

NORUT Samfunnsforskning AS
Rapport nr 12/2005

CREATION OF A CLUSTER?

PULL-FACTORS AND OBSTACLES IN THE ESTABLISHMENT OF A FORMALISED NETWORK

The case of the marine biotechnology industry in North Norway



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NORUT Samfunnsforskning AS
Desember 2005

Prosjektnavn Bioklynge Nord		Prosjektnr 44
Oppdragsgiver Bioklynge Nord		Oppdragsgivers ref
Dokumentnr SF 12/2005	Dokumenttype Rapport	Status Åpen
ISSN 0804-6069	ISBN 82-7697-207-1	Ant sider 45
Prosjektleder Anne Katrine Normann	Signatur	Dato 05.12.2005
Forfatter Anne Katrine Normann		
Tittel Creation of a cluster? Pull-factors and obstacles in the establishment of a formalised network. The case of the marine biotechnology industry in North Norway		
Resymé This report documents the first phase of a cluster development process. The case is the aquaculture- and fisheries related biotechnology industry in North Norway. In January 2004, Bioklynge Nord (Biocluster North) initiated the mobilisation of supporting actors to the cluster development process. The Bioklynge Nord project leader established a Resource Group and recruited a Process Leader. In November 2004, the industry actors were summoned to a first in a series of process meetings. A forum was established, as an arena for the industry actors to meet and interact. Since then, significant changes have taken place. Even though it is too early to call the marine biotechnology industry companies a cluster, there is definitely a network of companies, some more active and dedicated to the process than others. The analysis demonstrates that the public support system has had an important role. The cluster development process is still dependent on a supportive system, however, the industry actors have to an increasing degree taken on responsibility for the process to continue. The entrance to 2006 demarcates a new phase in the cluster development process. The industry actors have taken over some of the seats in the Bioklynge Nord Board, and thus, they are in the position to define the further direction of the process.		
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PREFACE

This report presents some results of the first year of a cluster development process in the aquaculture- and fisheries related biotechnology industry in North Norway (Troms and Nordland counties). Bioklynge Nord (Biocluster North), which is a main project of the Arena Programme, funded by SIVA, the Norwegian Research Council and Innovation Norway, has initiated and driven the process.

I thank Bioklynge Nord/the Arena Programme for funding the report. It has been an interesting experience to follow this very dynamic process, and to work with the group of dedicated facilitators.

Tromsø, December 2005

Anne Katrine Normann

PREFACE	V
SUMMARY	1
1 INTRODUCTION	3
2 ON INDUSTRIAL CLUSTERS AND INNOVATION SYSTEMS.....	5
3 THE CLUSTER DEVELOPMENT PROCESS IN NORTH NORWAY	10
3.1 Preparations: mapping the potentials	10
3.2 Bioklyngje Nord: The project leader, the Resource Group and the Process Leader	10
3.3 Forum for Biotechnology and Aquaculture.....	12
4 ACTIVITIES TO NURTURE AND STIMULATE THE CLUSTER DEVELOPMENT PROCESS.....	16
4.1 The Process Lab.....	16
4.2 Internal FBH study tour	16
4.3 International study tours	18
4.4 Strategies for increasing the attractiveness of FBH.....	19
5 ACHIEVEMENTS AND POTENTIALS	22
5.1 Industry actors: From scepticism to enthusiasm.....	22
5.2 Towards increased cooperation	22
5.3 A new study curriculum.....	23
5.4 The FBH attracting public interest	23
5.5 Towards 2006: New period, new opportunities.....	24
6 DISCUSSION: STIMULATING AND HAMPERING FACTORS	27
6.1 Significance of location	27
6.2 Significance of a public support system	28
6.3 Significance of pull-factors.....	28
6.4 A spiral interactive process.....	30
6.5 Development challenges	33
7 CONCLUDING REMARKS.....	35
REFERENCES.....	36
APPENDIX	37

SUMMARY

This report presents some results of the first year of a cluster development process in the aquaculture- and fisheries related biotechnology industry in North Norway. Emphasis is on the role of the public support system (virkemiddelapparatet), represented by Bioklynge Nord as a main project of the Arena Programme, and on the role of the industry actors. Thus, the focus of the report is twofold:

- 1) On how the role of the public support system started out as being the energetic initiator and driver of the process, towards encouraging the industry actors to take on more responsibility
- 2) On the role of the industry actors. A year ago, they were a heterogeneous group of relatively isolated industry actors, some sceptical to the process. Today they are still a heterogeneous group with respect to size, products and markets, but appear as more of an organised group of biotechnology industry actors, thinking and acting in terms of cooperation, joint benefits and synergy effects. They have to an increasing degree taken on a leadership role of the cluster development process.

An industrial cluster is a precondition for an innovation system to materialise in this context. The cluster is the mere physical setting where the industry actors recognise and make an effort to realise the potentials of being located together with other companies with rather similar challenges and experiences. An innovation system demands conscious attitude towards sharing knowledge and expertise, with the ultimate goal of innovating and penetrating new markets.

There have been tremendous changes during one year; the industry actors have gone from being a loosely connected group of companies to appear more as an organised unit of companies with interests and challenges in common. This has taken place within the arena Forum for Biotechnology and Aquaculture. The process has received attention from other companies with some interest in aquaculture- and fisheries related biotechnology. Some have asked to become members of the forum. The public support system has had a key role, for instance by arranging a wide range of activities of relevance to the industry actors. By 2006, the process enters a new phase where the industry actors have a more dominant role in the process.

1 INTRODUCTION

Since January 2004, Bioklynge Nord (Biocluster North) has played a key role in stimulating a cluster development process in the aquaculture- and fisheries-related biotechnology industry in Nordland and Troms counties in North Norway. Bioklynge Nord invited eligible companies to take part in a process towards the consolidation of a biotechnology network, based on the idea of industrial clusters. There are few industrial clusters in the northern part of Norway (www.aksjonsprogrammet.no). The bulk of the companies that form part of the industry cluster development process of Bioklynge Nord is located in Tromsø, and represents a wide variety of products. The production is knowledge-competence- and innovation intensive. In 2002, there were about 500 persons employed in the biotechnology industry in Tromsø, of whom 200 were university graduates.

Bioklynge Nord was formally initiated in 2004, and is a main project of the Arena Programme (funded by Innovation Norway¹, SIVA² and the Norwegian Research Council). The overall focus of the Arena Programme is on the stimulation and development of regional clusters where enterprises within an industry segment, relevant R&D institutions and other competence institutions are concentrated within a geographical area, and where there is a potential for strengthening the interaction between them. The Arena Programme provides assistance in terms of funding, and expertise to the planning and implementation of long-term development projects. Sub-goals of the Arena Programme include strengthening the companies' capabilities for innovation; enabling expertise to become more active partners for the companies; assisting public authorities and development agencies to develop a more proactive and well coordinated commitment to support innovation processes; and building up a knowledge base to support policy learning (www.invanor.no).

The purpose of this report is to contribute to the understanding of the significance of key actors and supporting activities in a cluster development process. This is done by exploring the case of a cluster development process in Nordland and Tromsø, documenting the interaction between the marine biotechnology industry actors, the public support system (virkemiddelapparatet), and the researcher

¹ From 1 January 2004, the four organisations The Norwegian Tourist Board, the Norwegian Trade Council, The Norwegian Industrial and Regional Development Fund (SND) and The Government Consultative Office for Inventors (SVO) merged into Innovation Norway. Innovation Norway is a public (state) organisation employing more than 700 people. It has offices in Norway's 19 counties, and in more than 30 countries worldwide. Innovation Norway promotes nationwide industrial development profitable to both the business economy and Norway's national economy, and helps release the potential of different districts and regions by contributing towards innovation, internationalisation and promotion (www.invanor.no).

² Selskapet for industrivekst SF (www.siva.no)

community. The focus is on the potential and ability of companies to network, and their evolving commitment to the process, and on the role of the public support system. The following questions are addressed: Which factors promote and restrain the networking initiatives? What are the observed successes and failures of the networking process since the inception? Has there been resistance among the industry actors? How resilient and sustainable is the industry network after approximately one year in operation? The emphasis is on the period from early 2004 to the end of 2005.

The BIT-group (Biotechnology in Tromsø), established in 2002, has defined some of the premises of the biotechnology industry in the Tromsø area. The BIT-group consists of ten members, which represent the biotechnological industry, research, the public support system and regional authorities. At its initiation, the BIT-group had a vision of expanding the biotechnology industry in Tromsø, and the goal was to reach 2000 employed in the industry, of which 40 per cent university graduates. This presupposed the existence of a biotechnology cluster.³ In order to achieve this, the focus was on facilitating the growth of the industry, for instance by providing physical infrastructure to serve the biotechnology industry in Tromsø. The BIT-group is influential and often referred to as an informal formal network, efficient when it sets out what to achieve. Thus, the focus on biotechnology in North Norway is not a new phenomenon; what is new, is that there is a conscious and dedicated effort to coordinate and integrate the biotechnology industry companies as an organised unit in a process of industrial development.

