDs criteria for evaluating development assistance.⁴ That is, the evaluation is structured around three

Figure 1.1
Conceptual model of cluster-based development



Source: Jakobsen and Røtnes (2011)

main criteria: relevance, effectiveness (incl. impact) and efficiency.

To assess the abovementioned, we have reviewed project descriptions, annual reports, Innovation Norway's survey to the cluster participants and previous evaluations. Further, we have interviewed relevant stakeholders, participating firms in the cluster project, as well as the project manager.

In addition, we have mapped firms' R&D network by analysing their R&D collaboration in projects with public funding.

As part of the evaluation of the cluster program we have analysed effects in firm performance from participating in a cluster project by comparing growth in selected performance indicators (e.g. employment, revenues and productivity) for core members in the clusters with growth in similar firms not participating in a cluster project.⁵

Due to data requirements, it is not feasible to conduct a complete impact assessment for the individual projects, and the reader is referred to the main report for the results of this analysis.

Data and our evaluation approach is described in more detail below.

⁵ That is applying a matched difference-in-differences procedure.

2 NCE Micro- and Nanotechnology

In this chapter, we give a short description of NCE Micro- and Nanotechnology and account for its objectives and strategies, potential synergies and relational basis.

2.1 NCE Micro- and Nanotechnology

NCE Micro- and Nanotechnology (MNT) is centred on the production of ICT systems, microsystems and the usage of micro- and nanotechnology in miniature.

The companies in the cluster have a leading role in microsystem technology and electronics/ICT in Norway. Several of the companies in the cluster are international leaders in their product areas through market, commercialisation, production and technology expertise within their niche areas.

The cluster originates in four companies that settled in Horten in the early 1960s. Most of the companies in the cluster originated from one of these four. The business environment grew with several new establishments from the 1970s onwards.

The cluster was part of the NCE programme from 2006 till 2016. Originally, it was known as NCE Microsystems, but it changed its name to today's NCE Micro- and Nanotechnology in 2008.

2.1.1 Core members

Most clusters divide their members in four groups; core businesses, other active firms, R&D and educational institutions and public development actors.

However, it appears that there are different practices among the clusters in how they categorise their members, especially when distinguishing between core members and other active firms. Hence, for both presenting different cluster characteristics and the econometric analysis (main report) it has been necessary to refine the selection of core members in a more consistent matter.

Our definition of core members is based on the list of participants categorised as “core businesses” and “other active firms”. In accordance with previous evaluations of effects of participation in a cluster project, we have chosen to limit the selection of core members to limited liability companies (LLC).⁶

Further, we have limited the selection of core members in each cluster to LLCs located in the economic region⁷ we consider to be the cluster's geographic localisation (see next paragraph). As we want to focus on firm performance, we have chosen to exclude research institutes organised as limited liabilities.

Table 2.1
Number of core members, mean firm age and number of employees in enrolment year

Enrolment year	Members	Firm age	Employees
2006	13	12 years	209.3
2011	2	0 years	0.0
2013	8	6 years	6.0
2014	1	1 year	1.0
2015	9	5 years	5.0
Total	33	8 years	92.5

Source: Samfunnsøkonomisk analyse

⁶ The econometric analysis presented in chapter 4 largely follows the method used in yearly evaluations of effects on firm performance of support from Innovation Norway (Cappelen, et al. 2015). Further, to study effects on and development in number of employees, value creation, productivity, etc. it is a prerequisite that the cluster members are present in accounting data. All LLCs are liable for accounting and by refining the

selection of core members to these firms we ensure that we have the necessary information on all firms in our sample.

⁷ Economic region is a regional classification for the level between county and municipality. The main criteria used for defining the regions are labour market and trade. The classification corresponds to the NUTS 4-level in EU's regional classification.

With our definition, NCE MNT has its geographical centre of gravity in Horten and 33 core members, see table 2.1.

2.1.2 Industrial distribution

NCE Micro- and Nanotechnology mainly consist of firms within the manufacturing of electronic and optical products industry, and the manufacturing of electrical equipment and machinery and equipment (cf. figure 2.1).

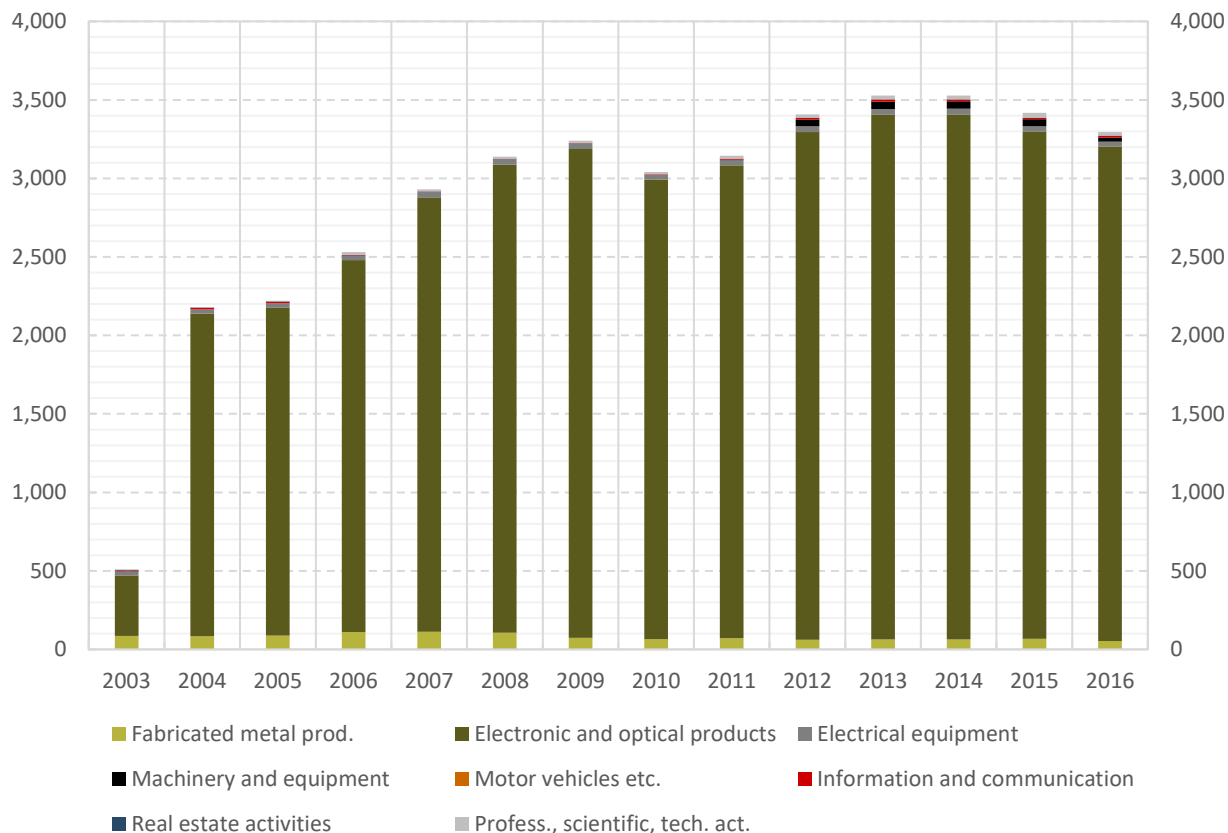
2.2 Objectives and strategy

The project's objectives and strategies are meant to be directives for the project period. NCE MNT has had the following vision and objectives. During the project period, there has been certain adjustments, as shown below.

