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From an industrial development program towards strategies for local and regional development. The emergence of an IT cluster?

**By
Bjarne Lindeløv**

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From an industrial development program towards strategies for local and regional development. The emergence of an IT cluster?

Bjarne Lindeløv, Nordland Research Institute, Bodø, Norway

Revue of the Industrial history of Narvik	1
The end of an Epoch	2
The process of reconstruction	4
Building up a net-based leaning network	7
The project: "Electronic bag"	9
The role of the University College of Narvik	10
The importance of anchor	11
Final discussion and conclusions	13
Time:	16
Space:	17
Anchor:	17
Politics:	17
Literature:	19

Revue of the Industrial history of Narvik

In the far north of Nordland county and at the inner end of the Ofotfjord is the municipality of Narvik. Nowadays this area is the centre of the Ofoten and southern Troms region and geographical area includes eight municipalities with a population of about 35,200.

Historically Narvik was founded and has built up its identity as an ore city. The mining area around Kiruna on the Swedish side of the border needed a transportation corridor to a deep, ice-free harbour, which was on Ofotfjord. Narvik grew quickly around the activities of the ore-company LKAB (Loussavaara-Kirunavaara Aktie Bolag). In 1903 LKAB, together with the national train companies of Sweden and Norway, finished the construction work with the completion of the section of the line between Kiruna and Narvik.

Narvik became a transport centre and in the wake of the activities of LKAB the Norwegian Railway Company (NSB) grew up to become the second core business. On the maritime side another transport firm was established - Ofoten and Vesterrålen Steamship Company (OVDS), whose main business was and is passenger-traffic and the transportation of commodities for the region.

This was Narvik's golden age and lasted up to the 1970s. A network of maintenance and supply businesses grew around LKAB. The physical infrastructure had to be built up from the ground. A quay-structure system which has gradually been extended to take ships of up to 200,000 tonnes; a storage complex for the ore and loading facility. All these activities gave rise to a concentration of highly competent building and construction firms.

At the end of the 1960s LKAB and NSB reached its highest level of employment with about 1850 employees. At the same time the two cornerstone enterprises contributed, through taxation, nearly 65% of the total municipality budget. Beside its direct effects on the local

economy, LKAB also took care of traditional local authority matters like land-use, planning and harbour works. As in many other one-company towns in Norway, the company played a paternal role in Narvik. Thus the company was not only regarded as an economic entity, but it also undertook a social responsibility for the local community.

Up to the mid 1970s, a relatively strong wage earning culture developed in Narvik at a relatively high level of wages. Together with a supply industry that, for the most part, was oriented towards the local market, Narvik became a stable industrial system, with steady labour markets and a wealthy municipality economy. But the dynamics arising from a diverse market, a more diversified network and a more developed new business culture were lacking.

About this time a new trend emerged in the Narvik industrial structure. A new institution was born with the establishment of the technical university college in 1975. For the first time the north of Norway obtained its own engineering education facility. Together with VINN - an advisory institute for business development and technology - and Norut-Technology, those three institutions intended to build the core for technology driven development. Two years later in 1977 the Kongsberg Arms Factory (Kongsberg Våpenfabrikk) set up a department in Narvik called Norwegian Defence Technology (Norsk Forsvarsteknologi (NFT)). The establishment of this technology production firm was a result of the F-16 deal. NFT started as purely as a subcontractor to the Kongsberg Arms Factory, but after a few years developed skills in producing more advanced Electro-mechanical products and was by itself carrying out testing. On this background NFT moved into the international military licence market. This included the production of rocket components and a laser based telescope to Bofors. A hundred people were employed on this production over the ten years of the contract.

The end of an Epoch

From the mid seventies the dynamic business structure, which had developed in Narvik, was gradually undermined. As the competitive climate for the European opencast mines hardened, LKAB experienced a dramatic fall in its raw materials' prices. Their response was to increase their efficiency and to rationalise production. LKAB started to introduce new technology in their production lines and reorganised their transport system. Within a period of 25 years LKAB together with NSB, reduced its staff in Narvik from 1850 to about 600 by 1993.

As some of the activity, which LKAB outsourced in this period, has been taken over by local firms, the total loss in employment has not been as high as these figures suggest. Nonetheless, the consequences for Narvik have been noticeable and especially for the municipality of Narvik which has had severe economic problems. Losses in tax-income and increases in expenditure for services and infrastructure projects which LKAB formerly undertook, resulted in a negative balance sheet. From being one of the wealthiest municipalities in Norway, Narvik nowadays is fighting an enormous debt burden

But what did happen to Narvik as the City of technology? Up to the beginning of the 90s it was hard to see the promised land. When we examine the main agents we might sum up the following experience.

The Technical University College: As part of a national educational regime, the focus of the Technical University College in Narvik was not automatically directed towards the local business structure or the local needs for technical competence. Neither was the interpersonal network of the academic staff linked to local industry, but rather, and not surprisingly,

reflected disciplinary relations along national lines. The result of this was, that a relatively low percentage of the locally educated engineers were employed in Narvik and as a result, they had to move to other regions in Norway. Those who stayed went into traditional industries like mining, transportation, the energy sector¹ and construction. At a local level, as has been described earlier, those sectors were either in a phase of decline and involved in powerful processes of rationalisation, or represented relatively isolated enclaves without a viable industrial network, that might have stimulated and supported dynamic development.² Furthermore, at a national level, some of those sectors represented mono-cultural regimes, that were not open to alternative technological development strategies.

Of the educated engineers from the technical university college of Narvik, very few started up new business in Narvik and with few exceptions neither did the academic staff create business activity alongside their teaching work.