This report is based on material derived from observation and participation at the Resource Group meetings, FBH process meetings, and other activities; minutes and memorandums from meetings; interviews with actors in the public support system and informal talks with industry actors. The companies' names and participation in the forum are not secret, and can be found in the appendix or at the homepage of the forum (www.aksjonsprogrammet.no). However, names are omitted in the report when referring to meetings, events and statements.

³ Minutes BIT-group 2004.

2 ON INDUSTRIAL CLUSTERS AND INNOVATION SYSTEMS

The literature holds positive messages about the importance of industrial clusters for a region's successful economic development. Much of the literature is normative, describing and analysing existing industrial clusters, and conveys convincing explanations of why clusters are important to industrial growth and innovation. Being part of a cluster is related to increased competitive advantage, which is an important rationale for Bioklynge Nord's efforts. Bioklynge Nord literally had to start from point zero (some would claim, below zero), in that the companies made up a heterogeneous group of actors with irregular informal cooperation and little tradition for recognising the potential for cooperation as a parallel process to competition. It is therefore essential to describe the dynamic and the process of developing an industrial cluster: how the situation is, the development potentials, and what can be learned from the experiences.

Porter (2000/2003) defines cluster in the following way:

“Clusters are geographic concentrations of interconnected companies, specialized suppliers and service providers, firms in related industries, and associated institutions (e.g. universities, standards agencies, and trade associations) in particular fields that compete but also cooperate.” (Porter 2000/2003: 253)

The emphasis is on the importance of geographic concentration and spatial location for a company's competitive success, where suppliers and firms in related industries and institutions are localised. When the industries are knowledge and competence intensive, there is often reference to innovation systems. The concepts of cluster and innovation system are often used interchangeably. However, cluster mainly refers to organisation and geography, innovation system focuses on knowledge. A cluster can therefore be perceived as the organisational and geographic context of an innovation system (STEP/KPMG 2002). In other words, a cluster may be an accumulation of companies within a geographical area, however, without being particularly innovative. Transfer and interchange of knowledge is an important precondition for a cluster to be an innovation system. In knowledge-based industries, innovation is the key to survival and development. Innovation can be defined as the novel application of economically valuable knowledge, and can be classified as product⁴ innovation, process⁵ innovation or organisational innovation. Innovations may be either radical or incremental (Feldman 2000/2003).

⁴ Product innovation focuses on the creation of new products that range from radical breakthroughs that create new product categories to simple, incremental improvements (Feldman 2002/2003: 374).

⁵ Process innovation focuses on incorporating new technology into the methods of production (Feldman 2002/2003: 374).

Porter contends that there is insufficient understanding of the tight relationship between clusters and competitive strategy at the company level. This is why there is a need to focus on location and cluster participation as integral to individual companies' success, and to integrate this understanding into a business strategy. Porter stresses that company executives be conscious about the possibilities inherent in the proper location. Supporting this is the fact that economically advanced areas are characterised by industrial clusters:

“Some nations, regions within nations, and cities contain far more competitive firms than others, even at locations nearby. If we focus on particular industries, and segments of industries, the concentration of competitive companies is even more striking.” (Porter 2000/2003: 253)

Porter found that companies that have common concerns related to production or marketing can be located in an area, without being referred to or recognised as a cluster. The company executives interact with each other to a limited degree only, being vaguely aware of common concerns and strengths. This is despite the fact that they often share both needs and opportunities to meet common constraints and obstacles to productivity. Porter believes this lack of consciousness is related to how managers are trained:

“Managers still rarely see the world in terms of clusters, especially in any conscious way. This is a reflection of the near absence of connections between location and firm behaviour in the management literature.” (Porter 2000/2003: 256)

Industry actors are often highly sensitive towards competition and seek to protect their innovative ideas, especially in the early phases of the product development. Porter sees this as a paradox, as most cluster participants actually do not compete directly, but serve different industry segments. This way, cooperation does not necessarily threaten the concern for secrecy:

“Seeing a group of companies and institutions as a cluster highlights opportunities for coordination and mutual improvement in areas of common concern without threatening or distorting competition or limiting the intensity of rivalry.” (Porter 2000/2003: 255)

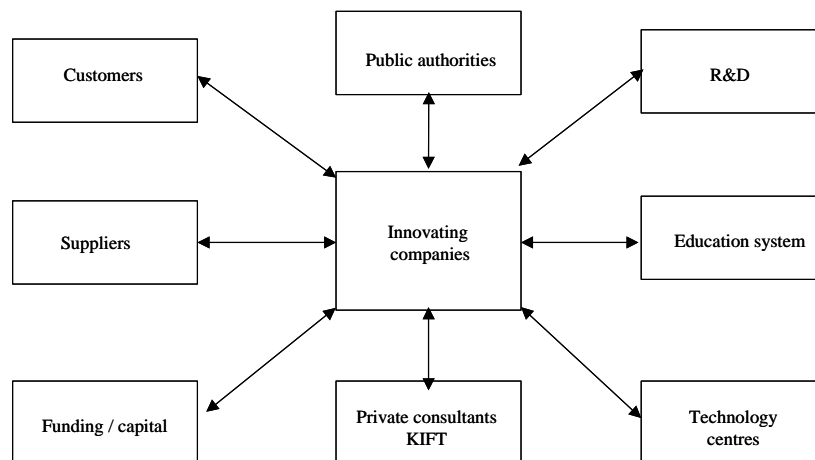
The cluster can be a spatial organisational form that is an efficient way of assembling inputs to the production, if competitive local suppliers are available. This means that being part of a cluster can provide companies with superior or lower-cost access to specialised inputs such as components, machinery, business

services, and personnel. A cluster may offer availability of specialised personnel, services and components. A potential benefit is the availability of information about current buyer needs. The buyers can be part of the cluster, and other cluster participants may gain and share knowledge about their needs. This is related to marketing. Related firms and industries in a location may offer efficiencies in joint marketing, such as for instance firm referrals. It is likely that a buyer will source from a place which has good references and has gained a good reputation in a specific field (Porter 2000/2003).

An innovation system consists of three central groupings of actors corresponding to the Triple Helix model: Industry actors, the public support system and the research community. The concept of Triple Helix is used for university-industry-government relations, described as the knowledge flows between the academic, industrial and governmental spheres. The spheres intertwine and are cross-linked, and the interactions result in a continuous reshaping and recombination of the various elements. Each sphere is also increasingly able to assume other roles. For instance, universities take on entrepreneurial tasks such as marketing knowledge and creating companies, and firms may have an academic dimension, sharing knowledge among each other and training employees at higher skill levels (Leydesdorff and Etzkowitz 1996, 1998).

Figure 1 below illustrates an innovation system where the Triple Helix actors interact.

Figure 1: Model of actors and innovation in an innovation system, based on the interactive innovation model (Isaksen 1997)



Bioklynge Nord has been concerned with how to develop a successful cluster. A question that has emerged from the Bioklynge Nord experience is how many industry actors are necessary for a cluster development process to result in an established industrial cluster. Steinsli and Spilling (2004) refers to the concept of critical mass as the minimum number of actors that is necessary to form an industrial cluster that is sufficiently strong to maintain and develop the core competence of the cluster. Critical mass varies according to industry and the corresponding field of competence. In addition to securing a critical mass, a number of preconditions need to be in place. Ffowcs-Williams (2005) argues that first and foremost, local seeds of excellence are necessary for the foundation of the clustering initiative, and clustering initiatives will not develop without active participation of industry actors. Early government support is needed to obtain private sector commitment. Government agencies, represented by public support systems, have an important partnership role in the cluster development process. As the prolonged arm of the public support system, a neutral facilitator is a vital driving force in the clustering process. A key role for the government is to fund the facilitator on a long-term basis. The facilitator need to be dedicated to the clustering process, and it is often an advantage if he/she is well acquainted with the industry:

“A neutral facilitator needs to be available to initiate the clustering process, and a key role for government is in resourcing the facilitator on a long term basis. This person is the neutral broker who has responsibility for instigating cluster development programmes, and ensuring that the initiatives continue to be upgraded.” (Ffowcs-Williams 2005: 3-4)

Creating a cluster does not happen overnight. It is important to distinguish between short-term and long-term gains and benefits, especially if the companies engage in high-cost and high-risk production that take several years to develop and to market, such as pharmaceuticals. The long-term perspectives for eventual returns means that the companies need to have activities of a short-term character to finance the other production activities. This can be seen as what Ffowcs-Williams (2005) refers to as low-hanging fruits, which are:

“...the relatively easy initiatives that do not require substantial resources, and deliver early wins. They are the tactical first generation initiatives, building early collaboration, rather than long term major impact initiatives.” (p. 6)

The concept of low-hanging fruits in the Bioklynge Nord context is twofold. One is that the cluster development process shows for small and larger achievements along the way to the ultimate goal. Another is mere financial, that the companies

have some product activities that render profits while they work on projects that will generate outcomes in a long-term perspective.