2.2.1 Objectives and strategies for the entire project period

According to the 2006 NCE application, the cluster's overall objectives was to:

Figure 2.1
Number of employees among. Core members in NCE Micro- and Nanotechnology. 2003-2016



Source: Samfunnsøkonomisk analyse

- Contribute to increased growth and renewal in the member companies, and establish new business with potential for international growth
- Create an attractive environment for internationally leading companies with foreign ownership who wants to develop and grow in the region
- Create a strong and coordinated regional innovation system to secure commercialisation and future value creation, also after the exit from NCE.

(Econ Pöyry, 2009)

2.2.2 Adjustments during the project period

After the self-evaluation in 2012, the cluster formulated the following main objective:

- Contribute to innovation, value creation and increased growth in the cluster in one of the world's fastest growing and most competitive industry-based market segment.

The points described in 2.2.1 was kept as sub-objectives for the project, but was specified through further sub objectives.

To secure further cluster development after the exit from NCE, the cluster aimed at developing the following lasting structures:

1. A research- and education environment at a high international level within HSN⁸, with accredited Ph.D. educational offers and state-of-the-art scientific equipment.

2. An innovation and commercialisation company at a high international level with incubator business that works with technology-based innovation, including commercialisation of research results, corporate development and financing
3. A well-functioning network organisation and associated secretariat for cluster development

For the second contractual period, the following were the objectives:

- Establish Centre for Research, Innovation and Business (FIN) as the core element for cluster development
- Establish a technology-based innovation company with innovation-enhancing elements such as idea generation, incubator features, etc.
- Establish financing opportunities for early-stage development for the cluster
- Further develop and strengthen network collaboration and relationship building
- Ensure and strengthen the academic research community at HVE and the research school
- Establish a joint development resource with a service portfolio in product development
- Work actively for access to advanced scientific equipment in clean rooms / laboratories.

(Menon, 2012)

In the annual report of 2014, we find that the cluster's main strategies for the year was to:

⁸ The University College of South-East Norway, earlier of Vestfold and Buskerud.

- Further develop the cluster's entrepreneurial ecosystem and NCE MNT as an innovation arena, including contributing to increased innovation, commercialisation and concrete collaborative projects in the cluster, as well as focus on innovation and product development and extracting ideas in the businesses through spin-ins, spin-offs.
- Recruit new member companies from new industries and applications
- Increase collaboration with other clusters and environments
- Ensure continuation of cluster cooperation after completion of NCE programme
- Support for further development of pilotage and test infrastructure
- Strengthen communication – with businesses and between businesses
- Increase member companies' involvement and participation in joint activities and teams based on registered needs in the companies
- Strengthen international cooperation in networks and collaborative projects.

In 2015, the cluster added the following strategies to achieve their objectives:

- Further develop the incubator community in Silicia and links with partner companies
- Further develop and increase international cooperation to strengthen companies' competitiveness and market access, with single projects in R&D and innovation, and through increased networking with leading players.
- Wider involvement of cluster partner companies and supporters in collaborative projects, teams and meeting places

- Be the driving force for innovation-enhancing infrastructure in the realisation of the next phase of Vestfold Innovation Park.

2.3 Potential synergies

2.3.1 Organisation

Formal contract partner and project leader in NCE MNT has, since 2009, been MicroTech Innovation (MTI). MTI is an innovation environment that offers advisers, activities and several services. In addition to being formal contract partner of NCE MNT, they are hosts for the industry network Electronic Coast.

The cluster has had a steering committee consisting of 6 individuals (excluding observers from the funding agencies), of which 5 were business representatives. The steering committee members have been elected for two years at a time. The steering committee has met 4-5 times a year, and provided over all policy direction and strategic project initiation. It has been the cluster facilitator's and project manager's responsibility to implement cluster development activities in accordance with the steering committee's decisions.

The cluster project is organised as a coordinated main project of three subprojects. The three subprojects are:

- Research and Development – led by the University College of Vestfold and Buskerud
- Network and cluster development – led by Electronic Coast
- Innovation and commercialisation – led by Microtech Innovation

Members have paid membership fees. From NOK 5 000 to NOK 10 000 for smaller companies, and up to NOK 75 000 for larger companies. Total income

from membership fees has been around NOK 400 000 annually.

2.3.2 Potential synergies: Economies of scale, common traits and complementarities

Potential synergies between members of the cluster project – also known as potential external economies of scale – exists if there are economies of scale in activities that are *common* for the participants and that are *non-excludable*. Examples include, but are not limited to, infrastructure, common features or complementarities in markets, competence, activities or resources.

2.3.3 Common traits and complementarities

The cluster project has its geographical core in Horten, but members are located all over Vestfold.

Many members have common roots, technology and value chains, and have continued to work within similar technology areas today. One common trait is that the technology they work with are put to use in products meant for niches where few other companies can compete. However, their products are rarely meant for the same markets.

From interviews, we have learned that the commonalities in technology are strong enough to provide a basis for collaboration in development of both technology and products, but that this differs somewhat between the members. Overall, our understanding is that there are moderate complementarities in the cluster, despite the relative lack of common markets or products.

Some members have few common traits with the rest, but do for example deliver components that are useful for the others. These members are usually among the smaller companies in the cluster.

There are several such supplier-customer relations in the cluster project, and the competition between

suppliers can be strong at times. There is however relatively little competition between the larger firms in the cluster.

2.3.4 Economies of scale

A high degree of geographical proximity is often viewed as an important precondition for releasing the potential of economies of scale. The cluster members are mostly situated in Horten, with some cluster members situated elsewhere in Vestfold. The cluster project therefore operates within a geographically limited area.

The cluster project is particularly focused the development of technology knowledge and innovation infrastructure, both are examples of factors where economies of scale may come in play.

Close geographical proximity facilitates knowledge spill-overs, which means that knowledge developed or imported by one part of the cluster project, is more easily diffused to nearby firms. Thus, knowledge development in the cluster can be assumed to benefit the whole cluster, leading to a multiplier effect on value creation of any knowledge developed or imported by the cluster. The close connections to, and involvement of, knowledge institutions such as the University College of South-East Norway, enhances this.

Innovation infrastructure is an example of a common good, a good that does not yield direct or exclusive benefits for any single individual entity. The cluster project's development of such infrastructure therefore represents production of a common good. Without the cluster project, the investments in such infrastructure would probably have been less than optimal.

2.4 Relational basis in the cluster

This part of the evaluation presents the relational basis through members' knowledge of each other,

their trust and confidence in each other, as well as the degree of collaboration and co-operation within the cluster.

