Research Platform at the University of Halmstad
"Technology, Entrepreneurship, Innovation, and Industry"
Final report of activities and results

Contents

Sven Åke Hörte   Bernd Hofmaier   Lars Bååth

The final report is approved by the mentors: Halmstad 2001-06-05

Carl Johan Hörberg   Bengt Johannisson

Per-Olof Samskog   Elisabeth Sundin

Preface

The results of the research platform *Technology, Entrepreneurship, Innovation and Industry* are documented in a series of reports and two final reports. One of the final reports, the present one, is a formal report written according to the directives of the Knowledge Foundation, a foundation that has generously financed the activities of the platform.

The second final report has two aims. One aim is to sum up and discuss the activities and results of the platform. Secondly, we also hope the report will be used as a base for discussions about research ideas and strategies at the University of Halmstad.

The platform started work during the spring of 1999. It has gone through two phases. The start phase ended during the summer of 2000, when 7-8 months remained to fulfill the contract. At that time a reorganization of the platform took place and a new management was installed.

During that time, two of the six mentors, for different reasons, decided to leave the appointments mentor of the platform. On behalf of the two groups of managers of the platform, I would like to thank all the mentors of the platform for their interest and helpful advice. A special thank you is extended to those of you mentors who decided to help us fulfill the activities of the platform.

I would also like to take the opportunity to thank all the researchers at the University of Halmstad for the stimulating discussions about the platform activities and for your contributions to the results of the platform.

Halmstad 5 June, 2001

Sven Åke Hörte
On behalf of the platform TEII

The establishment of the research platform "Technology, Entrepreneurship, Innovation and Industry", (TEII)

Halmstad University has since its beginnings in the 1980s focused on entrepreneurship and technical applications in a variety of technical disciplines, together with disciplines in the social sciences and humanities. This focus is manifested in several study areas and undergraduate courses, of which some reached the attention of the public and contributed to the reputation of the University as a place for innovation learning and entrepreneurship, as well as a breeding-ground for young entrepreneurs.

In recent decades, societal changes which include technical development, economic and political changes (including deregulation in many areas), and which are characterized by the buzz-word "globalization", have also placed new demands on the academic system. Traditional models for technical and organizational development have been gradually replaced by strategies for development. New forms of learning, perceived as more flexible and interdisciplinary knowledge creation, new ways of taking products to the market, etc. have become important.

Against this background the University of Halmstad formulated an application to the Knowledge Foundation for financial means for a research platform. According to the application, the overall purpose of the platform was to research the conditions for innovative learning, as well as determining how new technologies are developed and how technological renewal is implemented and continuously developed in a successful business. More specifically, the attempt was formulated in three questions:

1. How is innovative learning developed in different contexts?
2. How is new technology developed and transformed into new products and services?
3. How are societal developments interacting with industrial development?

The research activities proposed were characterized as:

- Disciplinary research, with a focus on knowledge development in the individual disciplines.
- Multidisciplinary research, where one study object is studied with theories and methods from different disciplines under the disciplines' own conditions.
- Interdisciplinary research, in which knowledge building between different disciplines can occur.

The Platform as established at the University

The platform has had a very chequered path in establishing itself at the University. The fundamental ideas behind the platform have been in the tradition and general thinking of the university from its very start. However, the university has undergone many major changes during the three years in which the platform has existed. These changes include six different administrations and a major re-organisation of the university organisation and structure.

At the start of the platform the university was organised into institutions, which administrated the education at the bachelor and master levels. In addition, there were research centres which administrated and were responsible for all research in a certain area. The institutions and centres collaborated by selling work hours for teaching (from the centres) or research (from institutions).

The suggestion to start closely-collaborative projects across domains of the centres and institutions triggered at first the same response as would be expected at large universities, i.e. each administrative part looked at its own research and educational interest only, even though there were many expressions of interest in the basic ideas and philosophy of the platform. The basic ideas and the philosophy behind the platform required that this structure be broken up so that more direct connection between education and research as well as between scientists could be organised in a much more open and free form.

This philosophy was then taken up by the university board and the university was re-organised into four different schools with a large degree of autonomy, each comprising a large variation of scientific areas. The new organisation is a good foundation for the platform to establish itself, and is de facto a manifesto of the platform itself. However, the re-organisation has taken all of the available administrative resources at the university, and thus some of the work to establish the platform philosophy on top of the new organisational structure still remains. Phase two of the platform was started after the re-organisation in order to further build on the new structure. This platform is now rapidly establishing itself as the focal point for projects which work across traditional scientific borders, and as the forum for research projects crossing the administrative barriers of the new school administrative structure.

The research areas of TEII

The three perspectives of the proposed platform activities - technological development and business context all within a broad societal context - were formulated in three research areas:
1. Dynamic technical development;
2. Dynamic learning and enterprise development (the title was changed later to "company boards and enterprise development");
3. Societal dynamics and local development.

Within the three areas a variety of research projects and other activities were planned and partly fulfilled. The research areas and projects during Phase 1 are depicted in Figure 1, and