To sum up on the theoretical approach: Companies that share production and marketing experiences and challenges can benefit from conscious interaction. Such companies can be located within a geographically delimited area, however, without recognising that they make up an industrial cluster. Even if they make up an industrial cluster and regularly interact, it takes more to become an innovation system. This demands interaction and interchange of ideas, joint projects, and an attitude of "you have to give something to get something". The industry companies are the key actors in a cluster, however, in a cluster development process involving knowledge intensive industries, there are aspirations towards an innovation system. Thus, the public support system and local research community are necessary actors both to get the process started and to its constructive development.

3 THE CLUSTER DEVELOPMENT PROCESS IN NORTH NORWAY

3.1 Preparations: mapping the potentials

Marine biotechnology has a huge growth potential. The Norwegian Ministry of Oil and Energy assumes that the biotechnology industry will claim an increasing share of the global economy. Hitherto unknown organisms in the Barents Sea have the potential to contribute significantly to the Norwegian economy, becoming more valuable than oil and gas (Wormdal 2004). The region of North Norway is particularly interesting with its natural advantages in the exploitation of marine resources, and high-level competence in marine biotechnology (www.invanor.no).

In 2001, the Regional Development Fund (SND; today incorporated into Innovation Norway) undertook a pre-study to map and evaluate the possibilities, bottlenecks, conditions and interests for the development of a regional innovation system related to marine biotechnology in North Norway. The pre-study demonstrated that there was a limited degree of networking among industry actors, and that there definitely was a potential. The Regional Development Fund presented the results of the pre-study to the public in 2003. Several of the industry actors who had been interviewed for the pre-study emphasised that there was too little cooperation between the companies in the marine biotechnology industry. Not all agreed; one of the company representatives contested this, arguing that there already was excellent cooperation. The divergent perceptions are an indication that the point of departure of a cluster development process could have been easier. The marine biotechnology companies made up a heterogeneous group with respect to production, markets and size, and the public support system faced an interesting challenge.

3.2 Bioklynge Nord: The project leader, the Resource Group and the Process Leader

An in-house project leader in the Regional Development Fund was in charge of the pre-study (2001-2003). Bioklynge Nord/the Arena Programme hired an external project leader from 1.1.2004, to be in charge of the cluster development process. She established a Resource Group composed of representatives from the public support system and the local research community to plan, facilitate and coordinate the process. A Process Leader with a substantial network in the biotechnology industry was recruited from Fiskeriforskning (The Norwegian Institute of Fisheries and Aquaculture Research) in Tromsø. His mandate included mobilising potential industry actors' interest and commitment, and to be the link between the Resource Group and the industry actors.

Table 1 below provides details over the institutions represented in the Resource Group, and their respective roles.

Table 1: Roles and responsibilities of the members of the Resource Group

Roles	Organisations	Responsibilities
Project Responsible	Innovation Norway	Overall responsibility; external spokesperson for the project.
Project Leader	Bioklyngje Nord	Coordinate the project. Report to the Project Responsible. Elaborate plans, reports and minutes. Coordinate resource use in the project.
Resource Group	- Norut Social Science Research Ltd - MABIT⁶ - The Norwegian Research Council - Norut Group / University of Tromsø / Norinno⁷	Planning meeting agendas and other activities for industry actors. Collaborate with the Project Leader on the implementation of the project according.
Process Leader	Fiskeriforskning	Interact with the FBH industry actors and the Resource Group. Assist the Project Leader. Prepare and chair the FBH process meetings.

The Process Leader's first undertaking would be to convince the industry actors of the usefulness of the network, that there would be something in it for them. He started out with a letter of introduction to 25 companies that were identified as eligible cluster participants. Ten of these companies had more than ten employees, while eight companies consisted of one person.⁸ The Process Leader conducted initial meetings and informal interviews with the industry actors. These meetings and interviews were crucial, as they were decisive for whether the companies would participate in the network or not. The industry actors were encouraged to identify their challenges and possibilities, which would be included in the work as early as possible.⁹

Based on the Process Leader's observations from the initial round of interviews, the Resource Group planned the first process meeting where the industry actors would be gathered. It met frequently the weeks before in order to plan a relevant and interesting agenda, and to discuss how to arrange the meeting as smoothly as possible. The issues to be addressed centred on establishment of common challenges; identify objectives, prioritisations and useful activities for the

⁶ MABIT: Marine Biotechnology in Tromsø, a policy instrument to contribute to increased value creation within fisheries, aquaculture and biotechnological industry (www.mabit.no).

⁷ The University of Tromsø, the Norut group (www.norut.no) and NorInnova (www.norinnova.no) are represented in The Resource Group through the strategy leader.

⁸ Minutes from Resource Group meeting on 6 May 2004.

⁹ Minutes from Resource Group meeting on 6 May 2004.

companies; and the possibility for the network to build on competence that the participants hold. The Resource Group also addressed details such as how to seat the industry actors in the meeting premises, the place of the Process Leader (central, chairing the process meeting), and of the Resource Group (discretely, in a corner behind the industry actors).

3.3 Forum for Biotechnology and Aquaculture

Some industry actors responded positively to the Process Leader's approach and saw the potential benefits of cooperation and of participating in a cluster development process. Others expressed little interest or seemed sceptical to whether and how it would benefit them. It took the Process Leader significant effort to establish interest from the latter, and some industry actors were literally convinced into attending the initial process meeting on 4 November 2004, which was scheduled to last for six hours. This meeting would be critical, as it was decisive for whether the industry actors decided to continue to be part of the network.

Despite varying responses to the announcement of the meeting, such as "*It will cost me NOK 7000,- to spend a whole day at the meeting, so it better be good!*" the Process Leader had succeeded in triggering the industry actors' curiosity. Representatives from twelve companies attended, which was more than anticipated. In addition, all the members of the Resource Group attended.

At the first process meeting, a name was established. The industry actors rejected name suggestions referring to cluster or network, as they were only loosely linked at this initiation stage. They agreed on the name "Forum for Biotechnology and Aquaculture" ("Forum for bioteknologi og havbruk", hereafter referred to as FBH). Other issues the FBH participants addressed referred to improved facilities and infrastructure, such as a biotechnology process lab, availability of standard and new analytic services, assistance related to patents and patent surveillance. They suggested making a homepage for the forum, to which the Resource Group attended immediately (www.aksjonsprogrammet.no/ForumBiHa.htm). The homepage has a link to all the FBH companies' own homepages.

An issue that the meeting attendants addressed was to establish rules of behaviour of the participants in the forum, relating to the concern for confidentiality. One participant said that he did not want any inquiries into the production process of his company, and wanted a document of confidentiality for the participants to sign. Another participant agreed to this and saw the rationale

of specifying what *not* to talk about. He added that confidentiality must not be an obstacle to cooperation and to the exchange of ideas and viewpoints, and that the FBH participants had to be ready to build trust within the forum (“You have to give something to get something”). Right after the first process meeting, the Resource Group elaborated a formal agreement for the FBH, with due consideration to trust, confidentiality and cooperation (Rammeavtale for Forum for Bioteknologi og Havbruk).

Based on contemporary needs, priorities and challenges, the FBH participants decided to prioritise the following five challenges in the forum:

Challenge 1: Commercialisation

The FBH industry actors seek to commercialise their research results, and emphasised the need for increased attention to the culture of entrepreneurship in studies and research environments, and arenas where knowledge can be shared and expertise developed.

Challenge 2: Innovation/customer relations

A step towards increased innovation was to elaborate long-term strategies for enhancing and building relations with present and future customers, and to engage in product development together with the customers.

Challenge 3: Market development and market penetration

Increase the potential for market positioning through continuous assessment of which markets to target, of who the customers are, and what products to develop and sell in collaboration with customers’ needs.

Challenge 4: Capital and financing

Enhance access to risk willing capital, risk sharing, identify sources of capital, and to standardise a model of financing.

Challenge 5: Access to strategic competence / innovation competence

Regarding the last challenge, the FBH participants expressed a need to draw on innovation competence in the local university and institute sectors in a formal way, and suggested to establish a network of expertise. The expertise network could for instance provide inputs in terms of strategies for innovative use of raw material, or to assist in application and documentation of products. This relates to the challenge of market access; as one of the FBH participant said: “For a product to be able to access a market, an enormous amount of documentation is needed”. The members of Resource Group discussed the idea of a researcher network, and the Process Leader began to screen the relevant research

environments for scientists to be part of a support group to the FBH. Some of the scientists he contacted were reluctant to participate in the researcher network, or downright negative, the arguments being that what researchers do is research, and they get their research funding independently of whether or not they establish contacts and engage in activities outside academia. They saw no need nor had interest in being part of a researcher network that was to get involved in business. STEP/KPMG (2002) had also noted this attitude among scientists in the Tromsø area, and reckoned that it may be a result of a series of university reforms that increased the requirements of documentation of academic results. This has contributed to some academic research communities enclosing their core activities. Anyway, the majority of the scientists who the Process Leader contacted were positive and interested in forming part of a researcher network. They represent the fields of bioprospecting, food articles, medicine and health, immune stimulation, pharmacy, and biotechnology (more details on the researcher network on www.aksjonsprogrammet.no). On 6 December 2004, the researchers met to discuss strategies and procedures. The meeting was also attended by some members of the Resource Group, and chaired by the Process Leader.