2.4.1 Members' knowledge of and trust in each other, and information sharing

Although the companies in the cluster have been part of a network with relatively strong historical roots, the ties have to some extent been limited to each of the four original companies. Nonetheless, most companies know each other from other arenas as well, such as Electronic Coast.

The last evaluation noted that the knowledge of each other, and especially the level of trust, was relatively low. This was said to be a consequence of the cluster's greater focus on infrastructure development in the earlier years (Menon, 2012).

However, we find that despite some competition, the firms are relatively open with each other today. The barriers for sharing information is quite low, especially concerning technology. When it comes to products and markets, the firms seem to be relatively less trustful of each other. Through interviews, we understand that the actors have not felt that this has been a problem in the last project period, and that the level of trust and information sharing has in fact increased in the period.

2.5 Earlier evaluations

Econ Pöyry's 2009 evaluation found that NCE MNT had largely achieved its objectives at the time. The cluster had been particularly successful regarding their R&D objectives. The cluster had achieved concrete results in product development and new business. Econ Pöyry further found that the competence building activities the cluster had initiated were expected to provide a good foundation for future technology-based innovation and commercialisation.

The challenges ahead included the need to create more continuous anchoring of activities across the board and link companies stronger together.

Menon's 2012 evaluation found that the cluster's structural properties, in terms of potential synergies between members of the cluster, appeared to be limited, mainly due to a lack of complementarity between the actors.

They also found that while the main activities initiated between 2009 and 2012, such as the development of infrastructure (laboratories, simulators) had significant relevance to the cluster, the cluster had overlooked important activities aimed at the interaction between cluster members. Thus, they found that the activities in NCE MNT were only partially relevant to the cluster's challenges.

Menon found that reported results from initiated activities appeared to be good, and to a large degree a consequence of the activities. Objective achievement was relatively high. Menon did however find that the objectives had been narrow and difficult to measure.

They concluded that the establishment of networks and relationships had been to lowly prioritised, and recommended that the cluster should focus more on such activities in the future. They did however note that a positive development in the later years, with a clear turn towards increased interaction and strengthening of the relational basis for interaction.

3 Activities

In this chapter, we will present activities that have been initiated or completed during the project period, as well as what the cluster wanted to achieve with these. The chapter is based on available annual reports and conducted interviews.

3.1 Activities

3.1.1 Activities for cluster development

The cluster project aims to create added value and give more business to member companies through increased collaboration between the companies and collaborative arenas with other environments.

The most important activities for achieving this in the cluster project have been meeting places and

concrete collaborative projects. Meeting places have included everything from seminars and workshops to member meetings and lectures.

The cluster has initiated several permanent meeting arenas, open forums and professional networks aimed at developing the cluster's relational basis each year. Interviews emphasise that these activities have been important. The activities have been held at all levels, cluster wide, or in smaller groups of relevant actors focusing on narrower topics. This division of members have also been implemented in activities within other strategy areas, such as innovation.

Table 2
Self-reported activities in available annual reports

Activity	2014	2015	2016
Number of permanent meeting arenas, open forums and professional networks	22	42	45
• Number of participants	244	264	240
Number of collaborative relationships (agreements or project collaborations) with other clusters	NA	3	5
Number of collaborative relationships w/ foreign companies or institutions	22	14	6
Number of innovation projects (with participants from several members) where the project has been the initiator or an active contributor	18	22	8
• Number of which were collaboration projects with R&D actors	13	11	5
• Number of which were collaboration projects with international partners	6	6	3
• Number of which included joint applications for funding from Innovation Norway, the Norwegian Research Council, the EU or other public funding.	18	22	8
Released R&D/innovation funds from funding agencies/EU, in NOK mill.	8	60/14	150/20
Number of projects aimed at internationalisation (incl. study trips, knowledge acquisition, partnership search, networking, market research et cetera)	4	5	4
Number of projects aimed at increasing knowledge	6	8	12
Number of projects aimed at developing new/better educational offers to the cluster	4	6	3
Number of projects aimed at establishing new companies or number of newly established companies (number of employed)	17	25	17

Source: Annual reports – NCE MNT. 2014-2016

To increase the interaction between cluster members, the cluster project has developed a cluster resource database for matching needs and projects with expertise, equipment and challenges in the companies.

3.1.2 Knowledge activities and collaboration

The cluster project has initiated and completed several activities and collaborations aimed at strengthening or developing the knowledge and competence within the cluster. Examples include arenas for experience exchanges and professional updates, which are central to several of the activities.

Many of the knowledge activities have been aimed at strengthening the companies' innovative capacity. The cluster project has initiated several activities aimed at strengthening relations with R&D and knowledge institutions for future cooperation and collaboration.

Activities in collaboration with the University College of Buskerud and Vestfold (HSN) has been especially important for the knowledge and competence development, as well as innovation infrastructure and cluster development in general. For example, they collaborated to strengthen the competence of entrepreneurs and to diffuse knowledge on relevant R&D resources available to the cluster members.

Knowledge and competence activities have also been completed in collaboration with other cluster projects, such as in a subcontractor development project.

In addition, the cluster carried out activities to develop new educational offers, as well as to increase the science interest among schoolchildren, both through support for the research line at Horten High School and to Forskerfabrikken.

3.1.3 Innovation activities and collaboration

The cluster project has been committed to strengthening cluster-based innovation through collaborative projects between members, as well as between incubator companies and established companies.

From available annual reports, we find that the cluster project has initiated or participated in many collaborative innovation projects per year, of which a majority included collaboration with at least one R&D or knowledge institution.

The cluster project has conducted activities to strengthen the cluster project's position as an innovation cluster – to develop the cluster to be a triggering facilitator for member's business innovation activities both individually and in teams and collaborative projects.

The focus on cluster-based innovation has been attempted strengthened by setting aside resources to trigger new projects, as well as mobilise for innovative collaborative projects.

In application-driven technology development, the cluster has worked to further develop R&D resources in terms of expertise and infrastructure to realise ideas for new products or applications. Activities include dissemination and sharing of relevant resources at HSN, SINTEF and other institutions.

In addition, the cluster has been working to further develop its incubator services, as well as stimulate utilisation of national and international funding instruments for funding R&D initiatives and infrastructure.

3.1.4 Cluster-to-cluster collaboration

The cluster project had increased cooperation with other clusters and environments as a project objective. Towards the later stages of the cluster project, there was particularly a focus on collaboration with

other clusters or environments where MNT's technology base could act as a "game changer" for increased innovation in various markets.

During the project period, the cluster initiated or participated in multiple activities with other clusters and environments. One such collaboration is Ask4Cluster, a collaborative relationship with NCE Raufoss. One of the main objectives of the activities have been to develop and commercialise intelligent infrastructure. The two cluster projects have also collaborated in a preliminary study aimed at accelerating innovation through cluster-to-cluster collaboration.

Other national cluster-to-cluster collaborations include Oslo Cancer Cluster, NCE Culinology and NCE Systems Engineering, amongst other.