all projects of TEII are listed in Appendix 1. There are additional projects mentioned in some documents, but most of these are indicated as planned projects that never became part of TEII.
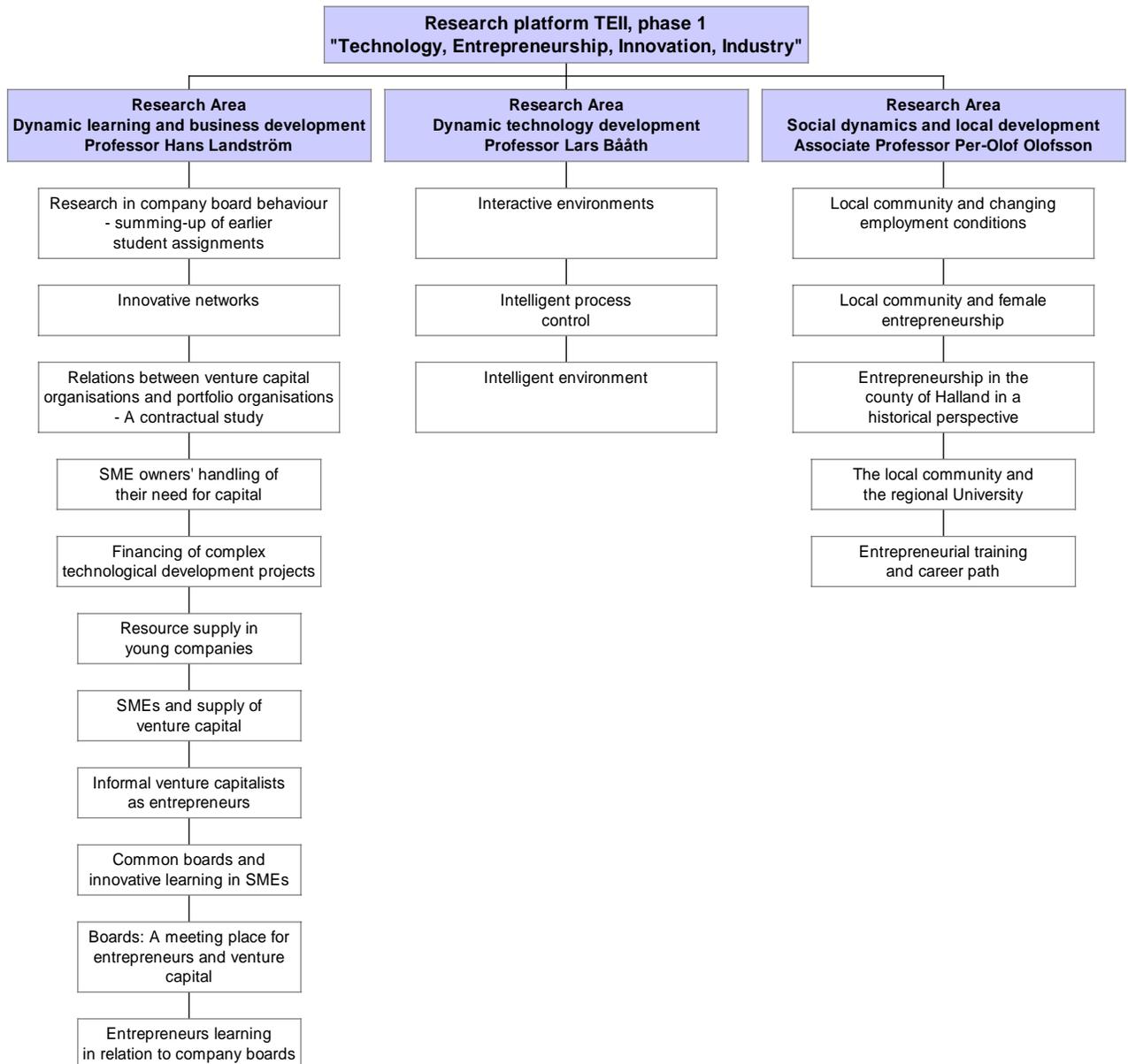
Research platform TEII, phase 1
"Technology, Entrepreneurship, Innovation, Industry"

Research Area Dynamic learning and business development Professor Hans Landström	Research Area Dynamic technology development Professor Lars Bååth	Research Area Social dynamics and local development Associate Professor Per-Olof Olofsson
Research in company board behaviour - summing-up of earlier student assignments	Interactive environments	Local community and changing employment conditions
Innovative networks	Intelligent process control	Local community and female entrepreneurship
Relations between venture capital organisations and portfolio organisations - A contractual study	Intelligent environment	Entrepreneurship in the county of Halland in a historical perspective
SME owners' handling of their need for capital		The local community and the regional University
Financing of complex technological development projects		Entrepreneurial training and career path
Resource supply in young companies		
SMEs and supply of venture capital		
Informal venture capitalists as entrepreneurs		
Common boards and innovative learning in SMEs		
Boards: A meeting place for entrepreneurs and venture capital		
Entrepreneurs learning in relation to company boards		

Figure 1. Research areas and projects during TEII, Phase 1.

1. <u>Dynamic technical development</u> (Professor Lars Bååth)
The main purpose of the area is to understand how ideas based both on scientific and societal connection, via research, can be realized in the form of marked-adjusted material and immaterial products, that meet an important social and personal need.

2. <u>Company boards and enterprise development</u> (formerly "dynamic learning and enterprise development") (Professor Hans Landström and adj. Professor Morten Huse)
The area deals with one of the important aspects of the economic debates in the 1990s, and concerns the establishment of new SMEs and their development and expansion. It is thus embedded in earlier research projects at the University and relies on the competence built up in this field, e.g. the Economic Centre (EC) which focused on financing problems in SMEs, and the Centre for Working Life Research and Development (CAU) with research on networks.

The research area centers around SMEs, and especially SMEs using and developing new technology. Some of the topics studied are: company boards, venture capital, learning, financing and resource supply. The theoretical framework used contains theories about financing and ownership, strategy and leadership and organization and learning.

3. <u>Societal dynamic and local development</u> (Lecturer Per-Olof Olofsson)
According to the area description the focus of the area is on societal changes and their influences on the local level. The theoretical basis is modern sociological theory where particularly concepts like reflexivity, "glocalisation" etc. are used. In more concrete terms the focus is on local labour market issues and entrepreneurial issues.

During the summer of 2000 the platform activities were reorganized in order to focus and integrate the activities of the platform. At the same time the management of the platform changed. The changes were relatively modest, many of the projects continued, others were reformulated and given a more focused approach.

In the first phase individual firms and their need for financial capital were focused. Due to learning over the platform period the need for more focus on interacting firms in their social context initiated a redirection of the platform activities in phase two.

As before TEII consists of three programme areas, which are explicitly related to each other. The three programme areas are:
1. The south-west region of Sweden as a learning region;
2. The innovation systems of the south-west region of Sweden;
3. Dynamic technology (in the earlier phase of the platform called "dynamic technical development".