VINN was, up to 1988, a general advisory institute for business related questions for small and medium sized business in Northern Norway. Their income was, in part, derived from public contributions and in part it was generated from project earnings. In 1988 VINN became a private institute, but was still partly public financed. VINN's activity was then focused more on technology related questions. As a tool in the general business politics, VINN thus has had a function of building up technology knowledge and competence and contributes in transferring technology to small and medium size business'.

NORUT Technology is part of the Norut Group which is a scientific organisation partly owned by the University of Tromsø. Their Narvik operation is the only part of the Norut Group which is located outside Tromsø. The main interests of Norut Technology are material technology, cold climate technology and structural engineering. It is within those fields that they provide business services for the region and national industry.

The presence of VINN and Norut Technology in Narvik has given them a regional identity, but as national institutions their networks and markets have been outside the Narvik region. VINN, with its workforce of about 70, has a relatively broad business focus, but Narvik industry has only to a limited degree created a demand for its services. Norut Technology, with 12 employees, has had a narrower specialised scientific focus. This is the sort of knowledge which, without adaptation, is difficult to implement in the grouping of smaller firms in Narvik.

Norwegian Defence Technology

In December 1994 shock waves stunned Narvik. Kongsberg Arms Factory announced its decision to close down its NFT production unit in Narvik. This would result in a double blow to Narvik:

- The closure of this mechanical and electromechanical firm would be equivalent to the disappearance of a technological production.

¹ "Statskraft" has its regional centre for Northern Norway in Narvik and do also operate the hydroelectric plants in Skjomen, Båtsvann and Norddalen.

² What I am arguing is that the relation between "new" knowledge from the educational system combined with the practical knowledge in traditional industry lacked its dynamics. This lack in dynamics can however not be explained in a distinction between a so called non-dynamic, non-innovative traditional industry on the one hand and a science and technology driven sector on the other hand. For instance LKAB has without doubt generated innovative processes of both product, process and organisational character. Innovations at a business level might however not always contribute to a development of business dynamic at an aggregated level. Innovations to be transformed from the individual business level to an aggregated level, need a receiver, that means structures of business milieus able to pick up the innovations directly or in the way of application.

- The closure would imply that the highly competent staff of engineers and skilled workers would be lost to Narvik. This was because the workforce at NFT was attractive to other companies elsewhere in Norway, but probably also because there were not many alternative job possibilities for them in Narvik.

There was an immediate reaction from Narvik's political and administrative management. The chairman, the City manager and his staff worked out an action plan and within a few days a crucial decision was made. The municipality of Narvik invested 15 million Nkr. to buy the capital in NFT and the firm was renamed "Narvik Technology" or Natech.

The judgement of the political and administrative leadership in Narvik demonstrated two issues. The first was to illustrate how isolated NFT had been in Narvik, and the second showed a strategic will to make technology a priority.

The description of the period from 1975 when Narvik first proclaimed itself as the City of technology, until about 1990, presents only a general picture. But the experience in Narvik showed the lack of interaction between the educational institutions and the industrial sector, between the technology companies themselves and between the technology sector and the surrounding grouping of small and medium size industries. What was missing was a network to link the single business units and the people within them. In other words, the local and regional elements, as a perspective for industrial development, were lacking. The dynamics were not there because the institutions themselves were not involved, nor did policy instruments, on their own, help. Scientific knowledge on its own was not sufficient and the high-tech production system did not act as a "motor", as it had nothing to react with. In short, the dynamic structures were not present.

The process of reconstruction

The decision made by the municipality of Narvik, was, of course, not an easy one. Firstly, it was ideologically quite unheard of a local government authority to be the owner of an industrial firm. It did not have any experience to administer its own business and secondly, it was a high risk investment. As a consequence, the investment resulted in criticism from political circles as well from some business leaders.

Now it is clear that this sort of decision always has to be analysed in relation to the background of some previous course of events. Thus there was a mental state of readiness inside local government which made them more likely to make such a decision. Over a period of almost two years, a strategic business development plan was developed. Being new, the production of this plan was not based on an internal local government process, but was the result of an open process of involvement. This process involved many people, representing local firms, local institutions and other interested organisations. It was a process seeking to integrate private and public spheres of interest. In this process the Chairman and the City manager were the drivers.

The planning process served different purposes. The first was an internal goal, which was to unite and activate local forces and resources in generating more positive development for the municipality of Narvik in general. Local development was to be achieved through business development and added value in this sector. The second purpose was to have Narvik recognised as an area of reconstruction and thus help in achieving the first goal. The external purpose of the planning process was to apply for public funds.

On behalf of the Norwegian government, the Ministry of Local Government and Regional Development since mid-1980s had administered a subsidiary instrument supporting processes of industrial reconstruction. The target group for this arrangement was the so-called one-company towns in crisis, either because of the closure of their cornerstone industries, or because of a drastic reduction in the labour force caused by rationalisation.

In aiming for the second goal, the chairman had been active in lobbying his social democratic colleagues in the Norwegian Parliament. As a result of the crisis involving the closure of NFT, linked with the resolute intervention of the local government authority, Narvik achieved the status of a municipality of reconstruction a month later in January 1995.

Narvik has had the status of an area of reconstruction for six years. But it has been divided into two periods - firstly from 1995 to 1998³ and secondly, after a new application and its renegotiation, a renewal from 1999 until 2000

The regime of reconstruction funds involve broad spectra of public and private institutions and firms. At the national level are the Ministry of Local Government and Regional Development and the National Business Development Fund (SND). At the regional level are the county authorities and the regional offices of SND. At the local level are a myriad of different institutions and actors representing wide interests.

The national authorities placed some demands on local government in Narvik. Primarily it was an absolute condition to establish an independent business development organisation, which was to administer the funds coming into the reconstruction process.

