Lena Trojer, Elsa Peinerud

Leadership Qualifications within Research Organizations

- trying transformations at a technical faculty by way of a graduate school for women

Content

1. Introduction

How do we bring about a research training program relevant and meaningful to female as well as male PhD students, where there exists an equal representation of both men and women? How are the universities to meet legitimate claims from women who wish to work fully as researchers without having to adapt to an organization, whose structures are strongly male gender ordered? How are we to develop supervisory qualifications that are beneficial to the individual PhD student's prerequisites and needs? How do universities create a research supervisor profession with equal numbers of men and women? Can one of the many answers be the Graduate School for Women within the technical faculty at Luleå University of Technology?

The Graduate School for Women at Luleå University of Technology (LTU) was the first graduate school for women in Sweden, and, moreover, placed within a technical faculty. The Graduate School was originally a three-year project, starting in September 1995. Fifteen female PhD students were admitted from the nine departments of the technical faculty. The purpose of the Graduate School was to increase the number of female research supervisors, teachers, and leaders in the technical sector, and to promote the recruitment of women to technical programs and research. Besides initiating the Graduate School, the university wanted to assist in the development of a model for a well functioning research training program that considers the prerequisites and needs of the individual student. The main theme for the Graduate School for Women was *Leadership qualifications within research organizations*.

This report contains a description of the entire project Graduate School for Women, an evaluation of the Graduate School based on viewpoints of the participants and other actors at LTU, and a short analysis including conclusions. The author of the report, a gender researcher, is the project leader. Elisabeth Gulbrandsen participated in reflecting upon and analyzing the activities of the Graduate School and also in the writing of chapter 12.

The project was based upon the pilot study "Crossing borders and carrying norms – female PhD students within a technical faculty"[1]. One conclusion suggested a more in depth and complex understanding of gender in research processes was needed to develop the necessary insight into the motives behind the Graduate School. What must be avoided is the deadlock that too often occurs when the discussion turns into either an attack or a defense. For a middle way, that is neither an attack on nor a defense of the system, suitable frames for interpretation are still missing in the public debate. Attempts to discuss gender in research processes show a relatively strong polarization. The Graduate School for Women has hopefully left a contribution to the middle way.

The challenges that the pilot study pointed out as important and possible to achieve within the project were to:

- deepen the knowledge concerning the different aspects and contexts of research processes
- contribute in developing the supervisor function
- develop an efficient research training program where the research can be combined with family life and other interests, important to a fulfilling life
- seriously consider the motives and wishes, concerning research, of female PhD students
- develop a preparedness for long-term research transforming processes.

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[1] Gränsöverskridare och normbärare — kvinnliga doktorander på teknisk fakultet. Trojer and Gulbrandsen, 1996.

The program of the Graduate School was a planned, conscious attempt at trying new ways to develop a potential for change that the already known ways have not been able to bring about. If we call these attempts a participatory provocation, the Graduate School has firstly demonstrated that the university tolerates this kind of provocation, and secondly that it leads to reactions in the organization that seem to be lasting longer than the three years of the project itself. The second graduate school for women, which started soon after the first one, is one of the university's reactions to the first attempt.

This report will initially give a background to the project as seen from some of the actors within the organization. A number of issues, which are of interest at the time of the project start, are identified. An open question is whether there has been a shift in this problem identification during the course of the project. Some comments and proposals for answers to this question are found in chapter 12.

Starting a comprehensive, multi-year project like the Graduate School for Women calls for thorough planning and preparation. The strategies that the university used in the initial stage are not the least crucial for the potentials of the project. Accordingly, this report also offers a detailed presentation of some preparatory work phases, including the recruitment.