The concept of the south-west region denotes the geographical region of western Sweden with Göteborg as the northern point and Malmö as the southern point, and with an eastern border including the western parts of Småland. As in the earlier phase of the platform, the programme areas are organized into several research projects.
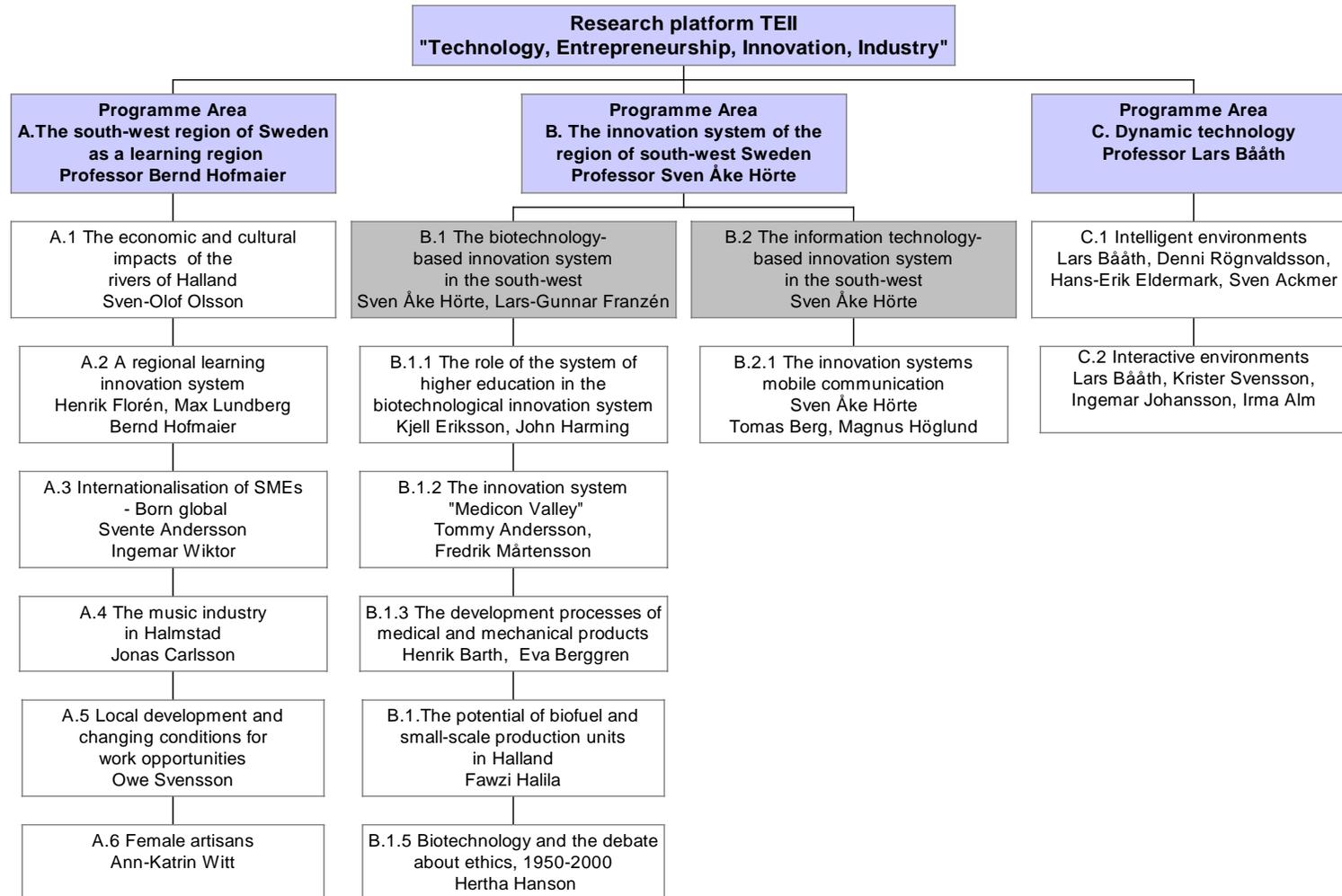
**Research platform TEII
"Technology, Entrepreneurship, Innovation, Industry"**

**Programme Area
A.The south-west region of Sweden
as a learning region
Professor Bernd Hofmaier**

**Programme Area
B. The innovation system of the
region of south-west Sweden
Professor Sven Åke Hörte**

**Programme Area
C. Dynamic technology
Professor Lars Bååth**

A.1 The economic and cultural
impacts of the
rivers of Halland
Sven-Olof Olsson

B.1 The biotechnology-
based innovation system
in the south-west
Sven Åke Hörte, Lars-Gunnar Franzén

B.2 The information technology-
based innovation system
in the south-west
Sven Åke Hörte

C.1 Intelligent environments
Lars Bååth, Denni Rögnvaldsson,
Hans-Erik Eldermark, Sven Ackmer

A.2 A regional learning
innovation system
Henrik Florén, Max Lundberg
Bernd Hofmaier

B.1.1 The role of the system of
higher education in the
biotechnological innovation system
Kjell Eriksson, John Harming

B.2.1 The innovation systems
mobile communication
Sven Åke Hörte
Tomas Berg, Magnus Höglund

C.2 Interactive environments
Lars Bååth, Krister Svensson,
Ingemar Johansson, Irma Alm

A.3 Internationalisation of SMEs
- Born global
Svente Andersson
Ingemar Wiktor

B.1.2 The innovation system
"Medicon Valley"
Tommy Andersson,
Fredrik Mårtensson

A.4 The music industry
in Halmstad
Jonas Carlsson

B.1.3 The development processes of
medical and mechanical products
Henrik Barth, Eva Berggren

A.5 Local development and
changing conditions for
work opportunities
Owe Svensson

B.1.The potential of biofuel and
small-scale production units
in Halland
Fawzi Halila

A.6 Female artisans
Ann-Katrin Witt

B.1.5 Biotechnology and the debate
about ethics, 1950-2000
Hertha Hanson

Figure 2. *Programme areas and projects during TEII, Phase 2.*

1. Programme area: The south-west region of Sweden as a learning region (Professor Bernd Hofmaier)

The concept of the Learning Region is gaining more and more attention among both researchers and politicians mostly for its emphasis on development relations between different actors. "Region" in the term Learning Region should be interpreted in a much wider sense than of a statutory or legally defined region. The important feature of the concept is that development is a collective process to produce an outcome that is in the interest of all concerned and in which top-down and bottom-up developments can be observed. The main vehicle is partnership which reflect local and regional circumstances which are not imposed and do not follow a standard model.