This organisation was to be a public limited corporation with its own management board. Private business interests had the majority of the shares, but the management board had wider representative interests. In other ways it was a hybrid organisation, being neither private nor public. The organisation was named Futurum AS and a manager was engaged. The first step was to produce an action plan based on the earlier strategic business plan. This action plan was to define the priority sectors, and the guidelines by which the project would be supported. According to the guidelines SND had introduced a method they called "project leader plan". This was a means of organising the leadership, control and accountability of the project. In this period of consolidation, many horizontal and vertical conflicts became visible. Different interests were fighting for position to enable them to define strategies and concrete actions.

Four main strategies were drawn up:

- Transportation and distribution: the vision was to make Narvik a centre of transportation and logistics functions
- Industry and Craft: Rolling stock for the railway
- Technology: Develop education in Transport technology and prepare an IT-strategy.
- Tourism: Develop increased competence within this sector and a goal to develop new tourism products.

³ For a more detailed analysis of this period of the reconstruction process in Narvik see. Omstillingen på "sporet"- næringsutviklingsarbeidet i Narvik in Karlsen, A/Lindeløv, B. (1998) Omstillingspolitikk i møte med praksis - spørsmål om forankring

It soon turned out that inside the tourism sector there was a lack of mutual co-operation. This field was therefore, after the first two years, excluded as a main strategy, as was "Industry and Crafts". Within this field a project had been devised which was ambitious but totally failed to fit in with the industrial landscape of Narvik. This strategy lacked realism.

During 1997 the reconstruction process developed towards a two strand focus: The first focused on Information and Communications and at the second on transportation and distribution. These strategic priorities were also directly required as a condition, by the Ministry of Local Government, if Narvik was to extend its reconstruction period by two years.

The development toward a more narrow focus might be illustrated by the figures below.

Object in focus	1995/96	1997	1998	1999	2000	TOTAL	%
Common main goal	958	1,265	1,527	1,585	2,500	7,835	10.0
Transport and distrib.	1,832	5,548	3,222	2,850	1,500	14,952	19.1
Inf. and com. tech.	1,221	7,579	5,031	3,715	4,200	21,746	27.7
Industry, craft, tourism.	7,023	3,257	4,703	1,000	1,000	16,992	21.7
Administration	3,344	3,884	3,735	3,000	3,000	16,963	21.6

In 1000 Nkr.

Also according to the financial conditions, the Ministry made some demands on the local government in Narvik. The demand was gradually to increase the self financing element of the project. By imposing this condition, the Ministry wanted to secure a higher degree of local commitment. After 1997 an increased onus was placed on the county. Together the local government and the county administrations were to contribute 50% of the total budget.

In 1000 Nkr.

	Min. local govern. and reg. develop..	Defence dept.	SND	Municipality of Narvik	Nordland county	TOTAL
1995	3,900	2,000		300		6,200
1996	8,000	1,500		1,000		10,500
1997	9,212			4,525	4,525	18,262
1998	8,000	1,300	600	4,000	4,000	17,900
1999	5,500			3,750	2,750	12,000
2000	5,500			3,750	2,750	12,000
SUM	40,112	4,800	600	17,325	14,025	76,862
%	52.1	6.2	0.8	22.7	18.2	100

On the basis of what hitherto has been said, one might perhaps have the impression of a centralised business development process in Narvik. A truer picture, however, was to formulate the reconstruction process within a climate of negotiation. Through the process of reconstruction a close co-operation and dialogue had developed between the SND-adviser and the administration of Futurum. But also there had been an active dialogue between SND and the companies. An evaluation of the activities of regional SND-office in Bodø towards business-Narvik, gave them credit for fast executive work.

Furthermore when the conflict level was at its highest it was, of course, convenient for Futurum to push the ministry and SND to the front, proclaiming that the requirements were dictated from above.

Building up a net-based learning network

The process, during the first three years, was characterised by trial and error. Of course this is never a method of conscious choice, but will always be part of the process of change, construction and reconstruction. One might even say the trial and error is inherent in every learning process. The reconstruction process was thus characterised by both disruption and anchor.

During the last three years, as the table above indicates, additional efforts and resources were put into the ICT strategy. The community learned from the experience and built up - gradually and systematically - a network of interacting firms and institutions, which co-operated, but also competed with each other.

The goal was to build up a diversified structure of ICT companies, where different business sectors, production and service units, educational institutions, public services, local government and administration were interacting.

Within the information and communications technology strategy many ideas have been articulated. The most durable of these has been the desire to construct a milieu within net-based learning.

The first step was to establish **Unireg Narvik**. This took place in February 1996 on a co-operative basis between the local labour market office, Futurum and Universities in Oslo. Unireg (The registration unit for University of Oslo) works with digitalizing texts. The idea behind Unireg is based on the principle that for half of its time the employer produces text for the University and for the other half they receive training or education. To date about 35 people are linked to Unireg.

The second, and perhaps most important step, was the formation of **Presens**. The founder of Presens AS was an entrepreneur who wanted to return to Narvik. He graduated as an engineer from NTH in Trondheim. In December 1997, Presens AS was established with Futurum contributing its capital. After three years the firm has grown to employ 11. A motive for a number of these has also been the wish to return to Narvik. It seems that Presens has a specific strategy of recruiting employees with a Narvik identity. Thus they have in active contact with students, with a Narvik background and offer them part-time employment.

What are the technology and ideas behind Presens? The technology is a development of a net-based learning system called "Web-learner" The idea is to transform text or educational programs digitally, to administer knowledge and systematise it to assist companies with business strategies. To back up its own technology, Presens has licensed the use of "Learning Management System", developed by an Irish firm. LMS controls access to a system and denies others. Compared to a traditional educational system the LMS equals a study administration.

The Web-learning system is a technology in its own sense, but may also be used as a supplement to another technology. Presens is primarily working in the business market. There is a core cost-reducing element in the use of this technology, because it might to some extent replace participation in conferences, and in doing so reduce transport costs.