The cluster project has also reported international cluster-to-cluster collaboration, including with Karlsruhe Institute of Technology and the DSP Valley cluster project in Belgium. They have also participated in several meetings in the European Cluster Network for Smart Systems Integration and EPOSS.

3.1.5 Measures for increased internationalisation

The cluster project has initiated several activities aimed at strengthening the cluster project's participation in international networks and cooperation projects. In the latter part of the last project period, the cluster project increased its focus on targeted communication with stakeholders abroad.

The cluster project has also worked to strengthen and further develop the cluster project's international contact network and long-term relationships, and ensure adequate upscaling capabilities for upgrading international commercialisation projects when they break through.

Other activities have been aimed at strengthening companies' competitiveness and market access, both with single projects in R&D and innovation and through increased networking with important parties.

Activities have been initiated to strengthen and further develop the cluster project's host attractiveness, identity and brand.

Towards the end of the project period, the cluster project focused particularly on developing EU cooperation projects. They also worked to strengthen their link with Asia, including Korea and China, as well as offering offices and hubs for entrepreneurs in Hong Kong Science and Technology Park.

Several of the other activities must also be regarded as relevant to strengthen the cluster's position and ability to enter new markets abroad.

3.2 Relevance of activities

As part of the evaluation, we will assess the relevance of activities. Specifically, we will consider whether:

- The interaction processes are based on potential synergies between the actors,
- The project has invested sufficiently in the development of relational assumptions – i.e. communication arenas, trust and identity-building processes – and whether,
- The activities are designed to lead to appropriate project results and long-term value creation effects.

3.2.1 Are activities based on the potential synergies between the actors?

It is our understanding that the cluster activities initiated in the last project period to a high degree have

been aimed at developing the cluster project's potential synergies.

The activities aimed at developing innovative infrastructure and relations with R&D environments for knowledge strengthening must be seen as attempts to release the benefits of economies of scale in infrastructure and knowledge.

Further, the innovation and commercialisation activities have been successful in linking companies with potential synergies together. While the cluster seen together may have limited potential synergies in technology, there are groups of companies with clear potential synergies. Within each strategy area, the cluster project has divided companies into smaller groups, facilitating the release of these.

3.2.2 Has the cluster invested sufficiently in the development of the cluster's relational basis?

In the Menon evaluation, they found that the focus on cluster and network development in the period 2009-2012 had been limited. With a possibly weaker starting point in this field, compared to other NCEs, Menon believed that this was unfortunate.

However, they found that towards the end of the second project period there had been a clear change of focus towards interaction and strengthening the relational basis of the cluster project.

From annual reports and interviews, we find that this change has been persistent, and that the cluster project has managed to initiate several relevant activities to develop the cluster project's relational basis, with a seemingly high degree of participation. Thus, it is our belief that the cluster project has invested sufficiently in the development of the cluster's relational basis in the last project period.

3.2.3 Have the activities been designed to lead to appropriate project results and long-term value creation effects?

The cluster project aims to give more business to member companies and create added value through increased collaboration between the companies and through collaborative arenas with other environments. The most important activities for achieving this have been meeting places and concrete collaborative projects.

The cluster has also initiated several activities aimed at strengthening knowledge and competence within the cluster. Many of these activities have been aimed at increasing the companies' innovative capacity.

The focus on cluster-based innovation has been attempted strengthened by setting aside resources to trigger new projects, as well as to mobilise for innovative collaborative projects. In addition, the cluster has been working to further develop its incubator services, as well as to stimulate utilisation of funding agencies.

The cluster project has also worked to strengthen and further develop the cluster project's international contact network and long-term relationships, and ensure adequate upscaling capabilities for upgrading international commercialisation projects when they break through.

Other activities have been aimed at strengthening companies' competitiveness and market access.

It is therefore our belief that the activities have been designed to lead to appropriate project results and long-term value creation.

4 Results and objective achievement

We will now report and evaluate the results and objective achievements within different fields by drawing on concrete results from the cluster project. The NCE programme is part of the NCE programme, which aims to create economic growth, and we will therefore also assess any eventual economic effects.

4.1 Cluster and network development and collaboration

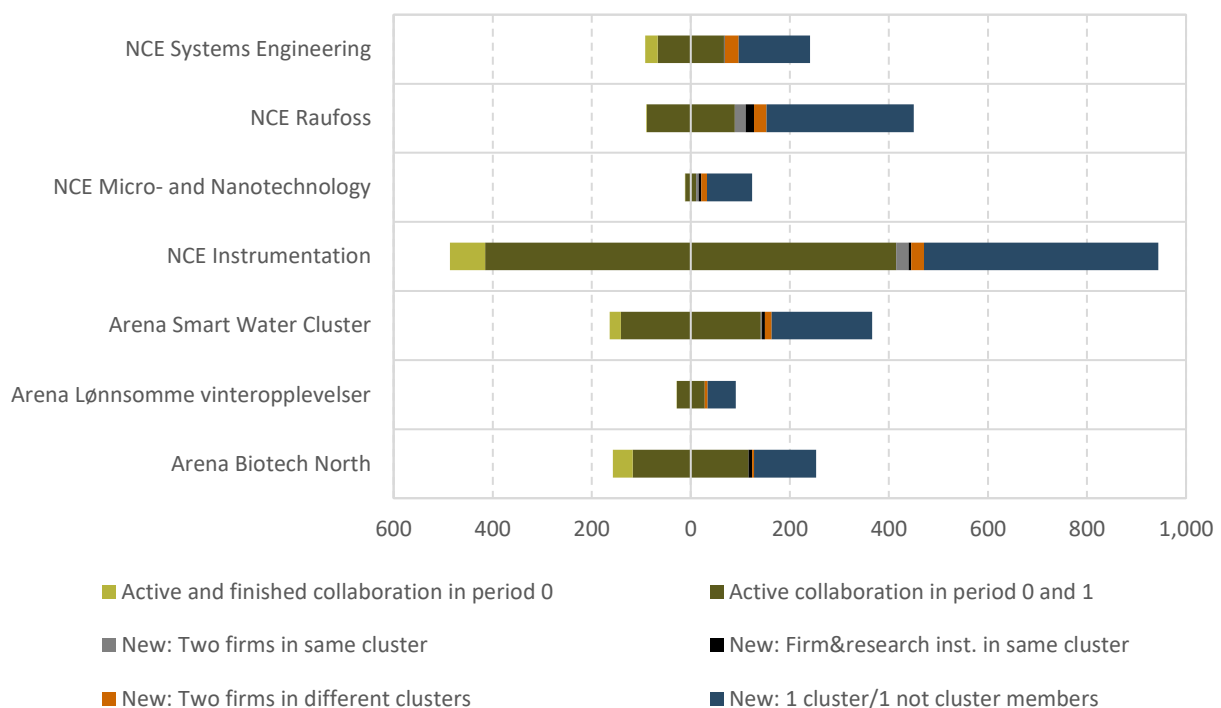
From annual reports and conducted interviews, we find that there has been a positive development in the degree of cooperation and interaction between cluster companies in the period, also between companies and R&D environments.