Learning in the concept of learning region is seen as development of the traditional "linear" way of thinking about learning, which is typical for formal learning in initial education and training. Learning in the concept of the learning region refers more to interactive learning which arise in the course of co-operation between different bodies and actors - technological and social research and development agencies, educational institutes, companies, social partners, community bodies etc. In line with this model, learning gives rise to a community "way of behaving" and "know-how".

2. Programme area: The innovation systems of the south-west region of Sweden (Professor Sven Åke Hörte)

The research in this area focuses on two technology areas; biotechnology and information technology. Both are new technologies with an expected growth potential. The focus of the research in the area is, however, not on the technology development, but on the systems of actors participating in development knowledge about the business opportunities related to the technologies. The University of Halmstad is not expected to be a key player in technology development, for example in biotechnology. The focus is on the innovation system and on the learning processes and business development going on in these systems. This is in line with the general concept of an innovation system according to B-Å Lundvall, who introduced the concept in 1980s. An innovation system "is constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge…" (Lundvall, 1992). An alternative concept to innovation system would be to use the concept of "technological system", introduced, independently, by T.P. Hughes (1983) and Carlsson & Stankiewicz. A technological system is considered to be a "network(s) of agents interacting in a specific technology area under a particular institutional infrastructure to generate, diffuse, and utilize technology. Technological systems are defined in terms of knowledge or competence flows rather than flows of ordinary goods and services. They consist of dynamic knowledge and competence networks" (Carlsson & Stankiewitcz, 1991).

Within the field of biotechnology the main focus is on modern biotechnology (e.g. genetic engineering, medical research), and in the field of information technology the focus is on mobile communication technology. Three general research issues are raised.

- The size and development of these two innovation systems in the region of the south-west of Sweden.
- The competitive situation and the competitive strength of the systems compared to other regions.
- The growth potential of the systems for the next 5-10 years.
  Only the first question will be answered during the lifetime of TEII. Questions 2-3 will be topics of future research.

3. <u>Programme area: Dynamic technology</u> (Professor Lars Bååth)

The general aim of the area is to increase our understanding of how scientific ideas, and ideas with a societal background, through research are realized as market-adjusted material and immaterial products, which fulfill important societal and personal needs.

Technological research is well established at the University of Halmstad, especially in the fields of computer science, non-contact measurement techniques, optics, program development of neural networks, and development of visualization techniques of complex phenomena. These are fields of technology that are suitable for cross-disciplinary research, where teams of researchers from different disciplines may cooperate, for example from disciplines such as psychology, sociology, and business administration.

The platform and its importance for the University

The research platform was founded against the background of a focus on entrepreneurship and technological application direction at the University of Halmstad. The ideas of the platform are part of, and contribute towards, the general discussion about a vision for the University. Parallel with the development and the activities of the platform, the different sections and departments of the University have been engaged in a process with the expected outcome of a shared vision of the future. This process involves different actors from the University as well as various actors within the region. Through the activities and results of the platform, the discussion about a shared vision could be fostered and nourished and, as the result of the reorganization of the platform, also more structured. The platform can, then, be seen as an activator and initiator of discussions about research strategies in all sectors of the University.

Industrial and regional importance

The new information technology, together with the easy access to world-wide communications and transports, is rapidly creating a new environment for industry and society as a whole. The market is becoming "glocalised", where the large national/international industries as well as the local and regional industries are facing increasing competition from large and small industries located in other local or regional areas of the world. It is no longer necessary for an industry to have its sub-contractors locally available nearby, but CAD and other design files can be sent by e-mail to any sub-contractor anywhere in the world. The technical skills of the labour force are rapidly increasing even in the most remote and poorest regions in the world. Computerised production machines are becoming affordable and accessible even to countries which hitherto have been competing with cheap labour as their only asset.

Swedish industry and society are now facing new challenges to deal with new international competition at all levels. These challenges mean that a positive and dynamic industrial and social development process has to be restarted and renewed. The new development has to be innovative at all levels and industrial development has to be based on a very close collaboration between all areas of academic and applied research, e.g. natural, social, economic, information, humanistic and technical sciences. The development and competitiveness of national and regional industries will require not only that these sciences have a high international standard, but also that they interact and actively collaborate at all levels. Such collaboration across scientific and faculty barriers is therefore of the utmost importance and is at the heart of, and fundamental to, this platform. The technical sciences are comparatively well-funded by industrial projects and the platform funding therefore has been mainly used for projects to raise the other areas to a similar level and to increase the collaboration between disciplines.

The Halmstad University has a long and successful track record where students and research staff have started spin-off companies in a "Technocenter" surrounding the university. Some of these companies are now well-established on the national and international markets. However, this is not sufficient since these established companies, as well as the new companies which are now being formed or will be formed in the future, are facing the new challenges discussed above. The spin-off companies of the future will need an even higher technical and scientific education than at present in order to have products at an internationally competitive level. They will also need to have know-how in economic, social and humanistic sciences at the same high level. All these will also have to be collaborative so that the company can communicate internally and externally easily and without friction. The platform has taken the necessary steps to establish this viewpoint internally.

The University of Halmstad has a long and well established and well known track record for innovative new educations in the technical-economical area, e.g. the highly acclaimed "innovation school" and school for entrepreneurs. The Halmstad University is also well

known for developing new ways to work with its relation to local and regional industries. The platform has been important for widening this view inside as well as outside the university. From the start, the platform activities and a variety of projects developed relations with SMEs both close to the University (spin-off companies etc.) and in the region. Some of the SMEs functioned as study objects, others were taking part in discussion about technological development of products and processes. After the reconstruction, the platform was given a clearer focus on studies of innovation systems and the related concept of the "Learning Regions". In doing this, the platform and the studies carried out within the platform are now directed more towards the interplay of a variety of actors in the region, and have thus achieved a clearer industrial and regional importance.

The platform, with its various studies of innovation systems, where the University of Halmstad is defined as one important actor, is now clearly connected to the joint effort of the University, the municipality of Halmstad and the regional industry towards creating a vision of Halmstad as an "Innovation City". The concept of "The Innovation City" includes the leading actors in the region with the Halmstad University focusing on entrepreneurship and innovation, the military college offering their competence in the field of leadership and the industry in the region. Together with the main companies including SMEs and the public sector, the aim is to increase the number of new companies starting up, stimulate the growth of knowledge-intensive companies and raise the technological level in existing companies. The overall purpose of the partnership created is that the three partners agree on creating an innovative climate, offering financial and other resources etc., which will result in creating more new companies, develop existing companies and be attractive for investment, etc.