Presens has established a contact with some University colleges to introduce their net-based system. But it has not been easy to get access to this market, because those institutions have built up own competence and have developed alternative technologies such as two-ways sound-picture videoconferencing.

The development of the technology is based on an ongoing dialogue on its use with, for example, the Web-school and Prokom, which are two other Narvik firms within this network. In a practical way the development of teaching and technology are walking hand in hand. Furthermore Presens has had assistance from Institute of Pedagogy at the University of Oslo.

Even although Presens technology has become more or less a standard product, there is an element of practical knowledge related to the functionality of the product. Presens was thus engaged in the project "Network of competence" ("Kompetansenettverk") on behalf of the Norwegian employers Association (NHO) In competition with 6 American firms and VINN⁴, Presens delivered a total training package to the project. There was a one-year trial period after which only Presens' system was functional. It was robust while the others were too complex.

Prokom is another firm in the education sector. It was established at the end of 1995 by three local investors of whom one is manager. Today Prokom has 10 employees. They have been recruited locally and VINN has been the main supplier. Business economic studies, elementary data-courses at user level are some of Prokom's products. Furthermore they were the first firm making use of Presens' technology, as a result of a demand from Unireg.

To get access to the market, Prokom has built up alliances with national partners. From its early start in 1995 Prokom has had a formal agreement with the Norwegian School of management BI, to arrange some of their preliminary courses within management. Later on in 1999 Prokom was part of "IT-Akademiet", Norway's largest private training provider in information technology. Prokom is thus acting as a branch offices within the IT-akademiet and is responsible for three other branch offices in the Northern part of Norway. So even though Prokom has been connected to the local IT-cluster, the company in its market strategies are acting at a national arena.

The Web-school (**Web-skolen**) is a one man company set up in 1999, by a former teacher at one of Narvik's Higher Secondary schools. The Web-school offers GCE (General Certificate of Education) A-level courses. Using Presens' technology developed, they deliver education though a net-based learning system. It was through the project "electronic bag" (elektronisk ransel) that he was introduced to Presens and their technology and thought of the idea for the Web-skolen (Web-school). Through a project called IT-Fish, a learning programme for fishermen and the fishing industry, the technology and the educational principle were tested. Web-skolen has engaged teachers from a local higher secondary school, to teach disciplines like social studies, mathematics, history, Norwegian and natural science. They have so far produced 140 lessons.

The students of Web-school are primarily coming as well from region around Narvik for example municipality next to Narvik, Ballangen, and from other parts of Nordland County. But the Web-school has students even as far away as the Counties of Finmark and Nord

⁴ VINN was engaged in this project: "Kompetansenettverk" and worked together with the American firm Informania.

Trøndelag. In addition to individual students seeking the courses, the labour market office is acting as a custom. The evidence of this is pointing of at least two central potential of E-learning in a regional perspective or even from the perspective of peripheries in regions:

- E-learning is offering education to youth or less mobile persons e.g. family persons, so that they are able to take higher education in their home area;
- E-learning, by offering post-qualifying education and up-grading courses may also be seen as an instrument increasing the locale basis of competence creating a more flexible labour market. This will give locale industry and service institutions access to new knowledge.

In the first year of activity the Web-school got 50% subsidy from the National Business and Development fund (SND), but after this year the company has to be self-financing. The break even point for Web-school will say approximately forty students. The challenge for Web-school in the future will be to attract investment capital and create networks of alliances. The development will depend on the ability to produce the content of new courses and post-qualifying studies within the E-learning technology. But the experience so far is that the development cost to produce content is high.

The project: "Electronic bag"

Within the field of education and technology we also find the project "Electronic bag". This project was introduced into Futurum in 1997 and started up as an ICT project with founding from reconstruction resources. The project was then financed by the Ministry of Education, which has now taken over responsibility for the project through the PILOT (Project: Innovation in Learning, Organisation and Technology) national programme. The idea of the project "Electronic bag" was to make use of portable computers as a tool in classrooms and for education purposes. From Futurum's viewpoint, this project was intended to be an element in a business strategy to stimulate the use of ICT technology for the up and coming generation of employers and entrepreneurs in Narvik..

Of course it would be easy to identify conflicting goals between the perspectives of local business development and of the education system. According to the education authorities, the contribution of the "Electronic bag" project was to answer questions on developing a methodology adapted to the use of ICT in schools; creating an innovative school and integrating ICT, as a inter-organisational tool, into a regional perspective.

In practical terms, the project was implemented in three school classes at different higher secondary schools in Narvik. All students in these classes used portable computers and all classroom teaching was to be organised around the use of this tool. In Narvik all three higher secondary schools were involved in the project. These schools have differing specialisations; one is a grammar school and the other two are vocational schools focusing on health and social studies, and industry and trade respectively.

Even though the project is still ongoing some lessons have been learned in relation to the use of new technology and the organisational culture of the schools. It should be obvious that technology cannot be isolated from the wider educational context. Despite this there is often a dichotomy between viewing technology as being an autonomous power or being controlled by social factors. But this dichotomy does not see that technology might be seen as a complex network of relations between political, social, institutional and economic interests.

The “Electronic bag” project illustrates this point. In the context of learning, what different organisational cultures implementing the use of ICT? To the extent that we can look at schools and classrooms as social organisations, the result of a post-graduate thesis⁵ that is analysing "Electronic bag" as a case study, confirms that cultural and historical structures do influence the way in which ICT is used in learning institutions.

Wiig thus described and analysed the three higher secondary schools as different learning groups. In the first case, the Grammar school is characterised as a learning group that maintains a traditional approach to learning by basing its teaching on communicating a given list of books. As technology was brought into use in such an academic culture, the purpose of using PCs was not to make fundamental changes in learning activities or in the teaching goals and methods. The intention was rather to adapt the technology to the existing practice of text communications.