The program of the Graduate School is most easily described in terms of the more visible activities such as PhD courses, development projects, seminars, study tours, mentorship, and building-up of the network. These parts are described in chapter 7. The more invisible work must not be underestimated. Interactions and reactions, attempts of development, and change on various levels within the university have occurred as consequences of the Graduate School. Parts of this may be obvious and possible to describe, while other parts are still invisible or too delicate to write about considering the state of dependence all PhD students are facing. This report, for example, has been written through a continuous dialogue with all the PhD students of the Graduate School. Chapter 8, *The supervisors*, was the hardest chapter to write.

The aim of the report is to contribute to a more substantial insight into the Graduate School for Women than an external evaluation would deliver. The answers to the initial questions are especially difficult to attain without solid assessments, opinions, and experiences that are difficult to visualize by those not continuously present in the activities. In order to present assessments and reactions from others than those most involved, different views in the university organization are cited in chapter 11. The report ends with a six-point summary discussing what was possible to achieve with a project such as the Graduate School for Women.

The responsibility for the realization of the project has for good reason been placed onto both a person and a research division with gender research competence. Gender research has during the past two decades developed a knowledge base about gender issues in a variety of fields. The knowledge base that is being accumulated in techno-science has a different focus for problemizing gender than, for example, social sciences. The techno-science oriented gender problemizing has been very useful for the Graduate School, especially in turning the well-known equality issues into lesser known issues concerning research processes for the purpose of moving towards a potential of sustainable change. In chapter 12, these basic questions for the Graduate School are discussed.

Many people have contributed to the realization of the Graduate School for Women, and have lived with the project for several years. First of all, I would like to thank the friends and PhD students of the Graduate School and their families. The PhD students are the very reason why the Graduate School could be realized in its present form. Many thanks to the students' supervisors and their valuable contributions to this report, to Inger Medin-Olsson for her never-failing commitment and

2. Why a Graduate School for Women?

What are the motives for a large endeavor such as the Graduate School for Women at Luleå University of Technology (LTU)? In this chapter, the answer to this question is given by a number of people and groups active at the university. These answers also include some problem identifications.

The initiator and a strong driving force of the project was the head of the Personnel Development Office at LTU, Inger Medin-Olsson. She is the person who has expressed the university's attitude towards female research students and research training programs AND taken action by powerfully contributing in the creation of the Graduate School. She describes the reason for and arguments behind an effort of this kind at LTU as follows:

"Firstly, I thought it was time to do something concrete and I really believed in the idea. The need had been there for a long time. I thought that our research training program was in need of a change and that the quality of the supervision needed to be improved. I also believe it should be possible to pursue postgraduate studies during the day between 'eight and five', in the normal case, and that men up until now have invented the 'myths', i.e. have dictated the terms. Although we have been very successful for a long time at recruiting women to technical programs, I also acknowledged that we haven't done much for taking care of them inside the system – not 'fixing more women models' in the form of teachers. Nor have we 'adapted the form and content of the education' in order to interest women. Further, our postgraduate education was primarily formed by men for men. We had been discussing, analyzing, writing, etc. for a long time, but had not made any specific attempts to show that we really tried to do something, even on a long term. Quote Peter Weiss: 'It is not the words that make somebody believe in you. It is your action. It can be explained in words, but is not words. Your life is your explanation.'

The idea for the project emerged gradually. It had been preceded by several things, e.g. the result of an inquiry among the postgraduate students at LTU, a mapping of the research supervisors initiated by the Board of Faculty, experiences of postgraduate education and supervision from other universities, etc. Another important factor was the two-day courses on supervision and transformative psychology, for our research supervisors. It was also interesting to test whether the organization was ready to show and demonstrate if it really was serious in being a technical university for women."

The research students in the Graduate School for Women interpreted the university's arguments for the Graduate School as a need for more female supervisors in order to obtain more female postgraduate students. The Graduate School for Women exists on behalf of the university, not on behalf of the individual participants' postgraduate studies or careers. This argumentation, towards an emphasized quantitative goal, has proven to be unproblematic to use when the participants are placed in situations where they have to explain the project and defend its existence. The students recognized that the university direction considers each of them important and that they are expected to become professors in the future – for many an unimaginable thought at the beginning of the project, though an encouraging signal, slowly sinking in as the postgraduate studies proceeded. Towards the end of the project, a desire and a motivation among the students to be supervisors themselves was expressed. For some, the professor profession did not arouse too much motivation when they comprehended the tasks of a professor: "to get funding instead of doing research".