Together these attempts have been of interest for VINNOVA, the Swedish Agency for Innovation Systems, which has chosen Halmstad University as a pilot project in order to stimulate and learn how minor universities can handle innovation activities. This is both an acknowledgement of the University and its partners' endeavours to create an innovative climate, but also a recognition of the work done in the platform.

In the perspective of the innovation system, which is the view of VINNOVA, the important aspect is to stimulate the flow of ideas, knowledge and information between different knowledge cultures. For instance, the academic system is characterised by specific norms, rules and criteria for research, which are different from norms and rules in industry. If one tries to stimulate the innovation system to be more efficient, by for example developing relations between those knowledge cultures, e.g. actors, there are three aspects which have to be considered and supported:

- Processes between actors, e.g. to achieve many relations and a culture where *connectedness* is recognised as important.
- Processes within actors, e.g. internal structures and processes have to be developed and elaborated, which lead to what can be called *responsiveness* or the ability to create and maintain relations with other actors in a responsible way.
- The innovation system as such, e.g. to create conditions for the development and maintenance of relations between actors, which can be formulated as creating *contextuality*.

In all three aspects the activities of the platform have initiated and supported such development. With regard to processes between actors, the platform stimulated contacts between researchers and students of the university and companies and authorities. The second phase of the platform concentrated explicitly on studies of actors and their relations by its focus on both the innovation system and the emerging relations between individual actors, which is described by technology development in networks.

If we look at processes within actors, the platform focused on developing internal processes within the university. Examples are not only the formation of joint research projects but also by organizing postgraduate courses where participants from different departments and sections participated. Through seminars with participants from different sections, ideas about research cooperation could be discussed and in certain cases organised. The platform also contributed to an internal process in which the University is now creating a vision of an "Innovation University" which includes support of students who want to establish their own companies, support of new study courses and elements of innovation management in every course.

Also with regard to the third aspect, the platform makes at least some contributions towards the development of a regional innovation system through its various studies of existing and emerging innovation systems. Experiences from such studies will contribute to a regional learning process with all actors involved.

Another typical result of activities in connection with the platform is a planned project concerning a cluster analysis of what is called the entrepreneurial region, which includes Halmstad and some parts of the region of Småland). The project will start in June 2001 and its main purpose is to identify and describe agglomerations and clusters of enterprises with development capacity. In close cooperation with regional and local authorities and development agencies such cluster formations will be supported.

The industrial relevance of the platform is obvious from the above discussion. The regional relevance should be seen from the viewpoint of the regional area. Halland with surrounding parts of south-western Småland and northern Skåne is a region with very little in the way of major and large industries. It is, however, one of the major and most popular tourist places, mainly because of its good climate and large and clean beaches. The communications are also excellent with only a ninety-minute drive or a one-hour train ride to the major Scandinavian airport of Copenhagen. The nature, the climate, and the communications mean that this is a region where people would like to live and this should be used to establish high-tech industries in the region. The university should be the focal point and the birth-place for such establishment. At the same time the University of Halmstad is unlikely to grow to the size and scientific reputation of the large universities of Sweden, at least not within the near future. Halmstad University cannot therefore be expected to have the scope and breadth of excellent science of the larger universities. It can, however, have the same depth and scientific relevance in key areas. It can also create an atmosphere and organisation where these key areas cooperate to form an innovative and dynamic climate where regional industries can grow and prosper in full and open competition on the "glocal" market. These key areas of

research are not only technical, natural, and economic sciences, but must also include classical and new areas of social and humanistic sciences, all working in the "innovation university". We believe that the combination, based at the university, of the regional area, high quality research in key areas, and true collaboration across faculties are of the major importance for the development of the region as a whole.

Industrial connections

The present platform has been aimed at establishing a basis for a future profile of the university and has therefore not had direct industrial connections as any major goal. The various projects have daily contacts with companies, regional, national, as well as international, at all levels from production to development and administrative and directional levels. Such contacts include the major operators in the household appliance industries, the toy makers such as Lego, process industries in the paper, pulp, steel, and car manufacturing markets, and local spin-off companies near the university. The broader view of the platform means, however, that these industries have not been directly involved in the platform work, but rather in projects which are, or will be, supporting the platform or are presently at the borderline of the platform. Such direct connections were also not required for the platform. They are, however, ready to be established within the requirements of the future profile.

The university has defined two major areas where the research is presently at the highest standard. These are embedded systems and intelligent sensor systems. These two areas are the topics of two recent profile applications to the Knowledge Foundation, ISSIA and CERES. These broad technical areas also include communication and information technologies and form an excellent base for future technological development with a large number of spin-off companies and establishment of high-tech companies in the region.

The companies and industries directly or indirectly collaborating with the groups of the two profiles include Braviken Paper Mill, Corus Group UK, EKA Chemical, Holmen Paper Mill, Kvarnsveden Paper Mill Stora Enso, Kährs Golv AB, MEFOS, SAAB Automobile, LKAB, SCA, ACREO, Carlstedt Research & Technology AB, Ericsson Mobile Communications AB, Ericsson Microwave System AB, Ericsson Mobile Data Design AB, Hassbjer MicroSystem AB, Innovation Team Technology Partner AB, Mitel AB, Sigma Comtec Systems AB, VOLVO AB, and VOLVO Lastvagnar AB.

The contribution and results of the research platform (TEII)

There are many ways to evaluate the results of such a complex action as a research platform. One way to do it is to focus on the scientific contributions of the platform. Another way is to study the outcome of the work and compare it to the aims, goals and purpose of the platform stated at the beginning of the action. We will present results in both ways, but our main focus is on the second way.

The scientific purpose of the platform was originally formulated in the following manner: "The primary purpose of the research platform of the University of Halmstad is to conduct research into the opportunities of innovative learning, how new technologies develop, and how new technology is implemented and continues to develop in the form of successful business." (Research platform at the University of Halmstad – A summary, 1999-02-23).

"Learning", "new technology", and the way in which new technology contributes to the start of new firms are among the most important key words of the proposed research action. This is very much in line with the traditions and strategic orientation of the University of Halmstad. Technological innovation and entrepreneurship are stressed both in undergraduate studies (e.g. The Innovation Engineering Programme) and in the research strategies of the University of Halmstad (see http://www.hh.se/forskning/index.htm). One important aim of the platform is then to support the research strategies of the University of Halmstad.