The higher secondary school of health and social education is characterised as having a learning system between text communication and social practice activities and the students’ own social experiences. When technology is used in these learning activities, it is used as a supplement to the existing structures. Some of the teaching at this school is project oriented and suggests that learning through projects can relax traditional structures associated with individual subjects and the curriculum. This creates new methods which are reinforced by the use of the ICT-technology.

The higher secondary school which focuses on industry and trade has a long learning tradition of using tools in a production context. Learning is through participation. In this culture learning and knowledge are communicated using a variety of tools; the portable computer has been adopted as one of these and provides the student with the necessary vocational competence. In this case the use of portable computers for teaching makes an active contribution in experimenting with and developing new teaching practices.

The “Electronic bag” project has been criticised for poor direction, implementation and lack of results. It is probably too early to evaluate the last of these, but this project nonetheless does illustrate a central point of the reconstruction process in Narvik and its focus on ICT technology. From about 1997 the strategy has been followed to introduce new technology as a tool within existing businesses and institutions like education, health and commerce. What the "Electronic bag" project has thrown light on is the mutual dependency between, on the one hand, individual activity and the cultural framework and, on the other hand, the project also illustrates, that even within closed structures, adopting new technology will create new forms of interaction, which, in its way, can modify existing structures.

The role of the University College of Narvik

When it was decided to narrow the strategic focus of the reconstruction process in 1997 with the ICT strategy being established as vital, the University College of Narvik was designated to play a central role. This was more or less a condition made of the Ministry of Local Government and Regional Development, if Narvik was to continue to be an area of reconstruction for another two year period. Even though it was a condition placed on the Narvik community, Futurum fully agreed and actively supported this strategy. But not

⁵ The following comment is based on the thesis of Camilla Wiig: "Elektronis ransel". En teoretisk og empirisk studie om hvordan ulike kulturer tar opp i seg og bruker IKT i læringspraksis i norskfaget University of Oslo 2000. .

everyone agreed with this proposition. There was doubt that an academic institution like the University College had sufficient flexibility and creativity to be a leading dynamic force. The fear was that its culture, characterised as academic, safe and non competitive, would produce an institutional inertia rather than industrial dynamics.

The goal was to secure a qualified workforce within ICT business and technology for the future. And to achieve this, the provision of education within ICT related subjects had to be adjusted. Within the last three years, the University College of Narvik has developed and established a five year graduate engineering course with its main focus on ICT. According to Futurum, the University College of Narvik is now producing up to a hundred ICT trained engineers.

Related to the health sector, the University College is providing an IT upgrade course for health personnel. Students in this course have, in co-operation with Presens, developed net-based courses. Within this field the University College has, furthermore, established a relationship with the Telemedicine Centre in Tromsø as well as with the Narvik hospital.

The philosophy behind this strategy is, as the manager of Futurum has described it, "If we are able to offer competence to companies, then they will be established where there is competence." However, it is important to bear in mind that normally labour force mobility exceeds the mobility of the firm. So within a traditional strategy of acquisition, the likelihood of succeeding is perhaps not as great as Futurum had been expecting.

The importance of anchor⁶

We might however also look at this strategy of competence in relation to other business development strategies. Two such strategies can be examined:

1. The strategy of "placing" students and educated personnel into existing industry and;
2. The strategy of entrepreneurship

As part of the first strategy, the University College has had close relations with Norut Technology. Many of the employees of Norut Technology have been recruited from the University College of Narvik. This, of course, is due the ability of Norut Technology to attract academic staff. Within the last three years, Norut Technology has developed two strategic programmes - KALTET - "Durability of materials and construction in Cold Climates", and STRUCON - "Structural Consequences of the Deterioration and Repair of Concrete Members". The last programme was developed in co-operation with NTNU in Trondheim, but both of the programmes have been financed by the Norwegian Science Council and four doctoral engineering scholarships were established. In addition some students have also finished their post-graduate theses within those programmes.

Through the NT programme (Diffusion of technology programme for Northern Norway), Norut Technology has furthermore participated in a programme, stimulating co-operation between private firms and science institutes. This program is paying researchers to participate in ongoing development projects within different production firms. Eight such arrangements

⁶ In a historical and knowledge-theoretic perspective I have analysed the practical implication of the notion "anchor" see. Lindeløv, B. *Local Industrial Development and the discursive structure of "potitics" in Nordic Institutions and Regional Development in a globalised World* ed. Åge Mariussen Nordregio R1998:2

have been initiated for the concrete industry and both theoretical and practical problem solving has been at their focus.

Also, in relation to the Natech and LKAB doctoral graduate programmes which have been developed, PhD and Post Doctoral students have been recruited from the University College of Narvik. This development indicates a better fit between the needs of industry and the competence of the qualified engineers from the University College. But it might also indicate that, building up a locally compatible competence structure between science and industry, requires a very long maturing period. What we are seeing utilised now in Narvik is based on knowledge built up over the last three or four decades.

The second business development strategy was the strategy of entrepreneurship as it is described in the "Strategic business development plan". This aims to develop Narvik as an attractive place for starting up ICT enterprises". VINN has played a central role, as an institutional framework, in working towards this goal.

As mentioned earlier, VINN is an institute for consultancy, business development and technology transfer. The company is operating within the following three main business areas:

- Centre for technology-transfer services within 3-dimensional-data-modelling, prototype building and tool building with steel and aluminium and small series production
- Centre for business information offers business related information by telephone and internet services. Furthermore Euro Info Centre North is part of this Centre.
- Centre for competence offers competence training in, for example, entrepreneurship, strategic management and marketing.