To sum up on the first FBH process meeting, the participants reacted positively to the initiative. One said that it had been a good experience: “*I feel that I am growing*”. The participants compared the situation in North Norway to the southern part of Norway, where development of industry potentials are more organised. A lack of a driving force to realise the potentials in marine biotechnology in North Norway was recognised. One participant had regarded one of the other participants as a competitor, but during the course of the meeting, he realised that there were also potentials for collaboration. At the end of the process meeting, the two “competitors” agreed to meet and discuss potentials for collaboration.

The meeting on 4 November 2004 was the first in a series of process meetings that came to function as an arena for the companies to meet, interact, and exchange experiences.¹⁰ At the two-hour long second process meeting on 20 January 2005, representatives from six companies attended. Shortly after this meeting, the project leader summoned the Resource Group to discuss how to increase attendance in future FBH meetings, and what would be a reasonable critical mass to expect to attend. One reason for why the attendance of the second process meeting was half of the first may be that the Resource Group did not have a preparatory meeting in advance. Consequently, it was not as diligently planned as the first process meeting, and mobilisation of industry actors to the

¹⁰ Process meetings: 4 November 2004, 20 January 2005, 15 March 2005, 21 April 2005, 7 September 2005, 8 November 2005.

meeting was initiated too late. The Resource Group agreed to have preparatory meetings before all future FBH process meeting.

By April 2005, eighteen companies with different product and market segments were part of the FBH (www.aksjonsprogrammet.no/RF_FBH.htm, accessed 13 April 2005). The companies cater to different markets, and thus do not directly identify with each other in terms of markets served and market penetration. Table 2 below gives an overview of the types of products and markets that the FBH companies engage in.

Table 2: Products and markets of the FBH companies

Products	Markets
“Oil-mix”	Foods
Animal food	Agriculture
Chitosan	Cosmetics, health
Enzymes	Pharmacy
Feeding	Aquaculture
Fish food, proteins	Aquaculture
Fish oils	Foods
Glucan and enzymes	Pharmacy, health, aquaculture
Hatchery	Aquaculture
Oil and proteins	Foods
Oil capsules	Foods
Phospholipids	Health, aquaculture
Services	Aquaculture
Services	The companies
System solution	Foods
Technology / Foods	Foods

After the initial two process meetings, the FBH participants had gotten to know each other, and in the remaining meetings in 2005, the participants to an increasing degree took part in the planning and execution of FBH activities. This is integrated in the following sections.

4 ACTIVITIES TO NURTURE AND STIMULATE THE CLUSTER DEVELOPMENT PROCESS

4.1 The Process Lab

In 1999, MABIT started to invest in processing equipment in order to contribute to the development of the biotechnology industry, by enhancing industry actors' access to necessary equipment for pilot production and processing. Norinova initiated the elaboration of a business plan, and the mobilisation of regional actors to fund the Process Lab.¹¹ This eventually led to the establishment of Process Lab, located at the premises of Fiskeriforskning in Tromsø. The Process Lab became a reality due to cooperation between MABIT, Troms County Authority, Innovation Norway, Fiskeriforskning, and the biotechnology companies Trofi, Biotec Pharmacon and ProBio Nutraceuticals.

The formal inauguration of the Process Lab was on 15 March 2005, and attended by FBH participants. Other attendants were representatives from media, aquaculture- and fisheries related biotechnology industry, regional development actors/public support system, the Resource Group, and researchers. The event was opened by a representative from the researcher network and the host institution Fiskeriforskning, the research manager at one of the larger companies of the FBH, and a representative from the Troms County Authorities, who each gave a short welcome speech (Tromsø 16. mars 2005). The cost of using the Process Lab is low (homepage: www.prosesslab.no). Initially, Innovation Norway had a seat in the Steering Board of the Process Lab, but rendered it to the Process Leader, appreciating the importance of FBH representation in the Board.

The third process meeting for the FBH participants took place the same afternoon, chaired by the Process Leader, who informed about the procedures around using the Process Lab. He asked whether the Process Lab seemed to fulfil the FBH participants' needs, and whether there was a need for additional equipment. In the aftermath of the meeting, four companies in the FBH came forward and offered their equipment to the disposal of other FBH members, to complement the Process Lab.

4.2 Internal FBH study tour

The fourth process meeting in April 2005 was combined with a visit to one of the larger companies, Company A. The Resource Group had preparation meetings in advance, and elaborated a detailed agenda. Ten FBH participants, two

¹¹ Information from MABIT, July 2005.

representatives for the researcher network, the Process Leader, and four representatives from the Resource Group attended. The manager of Company A gave a presentation of the company's history, its line of production, its collaborators and production and market potential. Followed this, Company A's owner, a large actor in the dairy industry, had a presentation. He started out by emphasising the importance of cooperation, networking, and not being too secretive. He put this in national and international contexts: Since Norway is such a small country, collaborating on innovation is important for success. He provided convincing examples of how innovation matters, and explained how marine biotechnology products are and will be important inputs to the dairy industry. He was impressed by the range of production in the FBH, and emphasised the significant market potentials, many still unknown.

A tour of Company A's production premises was followed by a vivid discussion among the participants, centring on individual and collective challenges, potentials, and how to follow up on and expand the networking and collaboration activities. The FBH participants addressed the necessity of being able to generate short-term results in a parallel process towards the longer-term goals. As one of them said: *"It is important to keep the cow alive while the grass is growing"*. For instance, developing pharmaceutical products and penetrating pharmaceutical markets demand planning, long-term work, heavy investments, and patience. In order to attract capital, it is important to work on products with immediate use, which generates short-term results.

The participants became increasingly animated as the day proceeded, and at the end of the meeting, they shared the following observations and experiences:

"From the very first meeting until now, a lot of things have happened. Now we are sitting here with a focus on the enterprises, together with researchers and the public support system. I have never experienced anything like this!"

"This forum is well composed. The industry, R&D and the public support system do not always walk in the same pace."

"This is a very useful network. We need to look into how to bring the experiences into the individual companies."

"I am rather impressed to discover what is here. Before, we used to be so closed that we hardly greeted each other."

"I am very impressed by Company A. The challenges related to risk willing capital becomes clearer."

"Very impressive. One needs financially strong partners such as the dairy representative."

“The best with this is that it demonstrates that it is possible.”

“It is positive that the Tromsø environment positions itself internationally, but we must not forget the market.”

“What is important is the market – and the market!”

“Several of us have talked about the market, it is important, but when we enter a market we need to document everything. To do this we need resources, and this is where the R&D environment in Tromsø has a function.”

“Great to meet the dairy representative. It proves that we need to be conscious about innovation, both related to products and markets.”

“We are concerned with R&D, and we don’t believe in lack of ideas. We see at least a couple of products we can develop in a system like this.”

“Everyone in North Norway is part of the Tromsø research environment. We all have a need for the University and Fiskeriforskning. We need to be part of a larger R&D system in order to do research.”

The fourth process meeting was a positive experience for the attendants. The dairy owner of Company A indicated that the dairy wanted more contacts in North Norway, to expand its network and seek niches. An unexpected and welcome outcome was that the dairy company became a participant of the FBH, which means that the FBH was enlarged by a nationally significant actor. This is a recognition of the potential of the FBH in the cluster development process. This new member added significant weight to the FBH; in fact, it represented two thirds of the FBH companies’ total turnover. At a later meeting, a FBH participant expressed satisfaction with the expansion of the forum: *“When I see one of their [the dairy company] cars on the roads, I think to myself that they are one of us!”*

4.3 International study tours

The Swedish Bioklynge Nord Board member and the Resource Group arranged a study tour to Lund in Sweden in May 2005, attended by ten FBH participants. Other participants were representatives from the public support system, the Bioklynge Nord Board, the researcher network, the Resource Group, and the Process Leader. The study tour included presentations of Swedish innovation systems, visit to a dairy with the subject “Functional foods in the dairy industry”, visit to a food producer with the subject “Food ingredients from offal”, and visit

to another food producer with the subject “The journey from a good product, to ‘business concepts’ to market penetration and successful export”.

In October 2005, a delegation from Tromsø undertook a study tour to the east coast of Canada. There were participants from the researcher network, the public support system, and four from FBH companies. The purpose of the study tour was to visit the Canadian biotechnology industry and R&D environments and to establish cooperation within aquaculture-related biotechnology. The delegation visited five institutions in Rimouski, Québec, three in Halifax, Nova Scotia, and four in St. John’s, Newfoundland. An important objective was to learn more about the potential for applying biotechnology to increase the use and value of aquaculture products. This study tour contributed to linking two types of value chains: traditional food production within aquaculture, and marine biotechnology. The visitors and the hosts got to know more about each others’ challenges and competence, and became aware of needs for competence, potentials within biotechnology, as well as of new markets and possibilities for cooperation in fields with high profit margins (Bioklyngje Nord 2005).