Besides the scientific purposes of the platform, some equally important statements were made when the action started. The platform should try to increase the contacts between individual researchers and research groups within University of Halmstad, and to establish multi-disciplinary research teams and research topics. The aim was to use the full breadth and depth of research perspectives and disciplines within University of Halmstad (Forskningsplattform vid Högskolan i Halmstad – Forskningsområden, 1999-02-23, p 6). The development of interdisciplinary networks of researchers and the utilization of the breadth of competences among the researchers of University of Halmstad are, then, among the issues that should be used in the evaluation of the results of the platform.

A third aim of the platform is to increase the possibilities of obtaining substantial funding for research projects and programmes. The evaluation of the results of the platform ought also to include this aspect.

The results of the platform in relation to these three aims (scientific contributions, network building, funding) are discussed in the next three sections.

The scientific contributions of the platform

The main part of the scientific contributions is made within the research projects supported by the platform. The research projects are of many kinds, but they are all considered as important contributors to the fulfilment of the goals of the platform. Together they form a basis for future research activities.

The platform has financially supported some projects, which started a long time before the platform was formed (for example, a project that Ph.D. students undertake as part of the process of finishing their thesis).

One study was carried out by a couple of undergraduate students (a master thesis), while other projects were conducted by senior researches at the University. Most of the projects involved more than one researcher.

The platform has directly initiated, or indirectly supported, 35 projects at the University during 1999-2001. When the platform was formed in 1999, 13 projects were mentioned as parts of the three research areas of the platform. During the first year of the action 15 new projects were added to the platform portfolio, while seven of the original projects, for different reasons, vanished. During the last year of the action 16 projects have received financial support from the platform.

These 16 projects constitute the main body of research activities of the three research areas, which emerged during the summer of 2000 as a result of the new focused approach of the platform. "Learning" is a theme in all three areas, but it constitutes the main basis for the area about "learning regions". Innovation, and innovations systems related to new technology (biotechnology and mobile communication), are focused in the second area, following up the previously mentioned themes of new technology and the development of new businesses related to new technology. The third research area focuses on some applications related to the new technology studied in the second area. The use of sensors in intelligent environments is one aspect of mobile communication technology. Bluetooth, as a technology, as a part of new business opportunities developed by networks of organisations, and as a basis for learning among the actors belonging to these networks, is for example a common theme running through all three research areas of the platform.

The areas and the projects belonging to them are depicted in Figure 2. The figure depicts the situation during the last year of the platform.

The projects have produced books, reports and papers presented at scientific conferences and published by scientific journals. Appendix 2 depicts the written output from the platform activities. Some of the reports are available on the homepage of the platform (http://www.hh.se/teii/Teii/).

The scientific quality of the written output varies. Part of the output is published by scientific research journals, with referee procedures, or as part of licentiate or doctoral dissertations, while some reports are written as part of the examination of undergraduate studies.

The main thing to consider is, however, whether the publications contribute to the fulfilment of the aims of the platform. To accomplish this, a publication should not only be of high scientific quality but it should also contribute to the collective research efforts of the University. Some final reports are published in a special platform-reports series, besides the electronic publishing of reports on the homepage of the platform. The main purpose of the published reports is to increase the visibility of the platform results, and to stimulate internal discussions within the University.

Ph.D. courses

The platform has organised five postgraduate courses. Ph.D. candidates, teachers and senior researchers followed the courses. Achieving that mix of participants is important if one wants to establish a research area within the University.

1. Bengt Johannisson & Hans Landström, Entrepreneurship as a multi-disciplinary research area, 5 p. (24 participants)
2. Per-Olof Olofsson & Bernd Hofmaier, Knowledge and social constructions, 5 p. (15 participants)
3. Ulla Tibelius & Gisèle Asplund, Gender perspectives on work and society, 5 p.
4. Hans Landström & Morten Huse, Corporate governance in SMEs, 5 p, (10 participants)
5. Sven Åke Hörte & Hans Landström, Innovation management, 5 p., (10 participants)

Summary: Scientific contributions

The platform has generated a large number of papers and reports, and five postgraduate courses. The written output is a substantial contribution to the research efforts of the University and establishes "learning", "entrepreneurship" and "innovation" as important future research themes for the research community of the University.

The platform's role as a network builder

The second aim of the platform is to stimulate the creation of cross-disciplinary teams and the establishment of networks of researchers within the boundaries of the University, with the researchers and research groups in Sweden and internationally, and with firms and other stakeholders.

The platform has during its existence engaged many postgraduate students, teachers and senior researchers in the various activities of the platform: research projects, courses, seminars, and conferences. The number of persons engaged could be estimated to be between 75 and 100 in total, and will not be listed in this report.

The programme areas and many of the research projects have engaged researchers from different disciplines and belonging to different sections of the University. The researchers working in the 16 projects have been in progress during the fall of 2000 and spring of 2001 representing different disciplines of social science, behavioral science, natural science, arts and engineering. All sections of the University are represented, and approximately half of the research projects engage cross-disciplinary teams.

The platform has organized internal seminars, and all researchers involved in the platform have been invited to some of them. Other seminars have been more exclusive, and have only invited persons engaged in similar research topics. The first type of seminars have had approximately 30 participants, including the heads of the sections and other key personnel

responsible for the research activities and funding at the University. These seminars play an important role as a distributor of knowledge about ongoing and future shared research activities.

The support of development of internal networks is important, but it is also very important that these networks and individual researchers are part of national and international research networks. This is mostly managed on the individual level. Many of the researchers engaged in the platform are part of extensive national and international networks, and they also have many contacts outside the academic world.

The fund-raising potential of the platform

The TEII-platform does not have an obligation to raise funds during the present phase. The purpose is to develop a research foundation, which makes it possible to apply for future funding of research. The establishment of a new research area is not completed in a couple of years, it may take 5-10 years, or even longer, to achieve a world-class quality of research in a new area. The platform covers different research areas, and some of them were already well established at the University when the platform activities started. Other research areas are quite new. Entrepreneurship and innovation are areas with a long tradition at Halmstad University, but most of the activities have been in teaching and not in research. The preconditions for obtaining substantial funding for new areas are limited, but the preconditions in the programme area "Dynamic technology" seem to be different. Activities in that area have been going on for many years, and the prospects for funding future research in the area seem to be rather good.