Over recent years VINN has given still more attention to technological service and has built up a Rapid prototype laboratory. To strengthen and complete its activity towards rapid product development and rapid engineering, in 1998 VINN took over a 51% share interest in the company, FEM Design AS. The reason was to make it possible for VINN to offer a total product service from 3-dimensional-data-modelling to small series production.

Both through its information and consulting activities and entrepreneurial courses, VINN is acting as a meeting place for many individuals and smaller firms with business ideas and concrete production plans. By supplying a more traditional role as strategic business adviser within management, with advanced production technology assistance, VINN has developed an interesting concept of business service enabling it to follow the whole process

- From the creation of the idea to the preliminary construction process
- From prototype building to small series production of up to some thousands using rapid tooling and casting technology
- Entering the market

Along this chain - Idea-Construction-Industrialisation-Market introduction - VINN has built up interdisciplinary teams of product-designers, engineers and toolmakers, working closely with the entrepreneur or the firm.

The advantage of using rapid prototype and rapid tooling technology are, of course, its flexibility and that it is making the development and production processes more efficient, by reducing adaptation and internal transport costs. Expressed in another way, risk in the innovation process is thus minimised.

Inherent in this technology is also a communications opportunity in that it becomes possible to operate at a distance. VINN tells the story of Rodner Nilsen who came to Narvik to participate in "Enterprise Innovation" - a meeting place for inventors, producers and financing partners. He was a local person with a concrete product idea and concept and at the Narvik event was introduced to VINN and its technology. As a result of this contact the two partners agreed to co-operate. VINN made a DAK-model and the drawings were transferred to the inventor by e-mail. In the further development and construction stages, different problems were solved, such as, measuring the strength and durability of the materials to be used and assessing the production possibilities for the product. In this problem solving process, they made use of both the applied practical knowledge of the inventor and the combination of practical, theoretical and modelling competence of VINN.

In considering the ICT cluster in Narvik, the example of Funn AS, which was established in 1989, deserves mention. This firm was established as part of a national programme focusing on Information Technology. Today the product spectra of Funn represents Internet delivery including products such as access, web and data security. Furthermore it offers an operational data service and through a partnership it is involved in several development projects within communications, system-development and development of Web solutions.

After a modest start Funn AS has, within the last twelve years, increased its staff to 14 employees. Three factors might explain this growth:

- In 1991 the firm invested in new technology and was coupled up to the data network of the universities "UNINETT". This not only gave Funn access to the technology, but gave it access to the large market of the regional universities.
- Late in 1995 Funn AS entered into a partnership with one of the leading national Internet networks, "Riksnett AS". A half year later NarvikNett became a reality and they have built up the local market which gradually has been expanded to the Ofoten region.
- At the end of 1996 Funn AS acquired new owners. The local newspaper and a local printing office took over 78% of the company shares. Funn kept its local roots but at the same time obtained access to the second largest media group in Norway - the "A-Press".

Final discussion and conclusions

What has been true for Funn in their strategy of growth: To win access to the market through partnership, ownership and technology, may also be highlighted as headlines of the ICT-strategy in Narvik. But in some way the picture which has been portrayed here does not fit the picture normally painted of the ICT sector.

In the media and in some economic literature, the ICT sector has been proclaimed to represent the new economy. But what separates this so-called new economy from what has to be the opposing concept - the old economy? According to its ideologists, the new economy is not characterised by scarce resources as in the case of the old economy. An argument for this is that within the new economy information can be transferred and shared to very low cost. Furthermore, it is argued, it demands relatively little capital to start up a knowledge-based business compared with the capital demanding industries of the old economy. Therefore the primary growth contribution of the ICT sector to the economy is its ability to lower transaction costs.

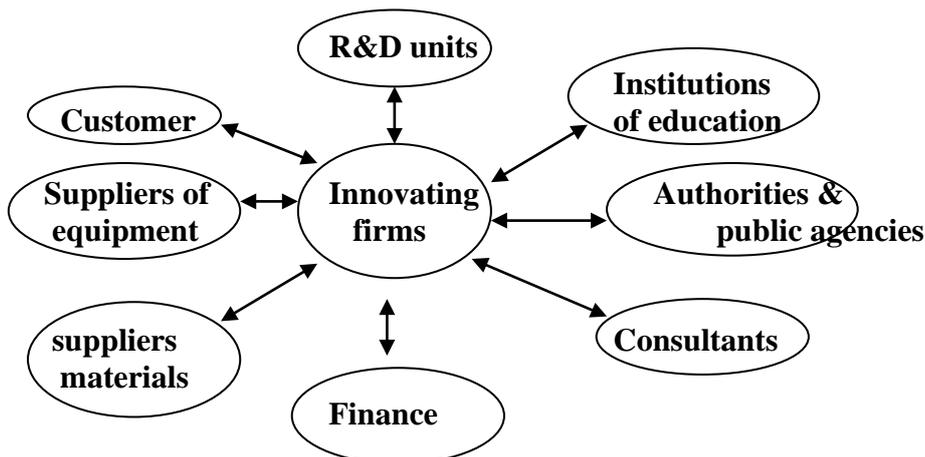
However, such an unilateral focus on the transaction cost argument and use of the rhetoric of efficiency, disguises the fact that the actors are individuals and institutions. And if we do not

understand how individuals and institutions are acting, we might not see how a given development process has been promoted or restricted.

According to these comments we may set up two different perspectives of the ICT sector:

- On the one hand there are those who argue that IT business and information and communications technology are vital for the national and regional economy. Consequentially, it is important not to fall behind in the technological race.
- On the other hand there are those who are claim that IT business and technology play a more ambiguous and indirect role. It is not the technology or the size of IT business that is of importance; rather the important issue is whether business can implement and use this technology competently.