We have the impression that the cluster project's relational activities have been popular among cluster

members. Answers from a questionnaire from 2015 (conducted by IN) supports this. Of 23 respondents, 22 had participated in activities aimed at cluster development, and about 70 percent of these found the activities to be "very useful", with the remaining 30 percent answering that they were "not sure".

From interviews, we understand that the cluster project's activities have contributed to create stronger links between local technology-developing companies and research communities, both in and outside of the cluster. The relationship activities have also led to an increased general knowledge of each other, and of which possibilities for collaboration and interaction that exists. This has eventually led to several members indicating that they have got new customers and contacts that they otherwise would not have had.

Figure 2
Increase in R&D collaboration through cluster network



Kilde: Samfunnsøkonomisk analyse

This development can also be seen in empirical data for collaborative co-operation between actors in different clusters, see figure 2. We have measured the extent to which members of the cluster have increased their R&D-oriented co-operative networks after joining the cluster. Compared to other clusters we have measured in this evaluation, NCE MNT has had a large relative increase, even though it is among the smallest in absolute terms.

It is therefore our understanding that the cluster project has managed to strengthen its relational basis through their activities, and that this has resulted in increased cooperation, and a recognition of the benefits of collaboration. This is thought to create a favourable arena for further cluster development and collaboration, establishment of new business and realisation of new opportunities.

The cluster has also attracted new members during the last project period, further strengthening the cluster.

4.2 Competence and knowledge development

The cluster project has initiated 12 to 15 projects aimed at increasing knowledge or competence or developing new or better educational offers to the cluster yearly in this last project period. A questionnaire given out by IN in 2015 shows that 35 percent of all cluster companies participated in common

competence or knowledge activities that year. Feedback on the activities' utility was divided – 50 percent responded that the activities had been “very useful”, while the other 50 percent responded that they “do not know”.

From interviews, we have learned that the cluster members emphasise the importance of the cluster project's initiated activities for their knowledge development. They tell us about increased knowledge about different technologies, innovation and commercialisation possibilities and markets.

4.3 Innovation

The cluster project has reported between 18 to 8 innovation projects (with participants from several members) where the project has been the initiator or an active contributor, each year. From the annual reports, we also find that while they released very little R&D or innovation funds from funding agencies in 2014, the growth in 2015 and 2016 has been very large. The cluster has appointed an EU coordinator who works to increase funding from EU funding agencies, and the cluster has successfully released several millions NOK.

In their annual reports, the cluster project reports that they have been successful in strengthening cluster-based innovation through collaborative projects between companies, as well as with incubator

Table 3
Self-reported results and effects in available annual reports

Results	2014	2015	2016
Number of new innovations related to project activities			
• Number of new companies	17	25	17
• Number of employees in new companies	NA	56	42
• New products or services	6	NA	NA

Source: Annual reports – NCE MNT. 2014-2016

companies. While the cluster's main focus is still on applications of member's technology, the collaborative projects also led to a broader established cluster identity.

The focus on cluster-based innovation was strengthened by the cluster setting aside NOK 1 million dedicated to launching new projects and mobilising collaborative innovation projects.

That the cluster project has succeeded in investing in cluster-based innovation through collaborative projects is partially supported by a survey conducted (by IN) in 2015. According to the survey, 60 percent of respondents participated in common cluster-based innovation activities that year. However, respondents were less sure about the utility, as only 30 percent responded that they found the activities "very useful". The rest answered, "not sure".

The incubator, Silicia Vestfold Technology Incubator, received incubator status from Siva in 2013. During the project period, this incubator has become an innovation centre, and has realised clear synergies between both entrepreneur companies and established companies, interviewees tell us. The infrastructure provides both a framework for associating new business that derive from existing companies, while also serving as a recruitment arena for new member companies.

The cluster project has managed to bring forward many new establishments in the form of entrepreneurs or spin-offs from existing cluster companies, with direct or indirect assistance from the cluster project. The new business has also resulted in many new jobs, see Table 5.

Through interviews, it is our understanding that companies find it easier to receive funding from

funding agencies due to activities conducted by the cluster project. This is partly due to increased knowledge about funding agencies and what they can offer, and partly because the NCE status is perceived as a quality guarantee.

The research park, established in the second project period, has been important in the last project period not only for research, but also for how it provides important professional service providers, including lawyers, accountants and communication agencies. This is believed to strengthen innovation and commercialisation capacity, especially for smaller companies without such services in-house.

The cluster project has also collaborated with two of NRC's new SFI's, Centre for Innovative Ultrasound Solutions (CIUS) and Centre for Research-based Innovations in Controlled-Environment Aquaculture (CtrlAqua). Collaboration with SFIs is a quality indicator, and can be expected to lead to more innovation, collaboration and value creation.

4.4 Internationalisation and market access

Throughout the last project period, the cluster project has initiated or participated in relatively few concrete projects aimed at internationalisation, as seen in annual reports.

Interviews reveal that there has been little change in the degree of internationalisation amongst cluster members. Our impression is that most members were already well-positioned internationally, or had no interest in becoming so. There are exceptions, and it seems to be that activities aimed at strengthening the cluster's attractiveness and standing internationally, has facilitated positioning in international markets for those members who had this as an ambition.

This impression is reinforced by findings from questionnaires given out by IN, where only 13 percent of the respondents had participated in common internationalisation projects, but that among these, everyone reported that it had been “very useful”.

According to annual reports, the cluster project's position within MNT globally, has been strengthened. This may also contribute to a strengthened position, and more opportunities for internationalisation, for the individual cluster member.

In 2013, the cluster became partner of the EU network Express, which is “an Ecosystem for Smart Systems Integration in Europe”. It is believed that the cluster's participation in the initiative may give member companies new market possibilities, and increase their visibility internationally.

Unfortunately, we have not been able to measure whether the measures for establishing connections to Asian markets have led to increased internationalisation.

While hard to measure, we expect the international cluster-to-cluster collaboration to result in new knowledge and potential relations for the cluster members, in addition to profiling the environment internationally. Interviews reveal that international collaboration generally has been important for knowledge and innovation results.

4.5 Cluster-to-cluster collaboration

From annual reports, we find that the cluster project has had between 3 to 5 collaborative relationships with other clusters in the last two years of the project period. The number of collaborative relationships with other clusters were not reported in annual reports before 2015, but we know from interviews that

the cluster project has had collaborative relationships with other clusters before this as well. The number of relationships is relatively low compared to some of the other cluster projects we are evaluating.

The collaboration relationships we know of, is expected to give a sizeable contribution to value creation and employment over time. For example, the Ask4Cluster collaborative project, where companies from NCE MNT and NCE Raufoss collaborates on new intelligent infrastructure and accelerated innovation processes, is expected to lead to new products and markets as well as increased innovation productivity.

Interviews also reveal that the collaborative relationship with NCE Systems Engineering, aimed at developing better subcontractors, is expected to yield potentially value creating results over time.