The platform will soon go into a new phase, and during this last phase of the platform funding is the most focused issue. The fund-raising activities will aim at the establishment of broad research programmes, but will also include more limited research project applications. Already some applications have been made based on different platform projects.

The recommendations for future research of the Mentors

The broad, multidisciplinary research that has been carried out on the research platform TEII in both its phases invites to a number of more focused and internationally competitive projects, all addressing **the social embeddedness of innovation systems.**

Present research on learning regions as well as on innovation systems are conceptually and empirically vague both with respect to the importance of informal institutions and the practices of learning. A very interesting contribution to international research can be achieved by integrating program areas A and B from the second phase with research area Dynamic learning and business development from phase 1. Since practitioners are becoming increasingly aware of the importance of the regional context to provide an innovative milieu, non-academic support for such a research focus should be easily acquired.

Contributions from TEII's both phases provides a unique knowledge base for elaborate research into the "glocal" economy. Key concepts then are frequent and lateral entrepreneurial careers (may will be in business for part of their lives), information technology and "molecularised" product and production structure (products composed of globally available components by individuals organised in networks) and multiple capital sourcing (financial, human and social capital). The "dynamic" technology being developed in both phases offers a substantive bases for frontier research in this field. Considering the positive development of and the entrepreneurial activity within the Halland region this research area is as well highly relevant to private and public stakeholders.

Appendix 1. The research projects during the two phases of TEII

Phase 1. Spring 1999 – Summer 2000

Research area: Dynamic technology development
Project: Interactive environments
The project concentrates on three basic problems:

- Virtual systems are developed and are used for expansion of reality. By using such systems fantasy, creativity and innovativeness can be stimulated. Therefore are researchers in the field of toy development using children as active part in the research and development process, engaged.
- Virtual systems are developed and used for making visible otherwise invisible parts of reality. Examples are graphic representations of temperature in gas flows etc.
- Interactive virtual tools designed for the study of consumer's participation in the design process of products. This is, according to the program description, especially important for the industry designing and manufacturing children toys, where ideas for the conception of toys are coming from adults and only in a minor degree from children.

Project: Intelligent process control
The project is focused on the need of process industries who will be in the future more closely to the market and the demands of the customers. In order to satisfy the needs of the customers, the industries will need more sophisticated instruments for process control.

Project: Intelligent environments
In the project problems and questions about so called intelligent houses, apartments etc. are studied. Here not only the control of domestic apparatus is in the focus, also the entire system for heating, energy and communication is approached. In the project both technical expertise and researchers from behavioural sciences expect to participate.

Research area: Company boards and enterprise development (Former: Dynamic learning and enterprise development)
Project: Research on company board behaviour - summing-up of earlier student assignments
The project is aimed to sum up the results from a number of master theses in the field of company board studies.

Project: Relations between venture capital organisations and portfolio organisations - a contractual study.
The study is a joint venture between Hans Landström, Halmstad, Barbara Cornelius, University of Wollongong, (AUS) and Anders Isaksson, Umeå University. The results are based on a survey among venture capital organisations and their portfolio companies.

Project: <u>Innovative network</u>
The projects is focused on network development and learning in network.

Project: <u>SME owners handling of their need for capital</u>
The project is aimed to develop a more profound understanding of SME owners handling of financing and capital need.

Project: <u>Financing of complex technological development projects</u>
The project is aimed to develop concepts and models for financing technological development projects in complex situations.

Project: <u>Resource supply in young companies</u>
Starting from the basic assumption that the need of and the handling of resources changes in the course of a companies development, the aim is to describe models and ways of the resource supply.

Project: <u>SMEs and supply of venture capital</u>
The project is aimed to sum up the various student and other studies on venture capital supply.

Project: <u>Informal venture capitalists as entrepreneurs</u>
The project is focusing by case studies on the role and behaviour of so called "business angels" which are not only venture capitalists but also entrepreneurs.

Project: <u>Company boards and innovative learning in SMEs</u>
Starting from two master theses using a survey including 400 SMEs, the project is aimed to explore the material regarding internationalisation, ownership and other variables.

Project: <u>Boards: A meetingplace for entrepreneurs and venture capitalists</u>
The project is focused on the relatively unknown part of a company's board behaviour when venture capitalist's are active members. In the study both theoretical development in concepts and methodological questions as well as empirical studies will be conducted.

Project<u>: Entrepreneurs learning in relation to company boards</u>
The project focus on the competencies of members of the board of SMEs, there needs and learning processes.

Research area: Societal dynamic and local development
Project: <u>Local Community and changing employment conditions</u>
The project is based on a survey among young people living in Halmstad and their attitudes to the demands on the labour market. Data from this survey will be analysed further and new surveys concerning young people's attitude towards work, school and university studies, etc. is planned.

Project: <u>Local Community and female entrepreneurship</u>
The study is based on a survey to female arts and crafts entrepreneurs who have started and developed their own business, which will give a better understanding of the conditions for women entrepreneurs.

Project: <u>Entrepreneurship in the county of Halland in a historical perspective</u>
The study take its departure in research on the transformation of Halmstad from a tiny small town to a modern industrial town, with a case study of a machine manufacturing company (WACO) as an example. Following the reorganisation of the platform, the project changed its title and focus to "River valleys of Halland and their importance for industrial and regional development".

Project: <u>The local community and the regional Universitys</u>
The study focuses on the changing role of the regional Universitys as a result of the implementation of the so called third task of the academic system. The empirical ground is the formative evaluation which was initiated by the National Institute for Working Life.

Project: <u>Entrepreneurial training and career path</u>
Since 1990 entrepreneurial training (courses and areas) have started in nearly all universities and Universitys. Today more than 70 academic courses/areas are offered. This expansion was met by both positive and negative reactions. The negative reactions where concerned foremost with questions about the appropriateness of entrepreneurial courses at universities and the argument that entrepreneurial skills are not possible to train and develop in an academic milieu. The study is planned as a survey among graduates from universities and Universitys in three countries (Bodö (N), Southampton (UK) and Halmstad (S).