4.4 Strategies for increasing the attractiveness of FBH

As has been indicated, attendance to the FBH meetings was varying. One obvious reason is that time is a scarce resource for most of the biotechnology industry actors and thus an obstacle to participation. It also has to do with the importance the industry actors ascribed to the meeting agendas. All companies claimed their eagerness to participate, however, some repetitively failed to show up at the meetings. At the process meeting in September 2005, some had apologised for their absence in advance, due to illness, travels, or other meetings. Six companies attended, two of them with two representatives. As a rule, some companies sent more than one representative to the meetings, which is a demonstration of the significance and potential they ascribed the FBH activities. At the meeting in September, the attendants reiterated the importance of the forum as an arena. As one participant said:

“We have to meet every once in a while, if only for a cup of coffee, to get to know each other, to trust each other in this cluster. It is so nice with a forum like this, to get feedback, to share ideas and possibilities with like-minded people. There are not many places in North Norway we can do this. If we don’t stick together, who can we then ask?”

Another attendant asked whether the forum needed rules that commit the participants to the cluster, and how binding participation should and could be.

Both of these participants used the concepts of forum and cluster interchangeably, which indicates that they had gotten used to the idea that they were part of a cluster development process. The same attendant said that:

“There is hardly a culture in North Norway to build up large companies, to build up locomotives. But now we have a unique interest for participating in industrial development, and it is a healthy environment. I don’t want to loose it!”

This was supported by another attendant who said that: *“This is a fantastic opportunity, a unique project that must not die.”*

In other words, it was quite evident that the FBH participants appreciated the process and that they wanted to contribute. Following this process meeting, the Resource Group returned to the discussion on critical mass, and saw it as a priority to increase attendance from the FBH participants. A challenge would be to influence the industry actors’ attitude with respect to meeting attendance, and this could be done by enhancing the attractiveness of the FBH meetings. It was a clear decision not to push the industry actors to attend, as this was likely to be counter-productive. One pull-factor would be to arrange useful arrangements a routine; for instance combining process meetings with guest lectures with topics of crosscutting interest. This was accomplished at the FBH process meeting in November 2005, demarcating FBH’s first year of existence. Guest lecturers from Lytix Biopharma AS (www.lytixbiopharma.com) and Natural ASA (www.natural.no) gave presentations that focused on commercialisation and marketing strategies, respectively, with inputs to issues and fields such as branding, health foods, dietary foods, marine phospholipids, and polyunsaturated fatty acids. This was relevant for most of the FBH companies. Representatives from four companies attended, and one company sent three representatives, demonstrating the importance this company attributed to the topics. Other attendants were from the researcher network, the Resource Group, the Bioklynge Nord Board, and scientists who were not part of the FBH, but who had asked permission to come when they had heard about the topics of the guest lectures. The Resource Group afterwards again discussed strategies for increasing the attendance of the FBH industry actors, and decided to continue to invite interesting lecturers from successful companies and other institutions that could be useful to the industry actors. The Resource Group and the Process Leader also reminded themselves that the industry actors are busy, and that they need at least two reminders well in advance of the FBH process meetings, so that they do not “forget” and prioritise the meetings. With respect to this particular meeting, the industry actors had received a reminder some weeks in advance, and it was decided to follow up on the invitations to the meetings more actively. It would also be stated clearly that the meetings were open for all FBH participants, as one

of the participants had informed the Process Leader that he had the impression that this was not an ordinary process meeting, for all members to attend.

In sum, the first year of the FBH has been filled with activities, such as establishing the FBH as an arena where the industry actors can meet, with formalised rules of conduct attending to the quest for confidentiality, and with a homepage that is continuously updated by the Resource Group. The Resource Group has sought the best strategies for being a support to the FBH, and a researcher network has been established. Activities have aligned to the FBH members' interest, such as the study tours to Lund and Canada. The process meetings have had varying content and duration, with fluctuating attendance. The attendance have been highest when visiting other companies, such as the visit to Company A, and to the study tour to Lund. This indicates that the FBH participants take great interest in learning about others in their own environment. There has been an increased feeling of unity among the participants, however, some are more into the process than others. Some of those who in the beginning were reserved towards the idea of the process have stood by it and participated in all meetings and other forum activities.

5 ACHIEVEMENTS AND POTENTIALS

5.1 Industry actors: From scepticism to enthusiasm

During the course of the first year, there have been changes in how actors relate to each other and to the idea of being part of the FBH. Some examples of this are provided in the following:

The representatives of the recently established Company N were initially sceptical to how they could benefit from the research and business environments in Tromsø, and to the idea of networking. However, due to the Process Leader's persuasion skills, curiosity conquered negativity, and they attended the first process meeting in November 2004. They were not overly talkative. However, the first process meeting apparently evoked their interest, and they attended the second process meeting, being active and contributing with ideas for the network and cooperation. At the meeting in March 2005, they appeared expectant and positive, and more at ease with exchanging business experiences with other participants. As a matter of curiosity: Instead of letting the others understand that what they do is secret, they now said aloud "what we do is secret!" Then, at the fourth process meeting in April 2005, they were enthusiastic, praising the process, and even more eager to contribute and give input (*"I am so grateful for being a part of this, there are so many opportunities in North Norway, the future is wide open!"*). At that time, they had already established contacts with interesting other FBH participants; they saw the potentials for collaboration, and experienced reciprocal interest and respect.

Another example is Company B, which is not in the same production line as most of the other FBH companies. It is relatively large and has a solid market already. Company B would thus be expected to be reluctant to participate in the FBH and in a networking process. However, the opposite happened, instead of staying away from the meetings and other events, the company has had one or more representatives at all gatherings, and it has taken on a role as active discussant. It is also one of the companies that have made its production equipment available for other FBH participants. It comes through as positive and sees the potential of innovating through new constellations.

5.2 Towards increased cooperation

During the course of the last year, some of the FBH participants have found common interests and potential cooperative areas, and there are contours of different constellations. Potential joint projects have been identified. A small and relatively new company has a production cooperation plan with a larger well-

established company. Another constellation consists of two companies of approximately the same size, but with different production and market segments, which complement each other and see a huge potential in a future collaboration in a niche market. Two other forms of cooperation are proceeding. These projects have in common that they are all offspring from the meetings and activities that have taken place in the FBH.

The FBH participants have used the researcher network only to a limited degree, mainly because cooperative projects still are in the design phase. However, the FBH participants are aware of the researcher network and that it is there for them to use. At the process meeting in September 2005, one FBH participant said that he had benefited greatly from discussions with researchers in this network (*“In fact, this morning, down the hill on the way to this meeting”*). One of the scientists in the researcher network who was present at this meeting sustained this, and had experienced that some companies approached the scientists, one by one, and there already were several discussions going on. This was on an informal basis; knowing that the researcher network was established as a service to the FBH, the participants could approach the researchers with ease.

5.3 A new study curriculum

The contemporary regional education in marine biotechnology insufficiently addresses all the competence areas that the biotechnology industry depends on. Innovation Norway took the initiative to map and analyse the educational facilities in marine biotechnology at the University of Tromsø. Consequently, Bachelor- and Master Degree programmes will be offered at the University of Tromsø. At present, most graduates in biotechnology disciplines are from the Norwegian College of Fisheries Science at the University of Tromsø, and extensive research is done at this institution. Therefore it was seen as convenient that the Norwegian College of Fisheries Science takes on the secretarial and coordinating function of the new study curriculum. This study will be unique in both a national and an international context, and attract students. An optimal student body is 25 students per year (Dalmo 2004). An interim Steering Board was appointed in 2005, with members external to the university, of whom there is one representative from the public support system and one from the FBH.

5.4 The FBH attracting public interest

By the end of 2005, several companies had declared their interest in becoming members of the FBH, much to the satisfaction of the Process Leader, the

Resource Group and the FBH. The forum had received attention from industry actors with a link into the aquaculture- and fisheries related biotechnology industry. For instance, it had been noticed that the dairy company referred to earlier had become a member of the FBH.

Among the companies that took an interest in the forum was a large consultancy company, based in Tromsø. A manager of this company contacted the Bioklynge Nord project leader and asked permission to join the process meetings and to become a member of the FBH. Later, an influential leader of one of the largest fishing companies in Norway approached the Process Leader, and wanted to become a FBH member. He argued that the FBH would benefit from including suppliers of raw material. Both the project leader and the Process Leader have received positive feedback from a variety of other actors, both in the region and in other parts of Norway, who acknowledge that the process is exciting and innovative. No decision has been made yet as to how to respond to these enquiries, except that they should be met with reciprocal interest. A topic of discussion at the last process meeting in 2005 was whether and how to expand the FBH. This will be a responsibility of the Bioklynge Nord Board.