The involvement in international cluster-to-cluster collaboration, such as the participation in the European Cluster Network for Smart Systems Integration, is amongst other things expected to provide important inputs and connections for member companies, as well as strengthening the cluster project's international standing through increasing the visibility of the project internationally.

4.6 Objective achievement

The overall objectives of the cluster project have been to

- Contribute to increased growth and renewal in the member companies, and establish new business with potential for international growth
- Create and attractive environment for internationally leading companies with foreign

ownership who wants to develop and grow in the region

- Create a strong and coordinated regional innovation system to secure commercialisation and future value creation, also after the exit from NCE.

We will consider these 10-year objectives, but we are mainly focusing on the objectives set in the third project period (2013-2016), see 2.2.2. Unfortunately, we have not had access to annual reports from 2013, but we will also consider objectives set, but not achieved, in the second project period (2009-2012).

The objectives of the last project period can be divided into two groups, those pertaining network collaboration and network building, and those pertaining innovation, competitiveness and attractiveness.

4.6.1 Objective achievement – Collaboration and network building

The only objective not achieved during the second project period, was to “further develop and strengthen the network collaboration and relationship building”. The cluster project had several objectives related to this in the last project period, including strengthened communication, increased member company involvement in joint activities and teams, increased collaboration with other clusters and environments, as well as strengthened international cooperation in networks and collaborative projects.

From annual reports and conducted interviews, we experience that there has been a positive development in the degree of collaboration and cooperation between cluster companies and between cluster companies and R&D environments.

Interviews also tell us that the cluster project’s relation-building activities directly contributed to

strengthened relations between local technology-developing companies and research environments, both in and outside of the cluster. The relation-building activities have also led to an increased general knowledge of each other among cluster members, and of which opportunities for collaboration that exists. According to cluster members, this has led to new customers and collaborative partners they normally would not have had. It is also an indication to support that the cluster identity has been strengthened during the last project period.

The cluster project also attracted new members during the last period, which has further strengthened the cluster.

Further, we find that several new collaborations with other clusters and environments have been established during the project period. Results from these collaborations is expected to contribute to increased competitiveness and future value creation.

We also found indications that cluster members have achieved increased contact and interaction with international clusters and environments, as well as EU funding agencies. However, we experience that few cluster companies have established new formal collaboration or supplier relations with international actors.

All in all, we believe that the cluster project has been relatively successful in building a stronger cluster, with a wider relational basis and increased degree of collaboration. Thus, we conclude that they have had a moderate to large degree of objective achievement within their objectives related to collaboration and network building.

4.6.2 Objective achievement – Innovation, competitiveness and attractiveness

The cluster project had several objectives related to innovation, competitiveness and attractiveness in its last project period. The project was to further develop the cluster's entrepreneurial ecosystem, as well as NCE MNT as an innovation arena, contribute to increased innovation, commercialisation and wider involvement in concrete collaborative projects in the cluster, support further development of pilotage, test infrastructure and the incubator community. The cluster saw innovation, international collaboration and competitiveness together, and wanted to further develop and increase international collaboration to strengthen companies' competitiveness and market access, with single projects in R&D and innovation, and through increased networking with leading players.

It is our understanding that in the last project period, the cluster project has further developed the cluster's entrepreneurial system, as well as NCE MNT as an innovation arena.

We find that the cluster's relational basis has been strengthened, which in turn is expected to strengthen the cluster project's foundation for cluster-based innovation, and thus NCE MNT as an innovation arena.

The argument that NCE MNT has been strengthened as an innovation arena is also supported by the fact that the cluster has been successful in releasing large sums of funding from funding agents, both in Norway and abroad. In addition, the cluster has released funds from "Innovasjonsrammen". This testifies to a professionalisation of innovation work in the cluster, as well as an increase in innovation and commercialisation efforts.

The cluster project's incubator member, Silicia, received Siva status in 2013, and has become an important part of the cluster's innovation centre. This

must be seen as an achieved objective, cf. the objective of supporting further development of pilotage, test infrastructure and incubator system.

This, and that the cluster reports to have successfully innovated several new products, solutions and ideas, leads us to conclude that the cluster has had a high degree of objective achievement within the innovation area.

The cluster also had the objective of furthering international cooperation to strengthen the competitiveness of companies and to support them in new markets, through individual innovation projects, and through networking with leading players.

The cluster's connections to other strong clusters, as well as knowledge environments, directly or indirectly through HSN, can be said to be a good step towards this goal. We know that many members of the cluster have gained an increased international network, with is expected to lead to valuable gains, but we have not been able to measure this development. We therefore conclude that while it is difficult to measure, we believe that the cluster is developing in the right direction at this point.

Figure 4.3

Average number of employees. Core members in NCE Micro- and Nanotechnology, compared with other limited liabilities in the same industry¹ (nationally, excl. all cluster participants). 2003-2016²