Phase 2. Fall 2000 – Spring 2001

Programme area: The Southwest region of Sweden as a learning region

Project: <u>River valleys of Halland and their importance for industrial and regional development</u>
The region of Halland is characterised by four river valleys, which have been important carriers of ideas, goods and products from the coast to the countryside and around. The project is discussing the historical importance of the diffusion process and is studying the industrial development in connection with the typical regional cultural features of coastal leisure time activities, which also have influenced products and services. The project is connected to the study of a machine tool manufacturer in the first phase of the platform.

Project: <u>Local technology development in a network</u>
The project focus on local innovation networks with a focus on wireless communication systems (Bluetooth-technology). In the project the relations between different actors in and around the University and manufacturers as potential users of the technology are studied. The project is an explorative study of technological development in networks.

Project: <u>Born Globals - SMEs and their internationalisation strategies</u>
The project question the traditional model of internationalisation that propose that internationalisation is developed in a slow and gradual manner with respect to geographical markets and market entry modes. An alternative conceptual framework is developed and in an empirical study several so called Born Global firms are identified and analysed. The project also has close connections to research groups working with similar questions in Odense (DK) and Göteborg (SE).

In continuing the projects of the earlier phase of the platform activities, three projects are completed and will report their findings:
<u>Local Community and changing employment conditions</u>
<u>Local Community and female entrepreneurship</u>
<u>The local music live in Halmstad</u>

Programme area: The innovation systems of the Southwest region of Sweden

Project: <u>The innovation and biotechnology based innovation systems in the southwest region of Sweden</u>
This projekt analyzes two innovation systems; bio-technology and mobile communication. The project focus is on the size and development of the systems. The empirical analysis is mainly based on the results of other projects within the research area.

Project: <u>The role of the system of higher education in the biotechnological innovation system</u>
The aim is to describe and analyze the role of the higher education system in the bio-technology innovation system in Southwest, especially the role of the University of Halmstad.

Project: <u>The innovation system "Medicon valley"</u>
"Medicon valley" is a network consisting of firms, universities and other actors in the southern part of Sweden and in the northwest of Denmark. The study is based on a survey to Swedish and Danish firms working in the biotechnology field that belong to this network.

Project: <u>The development processes of medical and mechanical products</u>
The aim is to analyze the development processes of two different types of product. One product is an innovative new medicine, Losec, and the other is Volvo 850, a car very different from the traditional Volvo cars.

Project. <u>The potential of bio-fuel and small scale production units</u>
The aim is to analyze the potential of bio-fuel and the possibilities to use small scale production units of bio-fuel. A demonstration site is built and evaluated.

Project: <u>Biotechnology and the debate about ethics, 1950-2000</u>
The aim is to identify and analyze the values and value systems in the debate about ethical issues related to biotechnological innovations. The empirical base is articles published in newpapers during the period 1950-2000.

Project: <u>The innovation system "mobile communication" in the southwest region of Sweden</u>
The aim is to describe cooperative and competitive relations between actors involved in the development of mobile communication technology and applications. The firm-university relations are also described. In total 120 firms have been interviewed.

Programme area: Dynamic technology

Project: <u>Intelligent environments</u>
In the project problems and questions about so called intelligent houses, apartments etc. are studied. Here not only the control of domestic apparatus is in the focus, also the entire system for heating, energy and communication is approached. In the project both technical expertise and researchers from behavioural sciences expect to participate.

Project: <u>Interactive environments</u>
The project concentrate on three basic problems:

- Virtual systems are developed and are used for expansion of reality. By using such systems fantasy, creativity and innovativeness can be stimulated. Therefore are researchers in the field of toy development using children as active part in the research and development process, engaged.
- Virtual systems are developed and used for making visible otherwise invisible parts of reality. Examples are graphic representations of temperature in gas flows etc.
- Interactive virtual tools designed for the study of consumer's participation in the design process of products. This is, according to the program description, especially important for the industry designing and manufacturing children toys, where ideas for the conception of toys are coming from adults and only in a minor degree from children.

Appendix 2. Reports from the platform

Books and book chapters

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Huse, M. (1998) Researching the relation dynamics of board – stakeholder relations, Long Range Planning Vol. 31

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Zahra, S., Neubaum, D., Huse, M. (2000) Entrepreneurship in Medium-Size Companies: Exploring the Effects of Ownership and Governance Systems. Journal of Management, Vol 26, p 947-976.

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Andersson, S., Wiktor, I., Innovative international strategies in new firms – born global, Paper presented at the Nordic Workshop in International Business, Idöborg, Sweden, 16-18 May 2001

Danilda, I, Hansson, A. (1999) Improving the Infrastructure for Women Entrepreneurship - A Tool for Regional Development, Paper presented at the 2nd International Conference "Entrepreneurship: Building for the Future", Rennes, 1999.

Eriksson, K., Harming, J. (1999) Reflecting on success criteria for the "third task" of the new universities. Paper presented at the conference HSS99, Högskolan Dalarna, 16-18 March 1999.

Gabrielsson, J., Winlund, H., Huse, M. (2000) The importance of working style on board task performance in small and medium-sized industrial firms. Presented at the Academy of Management meeting in Toronto, 6-8 August, 2000

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Andersson, T, Mårtensson, F. (2001) Medicon Valley. En studie av det biotekniska innovationssystemet i Medican valley med avseende på bioteknikföretagens samarbete, Högskolan i Halmstad, TEII

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Hanson, H. (2001) Svenskt biotekniskt företagande och etisk debatt (forthcoming)

Halila, F. (2001) Nätverkens betydelse under första fasen av produktutvecklingsprocessen – Ett exempel på utvecklingen av ett småskaligt reningsaggregat för biogas, Högskolan i Halmstad, TEII

Hofmaier, B. (2001) Learning regions – concepts, visions and examples, Högskolan i Halmstad, TEII

Hofmaier, B. (2001) Sydvästsverige som en lärande region (forthcoming)

Hörte, S.Å. (2001) Sydvästregionens innovationssystem – bioteknik och trådlös kommunikationsteknik (forthcoming)

Hörte, S.Å., Berg, T., Höglund, M. (2001) Innovationssystemet "trådlös kommunikation" i sydvästra Sverige (forthcoming)

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