5.5 Towards 2006: New period, new opportunities

The entrance to 2006 demarcates the transition to a new period for the FBH. During its first year of existence, the FBH has depended on the efforts of the public support system, which has been the driving force and operating facilitator for the process. The Bioklynge Nord Board was composed of six members, from Innovation Norway Troms, Norinnova, the Norwegian Research Council, Troms County Authority, a Swedish consultancy, and a company representative. When Bioklynge Nord was started, it was premature to expect the industry actors to take on a leading role for the process. After one year of FBH existence, it was time for a change. The Bioklynge Nord Board wanted that the FBH become the new core of the project, and thus invited the companies in the FBH to make up a new Board composition together with some form of the existing Board. In other words, the company representation would be increased.¹² The Board members from the Norwegian Research Council and Troms County Authority had been members since the initiation in 2004, and voluntarily resigned in order to give way to FBH representatives. While three of the old Bioklynge Nord Board continue into the new period, a new member from the researcher network and three new members from the industry were elected to the new Board. The industry representatives come from a large company, a medium-sized company and a small company; companies of different age, as well production and market

segments, and thus with different challenges and priorities.¹³ The new Board constitutes itself in December 2005, and a chair will be elected. The five challenges that were defined by the FBH will be a main focus of the new Board in 2006, and will be elaborated and refined at the constituting Board meeting. As mentioned above, the new Board will also make decisions as to whether to expand the network with new members. Other issues to address refer to how to focus activities; to whether the FBH is to have one overriding focus, or to divide the activities into more define sub-projects, each with its special focus and concentration of activities.

The MABIT representative in the Resource Group informed the FBH participants about the “Norwegian Centre of Expertise” (NCE) and the opportunities herein. The NCE is inspired by models of Finnish innovation and regional policies, where the motive is to strengthen regional industries’ international competitiveness by developing core competence. This is relevant for the FBH, as 50 per cent of its production is exported. A NCE contributes with the financing to enhance the cooperation between the individual companies, and between the companies and the R&D environment; improved access to capital and competence, and improvement of the external conditions and infrastructure. It can contribute with financial and disciplinary support for up to ten years. In the new FBH period, there is an opportunity for FBH to apply for a NCE. A NCE is applicable when a critical mass of companies is established, and among them, there should be a locomotive. Furthermore, the group of companies should appear as a defined cluster and the industry actors recognise its significance, and they are to be internationally oriented, and the cluster must have a potential for further development. The application initiative has to come from the industry. The NCE has to be based on an industrial cluster, and it has to be initiated and operated by the industry. The NCEs are a step towards a regional innovation system. Bioklynge Nord is thus in the phase preceding the NCE, since its intention is to contribute to cluster development (www.aksjonsprogrammet.no, accessed 25 November 2005). The application deadline is in February 2006, and it remains to be seen whether the appropriate interest and effort can be mobilised to apply for a NCE. The follow-up on this will be an issue for the Bioklynge Nord Board.

¹² Memorandum from Innovation Norway to the Bioklynge Nord Board.

¹³ Minutes FBH-meeting on 8 November 2005.

Figure 2: A scenario for a NCE and the FBH

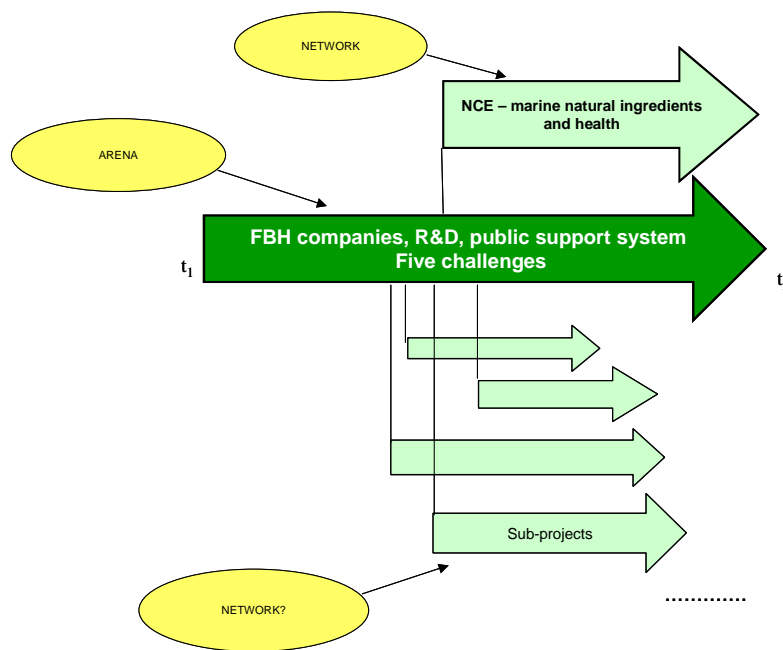


Figure 2 illustrates a possible organisation if the FBH achieves a status as NCE. While the NCE is a commercial network with focus on marine natural ingredients, the FBH continues as an arena for more informal collaboration, where the commercial considerations are not in focus. The FBH is an arena where ideas for sub-projects are generated. In other words, the FBH is continued even though the region gets a NCE.

The above depends on whether the forum is mature enough, ready to move to the next step. One indication of this is whether the FBH is ready to change name, to reflect the consolidation of a network. At the last process meeting in 2005, there was a discussion of whether to change the name of FBH. A challenge is to create a brand name for the cluster, as part of creating a common ground the companies can identify with. There were different opinions, some argued that the name must reflect the efforts of networking and cluster development, and have a name that is internationally marketable, while others argue that it is still at the level of a forum and that it will stay this way for a while more. Others again want the FBH to be careful with respect to how it presents itself; it includes a wide range of products, relating to the pharmaceutical industry to fish offal treatment. One of the FBH participants said: “Do we *have* to call it a cluster?” There was consensus that the FBH name stayed until the new Bioklyngje Nord Board takes further action in that manner.

6 DISCUSSION: STIMULATING AND HAMPERING FACTORS

The development of the network depends on the interaction between the biotechnology industry actors, the public support system, and the researcher community. The industry actors' commitment to the process is decisive for an industrial cluster to be established. The more the industry actors get involved in the process, the higher the likelihood that the public support system can gradually withdraw. This section discusses the factors that promote and restrain the networking initiatives, based on the experiences from the process' first year.

6.1 Significance of location

The aquaculture- and fisheries related biotechnology industry is close to the raw material base. In a Triple Helix perspective, as presented in Figure 1 (page 7), the location, with Tromsø as a locus, is ideal for the marine biotechnology industry, in that there are several companies that experience similar challenges related to production and marketing, even though they engage in different segments and do not compete directly. The public support system is active, and the biotechnology industry actors benefit from a competent and dedicated team that is enthusiastic about the cluster development process. Furthermore, the area has a relative large researcher community with a wide range of competences. The significance of this was demonstrated when the Process Leader recruited scientists to the researcher network; when some declined to contribute to the biotechnology cluster development process (which was a negligible few), there were scientists with the right competence in other university departments or research institutes who volunteered to be part of the process. This means that the upcoming innovation system is not overly vulnerable and dependent on a few key persons. All this relates to Ffowcs-Williams' (2005) reference to local seeds of excellence as a foundation for a clustering initiative. In addition, there is an education system from which the industry can recruit skilled staff, there are private consultancy institutions, and suppliers of raw material and other input factors that the companies need; in short, there are promising conditions for creating an innovation system according to Figure 1. Some challenges have to be faced and difficulties overcome, such as the difficulty of access to capital. Several of the companies experience lack of risk-willing capital, which may put a lid on the realisation of innovative ideas. Another difficulty relates to the legacy of lack of culture, or tradition, for fishing companies to collaborate with innovation in mind.

6.2 Significance of a public support system

Even though local seeds of excellence as a foundation for the clustering process were in place, the point of departure of a cluster development process was not the easiest. The FBH consists of a heterogeneous group of companies, with respect to production, markets and size. The companies tended to operate on an individual, atomistic basis, characterised by scepticism towards the idea of formalised collaboration. It was challenging and demanding to mobilise a common effort, commitment and enthusiasm for a cluster development process. After a year, there are clear signs that the efforts have been rewarded: There is a growing consciousness and attention towards the importance of cooperation and of the potential gains of networking.

The idea of developing this industrial cluster in North Norway can be viewed as a public policy, an industrial cluster defined as something positive to aspire to; a means towards increased innovation and realisation of economic potentials. The industry actors may respond in different ways to the challenge posed by the public support system. It was especially important with convincing arguments for why networking could be beneficial to the participants. The carriers of these arguments hold substantial expertise and knowledge of the industry and a sincere interest in developing a biotechnology industrial cluster and an innovation system in the region. These include an enthusiastic project leader and a Process Leader that can be described as “the right man in the right place”. The Process Leader is the neutral facilitator who takes on the responsibility as a vital driving force in the clustering process, as Ffowcs-Williams (2005) listed as a main condition for a cluster development process. Furthermore, the Resource Group has met regularly and prepared the meetings with the industry actors in detail. These supporting actors arrange for the FBH participants to find each other. The processes and mechanisms the supporting actors initiate are not always visible, nor are they of interest, to the industry actors. This way, the Resource Group is a shadow cabinet, with its main focus on the development process of the FBH.