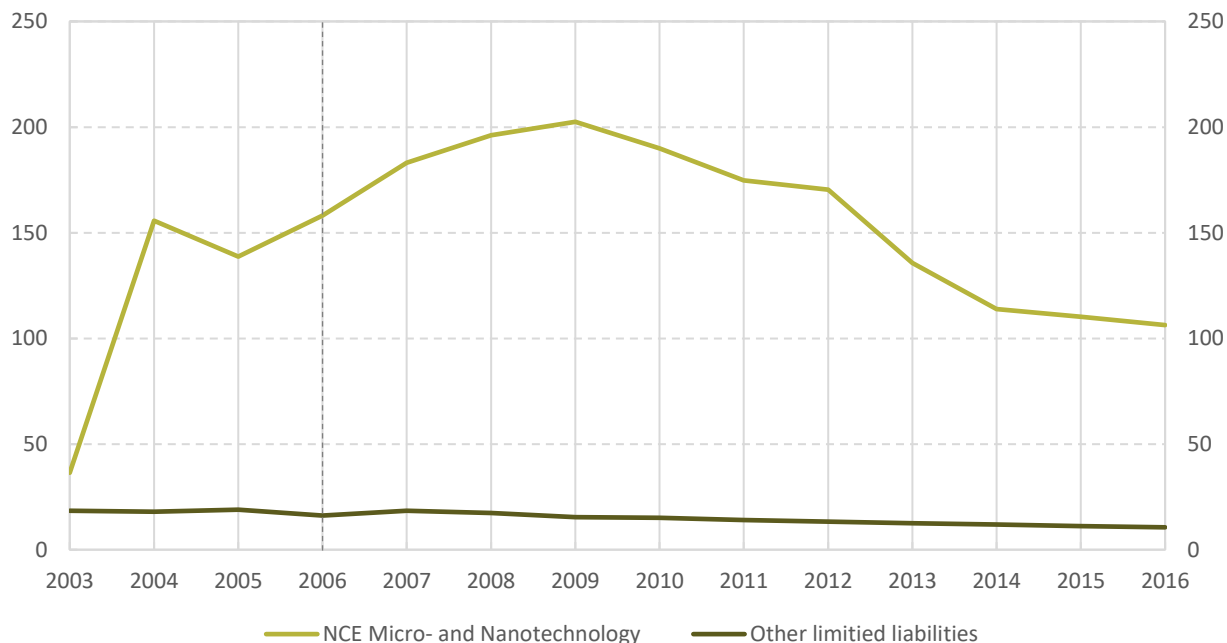
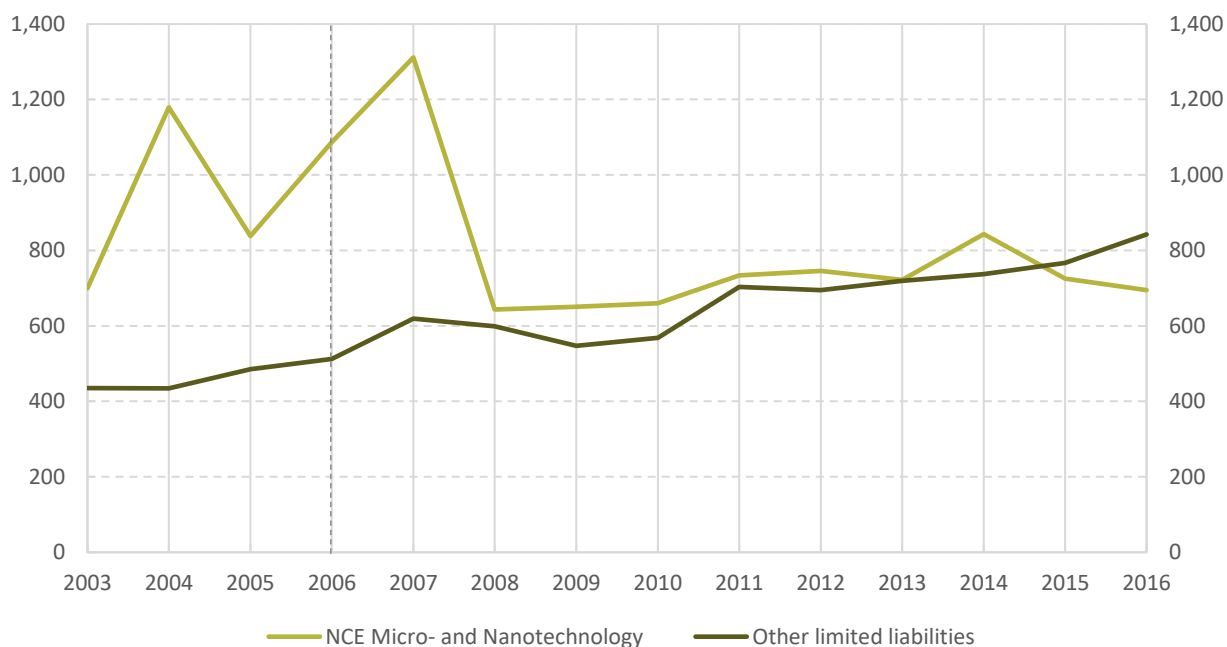


Figure 4.4

Average labour productivity³. Core members in NCE Micro- and Nanotechnology, compared with other limited liabilities in the same industry (nationally, excl. all cluster participants). NOK 1 000. Current prices. 2003-2016



Source: Samfunnsøkonomisk analyse

1) 26 Manufacture of computer, electronic and optical products

2) NCE Micro- and Nanotechnology was enrolled in the cluster program in 2006

3) Value added per full-time equivalent (FTE)

4.7 Economic effects

Based on annual reports, previously conducted surveys and our interviews with cluster members and facilitators, we believe that the cluster project has achieved several of its objectives. We are now investigating whether this has led to measurable economic effects in terms of increased employment or increased value creation.

4.7.1 Employment and productivity trends

The total number of employees among core members have increased for the main part of the project period, apart from a small decrease in 2009 and from 2014 and onwards (cf. figure 2.1). The first decrease must be seen in relation to the world economy at the time. The latter decrease may be, like for several other cluster projects, due to the downturn in the petroleum sector, which seems to have affected the core members' development after 2014.

The average number of employees in core members of NCE MNT increased from the start of the cluster project. This trend started before the firms enrolled in the cluster project, and continued for some years after. After 2009 there has been a negative development in the average number of employees. This decline has been slowing down in the more recent years.

Compared to other limited liability companies (LLCs) in the same industry (manufacture of computer, electronic and optical products), the core members are on average larger. Whereas the development on average in other LLCs has been a slow decline, the development has been more volatile within the cluster project (cf. figure 4.3).

Looking at average labour productivity there seems to be little difference between the core members of NCE MNT and other LLCs in the same industry after 2008 (cf. figure 4.4). The development in average

labour productivity in core members before 2008 is most probably a result of noise in the data.

4.7.2 Value creation

As for number of employees, the core members of NCE MNT is larger than comparable firms, measured in average value added. We find that the development in the average value added by core members is like the development in the average number of employees. The average value added increased from before 2006 to 2010, and then started falling. Again, there is little correlation between the development in core members and comparable firms, who have had a very flat development (cf. figure 4.5).

The total value added among core members in NCE MNT, as indexed from 2006, has increased yearly until 2014, when the index is falling. Core members in NCE MNT has performed better than comparable firms since 2008/2009, also when we take into account the negative development after 2014 (cf. figure 4.6). However, it is difficult to conclude whether this is an effect of cluster participation or not.

Figure 4.5

Average value added. Core members in NCE MNT, compared with other limited liabilities in the same industry¹ (nationally, excl. all cluster participants). NOK 1 000. Constant 2016-prices. 2003-2016²