The author has leaned towards the latter viewpoint in analysing the Narvik case, with its process of reconstruction and ICT business strategy. Furthermore he has tried to translate the general development process into an innovative perspective making use of the idea of an "innovation system". This idea is based on the idea that the innovative strength of the economy is dependent on the degree to which the firm, through its own innovations processes, is able to use the experience and competence of other businesses, science institutions and public authorities. In principle, each of these relationships is about a user with some needs and a producer with some solutions. It is from the perspective of such an interactive model that we might find the innovative power of the information and communication technology towards traditional industry, service business and the public sector.



Institutions

Figure 1. Actors and interaction in an innovation system (The figure is found in Isaksen et al 1999)

This leads us to question what is meant by “knowledge-intensive industry”. Policy-makers should not confuse knowledge-intensive industries with R&D-intensive industries. We need a finer understanding of the definition of the use of knowledge in industry than we have at present.

Towards this one might note that politics related to learning and knowledge have attracted increased attention. This has been a result of the claims that knowledge-intensive industries are now at the core of growth, and that we are now entering a new type of knowledge-driven economy. But what do we mean by “knowledge”? What does it mean to speak of a “knowledge-based” economy? Keith Smith has identified four approaches (Smith 2000):

- The belief that knowledge has become quantitatively and, in some sense, qualitatively more important as an input to production.
- The idea that knowledge is in some way more important as a product than it has been hitherto and that we are seeing the rise of new forms of activity based on the trading of knowledge-intensive products.
- The view that codified knowledge, as opposed to tacit, person-incorporated skills, is in some way more significant as a component of economically-relevant knowledge bases.
- The idea that the ICT revolution implies a fundamentally new role for knowledge in the economic processes

In the case of Narvik, some of these claims do indeed represent a real trend, while others do not. But what I have tried to stress is that ICT, as a technology, is only part of the story. Industries are characterised by the use of many technologies and many forms of knowledge, and firms within industrial sectors are usually skilled at integrating such knowledge (Lindeløv 1999). So what is important is the mechanism related to the integration of technology and knowledge structures.

Instead of opposing different forms of knowledge and their inherent technologies, it is more relevant to combine and use different forms of knowledge and technology in an innovative manner. It is important to be aware of that in each transfer of knowledge and technology, there is a supplier and a receiver. This means that the context of all knowledge and technology has to be adapted and translated. The Narvik case illustrates these integrating and translating mechanisms. The processes of reconstruction might be seen as procedures to make translation possible.

Let us take a summary view of this process. In the first period of reconstruction, the main focus was on projects organised around the competence and interests of the two old companies, LKAB and NSB. Furthermore there was a focus on the development of new business ideas. But to a large extent those new business ideas were associated with a strategy of acquisition. As mentioned earlier, the first two years were marked by high levels of conflict and there was a failure to mobilise sufficient local resources from either business or public institutions. Key people in Narvik posed the question “reconstruction of what?” and argued that the answer to this question would not necessarily be found in the causes of the reconstruction process.

Nevertheless the reconstruction period has been a learning process and early in 1997 some important changes were made at a strategic level. From the start of the business development programme, information technology was defined as a theme, but only limited analysis of its scope was undertaken. After an evaluation of local competence within the institutions of education and the technology community in Narvik, it was agreed that there should be a strong and united emphasis on an ICT strategy. The first goal was to build up the IT infrastructure in the educational institutions such as Primary Schools (teacher competence), Higher Secondary Schools (Electronic bag) and The University College (adapting/developing new courses). In the University College the task was to make its courses more market oriented and more in harmony with local and regional demands.

The second goal was to build up a network of companies within net-based learning. This involved establishing a milieu covering system and web-learning technology as well as content and educational competence. Towards this end success has been achieved by taking small steps to systematically build up networks of co-operation. The impotence to have competent receivers within individual businesses and creating a business-like approach within the institutional sector, especially in the University College, has been obvious.

Considerable resources have been devoted to organising and adjusting the conditions for a more technologically driven business-oriented environment.. The central technological challenge within the overall Information Technology strategy has been how to make use of ICT as a tool. I have outlined this using the following cases:

1. The construction of a value chain within net-based learning
2. Electronic bag as a learning-tool within Higher Secondary Schools
3. VINN technology of rapid modelling and tooling and its information services
4. Funn internet-service

In those cases, local and regional links between companies, institutions and knowledge-structures have been strengthened, and in this way, locally compatible competence between industry, science and the public institutions has been built up. The Narvik case illustrates, to a high degree, success in its efforts to build bridges between receiver and supplier competencies in technology and knowledge. Narvik has thus, over the last decade, moved from a situation of having a one-sided dependency on two cornerstone companies, towards growth in enterprises that demand a quite different infrastructure.

But to reach this degree of differentiation in business structures, there is a need to be aware of some structural components, which have been present in different ways in the cases described in this chapter.

Time:

Time plays an important role. It is a simple fact that it takes time to build up a structure of competency between production and scientific knowledge. Creating a basis of competency in material technology related to the durability, repair and retrofitting of concrete might illustrate this.

As mentioned earlier, expertise in concrete technology was built up in the 1960s and 1970s around customers such as LKAB and NSB. In this phase, construction firms built up experience of different kinds related to production and knowledge of users' needs. This form of practical knowledge, which skilled workers achieve, is necessary as a transitional stage in what I have called "receiver-competency of theoretical knowledge"(Karlsen & Lindeløv

2001). The theoretical material knowledge related to concrete was gradually built up within the University College, as it developed engineering studies in construction in the 1980s and 1990s. The last step of this build-up was the establishment of the doctorate engineering programmes related to Norut technology. But the application of materials technology towards production by raising its knowledge content was first achieved when new relationships developed between the two scientific institutions and the production sector. This change was stimulated by a change of attitude at the University Colleges and Norut Technology. This involved a transition from a one-sided national focus towards playing a more visible regional role based on the integration of practical and theoretical knowledge. A dialogue has thus been developed through practical teamwork projects, which have partly been promoted and supported by a public technology diffusion programme (NT-programme).