6.3 Significance of pull-factors

Since most industry actors are busy, time is a constraint, and there is a need for pull-factors for attracting as many as possible of the FBH participants to the arena. The Process Lab is a concrete and tangible initiative attending to practical and essential needs of the companies. The Process Lab functions as glue for the forum, as a step towards creating a common identity, and it has a unifying effect on the industry actors at an early stage of the cluster development process. This is substantiated by the fact that four companies complemented the Process Lab and made production equipment available to the other FBH members.

The attention to the five challenges defined by the FBH participants proves that the process can show for short-term results. One of the challenges refers to the need for competence on entrepreneurship. With a FBH member in the Interim Board of the forthcoming study curriculum on biotechnology, there is a greater chance of the study attending to what Porter saw as a flaw in management training; that managers are often unconscious with respect to relating a company's economic prosperity to its physical location within a cluster. The challenge of linking up with customers was partly addressed at the visit to Company A, with the dairy representative. The possibility of linking up with a potential customer, and to get input and ideas in terms of redirecting attention towards other potential sources for cooperation, is a pull-factor. The study tour to Company A in April 2005 was a success. The dairy representative visualised future possibilities, and encouraged and gave the FBH participants input with respect to approaching markets. This also addresses the challenge of capital and investors. The challenges that refer to market penetration and the researcher network have also been addressed. The researcher network is already in place and has been used.

The FBH participants see that they have an influence in the process, in that it has been adjusted to their needs and potentials. Influence and a sense of ownership were central topics when the conditions for using the Process Lab were discussed with the participants. In order to maintain and increase industry actors' interest, win-win situations need to be identified. When the actors' behaviour is predictable and they comply with the rules and agreements made, there are conditions for the growth of trust. Therefore, it is often appropriate to elaborate formal rules and agreements at an early stage, as the FBH participants asked for, in order for the participants to know what to relate to, what kind of behaviour is wanted and acceptable in the cluster (Iversen 2004). The same applies to the elaboration of rules of confidentiality and trust to adhere to.

Ten FBH-participants attended the study tour in Lund, Sweden, in May 2005, which included an appointment with a dairy producer to discuss potentials for cooperation. Through the study tour to Canada, the participants got the opportunity to be acquainted with how similar challenges were approached in different contexts, and they explored the potentials for cooperation. The future will show whether the cooperation potentials are realised.

All these efforts have led to development in terms of cooperation. Initial sceptics have turned more positive, some enthusiastic, and participants have started to look for ways to cooperate with each other. Furthermore, the well-established larger companies that may not strictly need to cooperate with other FBH participants show up at meetings. They observe that other actors have a positive

attitude towards networking and the cluster development process, and that the process has generated results already. They see the potential for own future benefits. At the last FBH process meeting in November 2005, three representatives from one of the larger company attended, which indicates the relevance of the topics addressed at the meetings. The FBH homepage has been frequently visited since its establishment, which is duly announced at the process meetings. Information about a new large FBH member, and about other companies and actors being interested in becoming members of the FBH, may attract actors to attend simply because they do not want to risk missing out. By the end of 2005, twenty companies are members of the FBH. Eventually there may be something that is of relevance to their business, and then it is worthwhile being part of the network, and to have an influence on the cluster development process. This demonstrates the importance of providing low-hanging fruits to be harvested, by showing off some short-term results for nourishing the interest of the different FBH participants to put in an effort in the network.

6.4 A spiral interactive process

Skilful researchers are not necessarily gifted business managers, and elaborating and following-up on business strategies can be too demanding for some of the companies. They lack knowledge about how to facilitate and manage the process from having a business idea based on research, to commercialising it. The public support system observed this and undertook a pre-study to map the potentials and bottlenecks, and presented a model of a cluster development process to the biotechnology industry actors. This way, the cluster can be seen as top-down designed. The intention was to gather individual company actors, and to stimulate a bottom-up process. Since the first process meeting in November 2004, the FBH participants have been encouraged to contribute to the formation of the network with the aim of consolidating an industrial cluster. The industry actors have been increasingly responsive, starting by defining and agreeing on the five main challenges; they came up with a name and suggested that a homepage be made, which was effectuated; and they emphasised the importance of being able to obtain short-term results along the way to the longer-term goals. The idea of cooperation has sifted through, and some cooperative projects are anticipated. There is an increasing interest from other actors to become FBH members. The new Bioklynge Nord Board has enhanced representation and influence of the industry actors. This way, the design of the cluster has gone from being a top-down designed model to an interactive process, where the participants are encouraged gradually to take on responsibility for developing and establishing a sustainable and resilient network and cluster. The ultimate

objective is that the public support system eventually renders itself redundant in this process.

There are different conditions that apply when differentiating between an industrial cluster and an innovation system. For the latter to be realised, there must be transfer of knowledge and expertise, and a determination to share in order to be able to innovate. In a best-case scenario, the process of Bioklynge Nord is headed towards a regional innovation system. The dynamics of the process that has taken place the past year is illustrated in Figure 3 below.

Figure 3: From the individual company to a system of innovation¹⁴

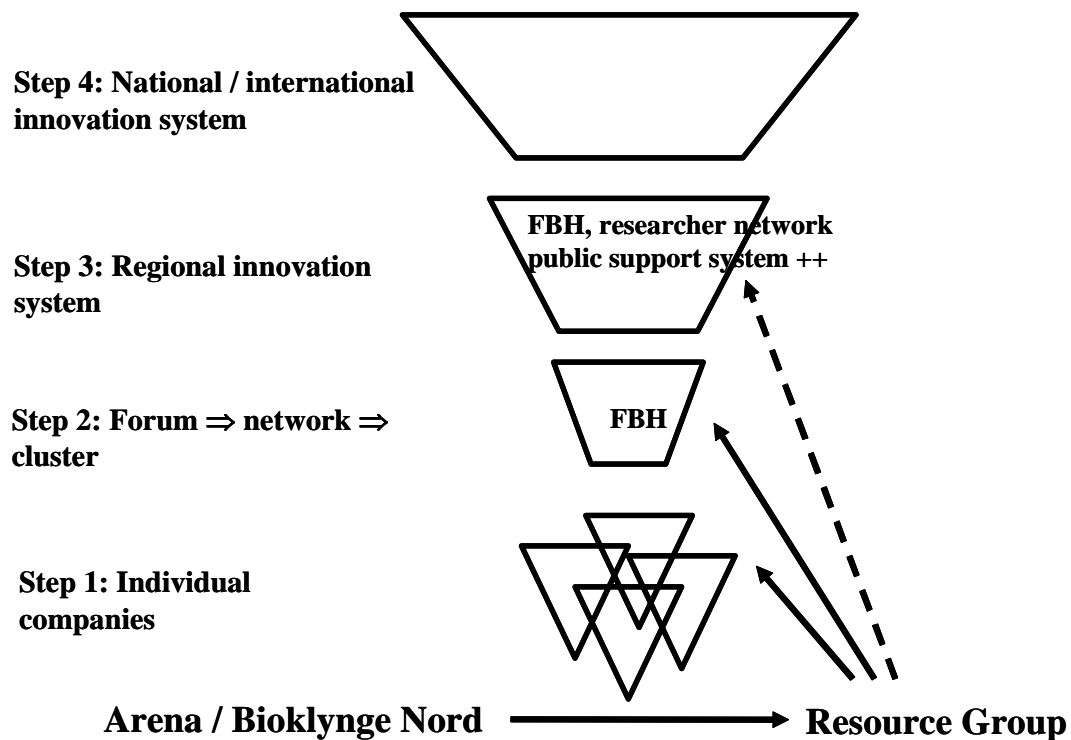


Figure 3 illustrates the stepwise development of the process of Bioklynge Nord since November 2004. It started out with individual companies that were only loosely related to each other, if at all, and a public support system that saw the potential of developing a biotechnology industry cluster that could enhance regional economic development. The point of departure was challenging: The companies make up a heterogeneous group, in terms of size, age, and raw material and production (such as lipids, enzymes, organisms). The crux question was whether, and how, the industry actors would respond to the initiatives taken