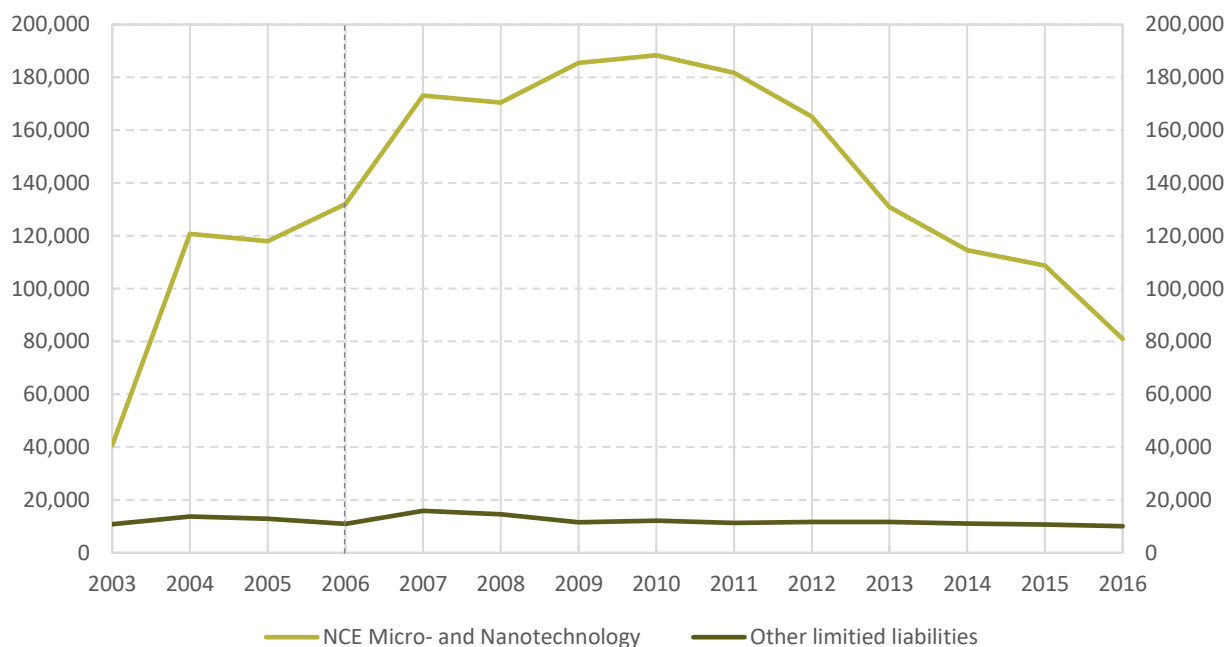
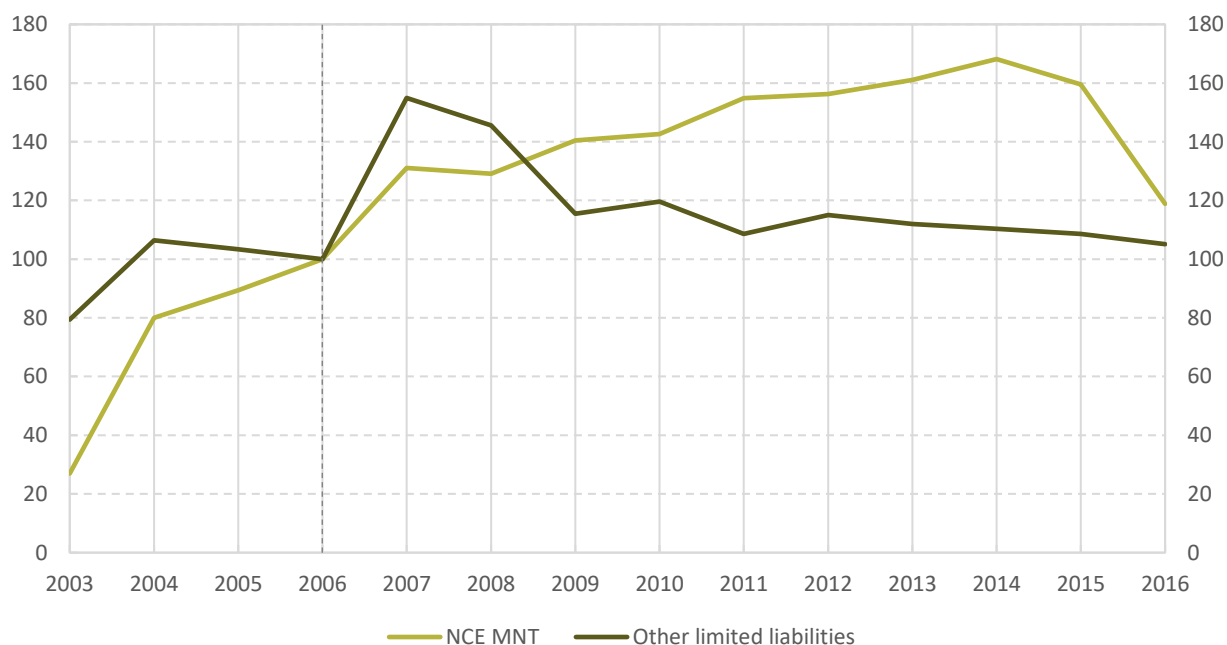


Figure 4.6

Total value added. Core members in NCE MNT, compared with other limited liabilities in the same industry (nationally, excl. all cluster participants). Index (2006=100). Constant 2016-prices. 2003-2016



Source: Samfunnsøkonomisk analyse

1) 26 Manufacture of computer, electronic and optical products

2) NCE Micro- and Nanotechnology was enrolled in the cluster program in 2006

5 Overall assessment

NCE Micro- and Nanotechnology (MNT) is centred on the production of ICT systems, microsystems and the usage of micro- and nanotechnology in miniature.

The companies in the cluster have a leading role in microsystem technology and electronics/ICT in Norway. Several of the companies in the cluster are international leaders in their product areas through market, commercialisation, production and technology expertise within their niche areas.

The cluster was part of the NCE programme from 2006 till 2016. Originally, it was known as NCE Microsystems, but it changed its name to today's NCE Micro- and Nanotechnology in 2008.

The cluster project has its geographical core in Horten, but members are located all over Vestfold.

A large share of the members had common roots, common technology and common value chains, and has continued to work within similar technology areas today. From interviews, we have learned that the commonalities in technology are strong enough to provide a basis for collaboration in development of both technology and products, but that this differs somewhat between the members. Overall, our understanding is that there are moderate complementarities in the cluster, despite a relative lack of common markets or products.

There are several supplier-customer relations in the cluster project, and the competition between suppliers can be strong at times. There is however relatively little competition between the larger firms in the cluster.

It is our understanding that initiated activities to a large degree have been aimed at developing the project's potential synergies, and that the cluster

has invested sufficiently in the development of its relational basis (trust among members and cluster identity). Further, we believe that the activities to a large degree have been designed to lead to appropriate project results and long-term value-added effects.

The objectives of the last project period can be divided into two groups, those pertaining network collaboration and network building, and those pertaining innovation, competitiveness and attractiveness.

We believe that the cluster project has been relatively successful in developing the cluster, with a stronger relational basis and an increased degree of collaboration. It is our belief that they have a moderate to large degree of achievement within their objectives related to collaboration and network building.

Results from innovative activities led us to conclude that the cluster has a large degree of achievement within their objectives related to innovation.

While it is hard to measure, we also believe that the cluster is developing in the right direction when it comes to furthering international cooperation to strengthen the competitiveness of companies and support them in new markets.

We find that the core members are, on average, larger than comparable firms, and that they mainly have had a better development in average number of employees and value added. After 2014, these numbers have declined within core members, and approached the levels of comparable firms. However, when looking at total value added, the core members of NCE MNT has performed better than comparable firms since 2008, also when we take into account the negative development after 2014.

Whether this is an effect of cluster participation is beyond the scope of our analysis to conclude on.

6 References

For this evaluation, the following documents have been used:

NCE MNT's annual reports for 2014, 2015 and 2016.

Various articles on nce-mnt.no

IN's questionnaires from 2014-2016.

Programme descriptions for NIC and NCE

Earlier evaluations by Econ Pöyry (2009) and Damvad and Menon (2012)

In addition, we have conducted interviews with the cluster management and cluster members.



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