In conclusion, many elements had to be in place to build up a locally compatible competence structure between the scientific and production related communities and this is a time consuming process.

Space:

Even though Narvik is a relatively compact community⁷, it is nonetheless striking that many relationships and acquaintances have been created in the first place through specific projects. This was the case when the idea of the Web-school was born and this has also been the case in relation to some start ups, which have resulted from the activities and technology assistance from VINN. To overcome internal organisational boundaries, it has been shown to be important to have meeting places and to work within project-oriented teamwork.

Anchor:

In the last period of the Narvik reconstruction process, there has been a concentration on so-called indigenous growth strategies. The strategies:

- of "planting" students and teachers from the University Colleges into other companies,
- of building up entrepreneurial competence and a culture for local and regionally-based business ideas, and
- constructing a net-based learning network,

are all based on anchoring business development into local and regional resources. This process has, as mentioned above, been possible to the degree that it can be successful in integrating national institutions, converting them through partnership, and adapting their profiles towards the needs of local and regional businesses and institutions. This process has also been promoted by public policies and funding.

Politics:

The whole process of reconstruction has been part of the politics of business in Norway⁸. Through the process, a shift can be recognised from a more traditional approach of money-transfer towards a model:

- involving monitoring through dialogue,
- engaging in a business-developer role and
- trying to integrate the perspective of cross sectoral interest and sectoral policy towards a business development process.

⁷ In Karlsen, A./Lindeløv, B (2001) *The process of innovation when the industrial scale and complexity vary.*, we are discussing theoretical and practical aspects of proximity and agglomeration in innovative processes.

⁸ For a discussion of this see Karlsen, A./Lindeløv, B. (1998) *Omstillingspolitikk i møte med praksis - spørsmål om forankring*

This form of interactive business development policies, of course, needs a co-ordinating agent. In the case of Narvik, Futurum, as the local business development organisation, has played this role, integrating different sectors and administrative levels. Below I have tried to illustrate, how different national, regional and local⁹ institutions have been engaged in the development of the net-based learning network in Narvik.

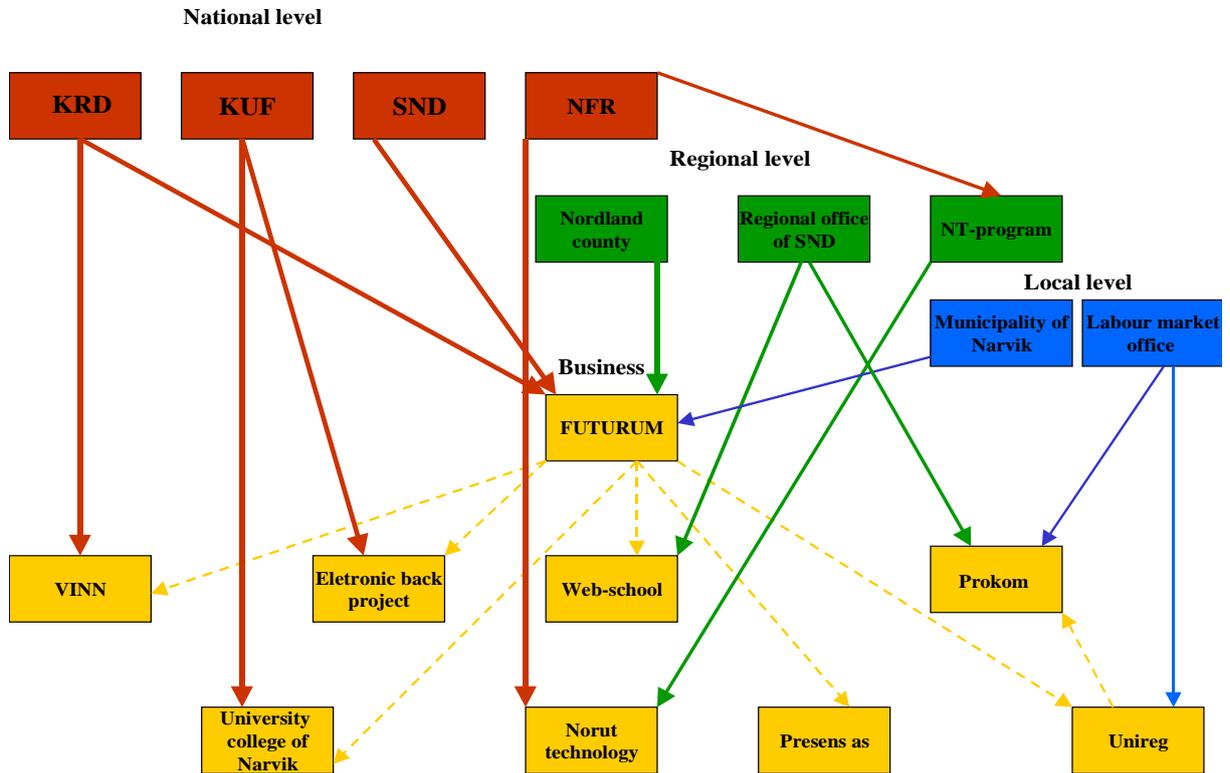


Figure 2

A last conclusion to be derived from the Narvik case is that the effects of taking new technology into use have been dependent on a complex network of relationships between institutional, economical, political and social interests. But, of course, looking at technology in this way makes it difficult to separate technology as an independent influential factor.

⁹ At a local level I have integrated the labour market office, even though their relation to Prokom and Unireg is not that of direct money transfer, but is that of a custom design and paying for retraining course.

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