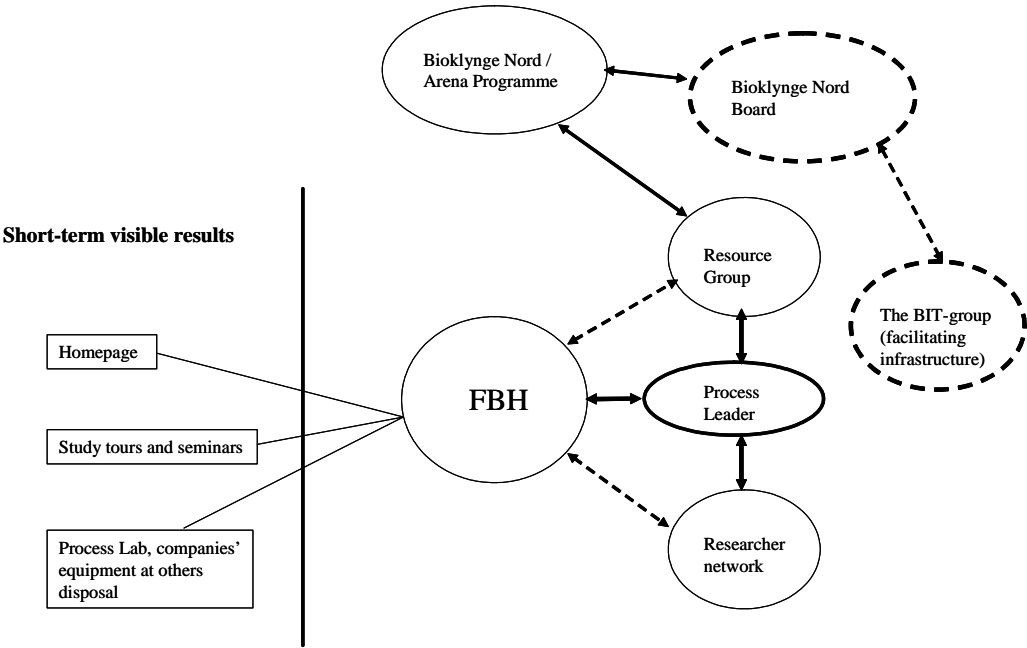
¹⁴ Based on J.R. Iversen, notes from Resource Group meetings.

by the public support system. The clue was to find common denominators between the companies, and between the companies and R&D. This has been, and will continue to be, main topics for the Resource Group and the FBH process meetings, and the future Bioklynge Nord Board.

The development of the network has reached step 2 in Figure 3. The FBH has been established as an arena, and this is a condition for reaching the next step (3) of a regional innovation system. A large share of the market consists of international customers. This indicates a need for assistance and expertise related to market penetration for newly established companies.

Figure 4 below illustrates the status of the FBH network by the end of the first year. It contains bits and pieces of the elements of Figure 1, and demonstrates the complexity of interacting actors and institutions.

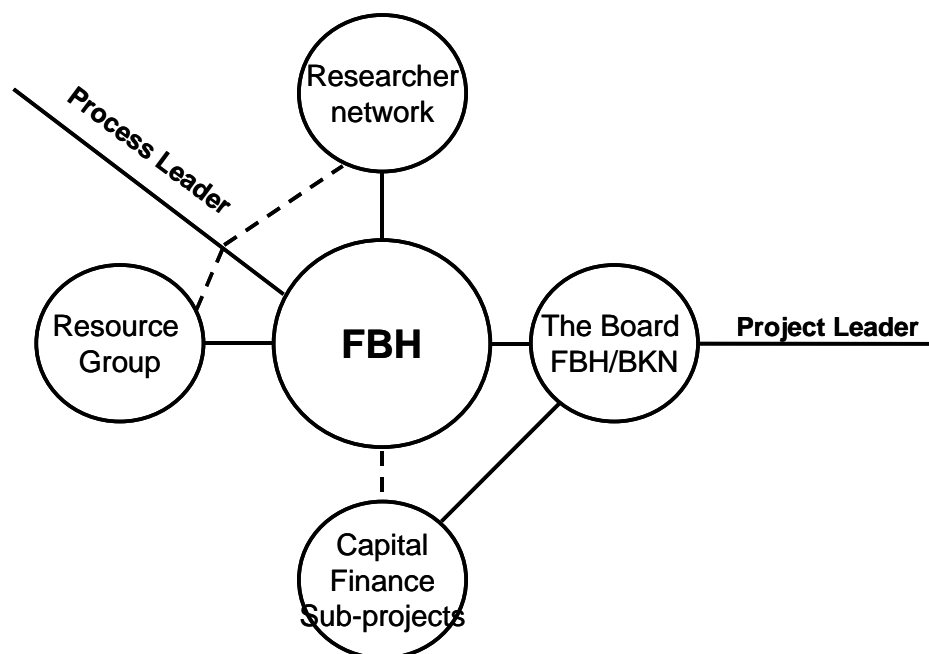
Figure 4: Status of the FBH network in Tromsø by the end of the first year



In Figure 4, the Process Leader is an important actor, functioning as a satellite and catalyst between the FBH, the Resource Group and the researcher network. The Resource Group has been rather invisible, working backstage and thus enabling the industry actors to find each other. The Process Leader, who is member of the Resource Group, has been the public support system's face and prolonged arm.

In the next phase, starting up in 2006, the point of departure for further cluster development is established, and the public support system knows where to continue its work. This is as opposed to when the industry actors were summoned to the first process meeting a year ago. Figure 5 demonstrates the network at entrance to the new period starting in 2006. The FBH is the main actor, and will have half of the seats in the Bioklyngje Nord Board. The project leader relates directly to the Board. The Process Leader is still the active part that the FBH members relate to, and he is the link between the Resource Group and the researcher network. The FBH will continue to address the five challenges, among them access to capital, and to develop new ideas that lead to sub-projects.

Figure 5: Organisation of the FBH network at the entrance to 2006



6.5 Development challenges

The cluster development process has come a long way when comparing to the initial situation. However, the FBH is still a fragile network, and by the end of the first year, its existence still depends on the continued enthusiastic work of the project leader and the Process Leader, and the back-stage invisible work of the Resource Group. The goal of the process is that the support system gradually reduces its importance for the process to thrive. To obtain this, there is a need for a driving force among the participants that eventually can replace the Resource Group once the cluster consolidates. In order to continue the process in the same

encouraging way, there is a need for dedicated industry actors who can be a driving force and take on responsibility for interacting with other cluster participants in order to reach the objective of having an active and innovative cluster. In other words, there is a need for a locomotive. A general trait of the northern part of Norway is that there is a lack of companies, or groups of companies, that can function as locomotives for industrial development. There is a clear need for a larger company to participate in the process of creating a biotechnology cluster. The lack of a persistent locomotive, or a driving force, among the industry actors, may be an obstacle to the cluster creation. The Resource Group had figured that Company B would be an evident candidate to take on the lead. However, this did not happen; instead, Company A demonstrated a positive and enthusiastic attitude, for instance by inviting the FBH to visit its premises. Company A has taken on a preliminary lead. Some of the smaller companies have come forward and enthusiastically contributed to the development of the network. Then, a scenario is that a number of smaller companies jointly make up a locomotive.

It is premature to refer to the FBH as an industrial cluster, something the FBH participants emphasised at the last process meeting in 2005; it is still not resilient and sustainable enough to exist without the continuous effort of the public support system. If the Bioklyngje Nord project was to end now, it is highly probable that the cluster development process also would end. Industry actors will have to undertake a trade-off regarding the commitment they are ready to make. Time is often scarce, and this trade-off may be an obstacle to contributing to cluster creation. Another obstacle has to do with secrecy and to an innate scepticism to sharing business secrets with other cluster participants.

7 CONCLUDING REMARKS

The experiences from the case of Bioklyngje Nord are illustrative of the complexity and potentials inherent in cluster development processes. The intention behind the establishment of the FBH in November 2004 was to mobilise and stimulate creative forces with an aim of realising the commercial potentials of marine biotechnology. The international perspective was central, as most companies either serve international markets, or have an objective of penetrating new, and perhaps unknown, markets.

The importance of the public support system has been duly described and demonstrated, as well as the importance of industry actors adhering to a common goal and vision of creating an industrial cluster and an innovation system. Time is a scarce factor for most industry actors, and may be an obstacle to participation in the process. Therefore, it has been essential to visualise and concretise the potential benefits of participating in the cluster development process.

The involved parties in the cluster development process have benefited from extensive and challenging learning experiences. The Resource Group and the public support system have had insight into the dynamics of a group of heterogeneous actors who, as seen from outside, should have all the good reasons to participate in the process. However, it takes effort to overcome some of the actors' resistance to change, and in this respect, it is important to align with the actors who have the potential of becoming the driving forces of the process. The industry actors have taken interest in a mutual learning process with other companies; a demonstration of this was that FBH members' attendance to meeting activities was greatest when they had the opportunity to visit other actors' premises.

While the case described and analysed in this report is the aquaculture- and fisheries related biotechnology industry in North Norway, the experiences and results can be transferred to other processes of cluster development. They can be analytically generalised to serve as an example and offering guidelines for networking efforts in other contexts. A precondition is the existence of a public support system as a facilitator and driving force in the development of existing as well as still unborn industry segments.

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APPENDIX

FBH members by the end of 2005 (www.aksjonsprogrammet.no)

Akva-Ren AS
Akvaplan-niva AS
Biohenk AS
Biomar AS
Biotec Pharmacon ASA
BioSea AS
Calanus AS
Contra AS
Drytech AS
EXIMO AS
Maritex AS
Norut IT
Olivita
Oppdrettsforeningen
Probio Group
Robio
Sea Eco AS
Tine Ingrediens
KS Trofi AS & Co
Troms Marin Yngel AS (TMY)