A qualitative way of arguing is clearly expressed in the participants' own view on why a graduate school for women is needed. Arguments presented are:
- a broader research training program
- a renewal of the research training program
- a more valuable degree
- access to a university network
- support from other studying female colleagues in the same situation

A quantitative argument:
- change in power structures, i.e. there are too few female professors

Torbjörn Hedberg was the university's president at the time when the ideas surrounding the graduate school were first formulated. He motivated the project with the statement that more female PhD students were needed. He also saw a qualitative argument in that the school could have a supporting function. As the university's president, he had come in contact with the difficulties for female postgraduate students, and he understood that they might be in a different and more problematic situation than their male colleagues.

The current president, Ingegerd Palmér, followed the entire project. She believes the most important thing is to create the necessary conditions for women to further themselves after their doctoral degrees in order to qualify for leading positions within the research sphere. A graduate school for women as such constitutes a study of what women identify as obstacles, of what kind of possibilities for leadership responsibilities they wish to have, and of their conditions in and wishes considering the research training program.

In the pilot study, the project group expressed the following viewpoints (November 1994):
- The graduate school for women can be a powerful recruiting tool
- The graduate school for women is going from words to action
- A good opportunity to exercise "the three legs": research, teaching, departmental tasks
- Possibilities to interdisciplinary work, active discussions, extra support, and learning from each other within the Graduate School.
- With the Graduate School for women, we can get rid of the stamp of being a male university
- A better gender balance creates good conditions for educated persons to be well adapted for work in the industry
- Considering the higher demands on PhD students (more published articles than before), postgraduate studies may again be looked upon as a vocation, which may lead to potential female

PhD students being missed. The postgraduate studies must be brought to a reasonable level; if we cannot recruit women, our university might face a survival problem.

The project managers' view on why a project like the Graduate School for Women at a technical faculty of LTU is important, is based upon some understandings of the situation of the Swedish postgraduate education:

- The postgraduate education is a part of an old and well-established tradition. Despite policy documents and activity plans where gender equity are often explicitly addressed, a patriarchal gender order is still alive and deeply structured.
- The low representation of women within technical faculties is often seen as a quantitative problem, i.e. the problem is placed outside the faculty, where the solution is to inform young women (preferably from kindergarten age and up through the school system) about the interesting contents of technology. Women should be tempted to enter an existing professional area, and then adapt to it.
- Female PhD students are expected to bring about a change in the research training program system or, in the worse case, there is a belief at the universities that changes will occur automatically if only the number of women in the organization increases. This change refers to lasting conditions, brought about without any special effort, that maintain an equal representation of men and women.
- Research training programs usually lack development of leadership competence. In building up this competence, it is inevitable to continuously discuss existing gender orders.
- Research educations within technical faculties often lack the self-reflection and analysis of their own work within the political context of the research domain. A project of this type may contribute to maintaining the motivation for the research training programs until the final exam; thereby helping to avoid students quitting.
- According to several surveys, the supervision situation is still problematic for both men and women. Expectations and needs often differ between male and female PhD students. The possibility for students to choose a supervisor considering their own personal needs and preferences are often limited due to organizational, structural, and traditional causes.

A challenging demand to find strategies for change in research training programs, and in particular the work and life situations of female research students, has been identified from these understandings. The work towards a transformation implies handling several basic questions including those concerning research processes. The Graduate School for Women was an experiment developing its own forms of work.

3. Prerequisites

3.1 Defining the project

The work of finding support for the project within the university and from prospective financiers took place during 1993 and 1994. The project was defined according to the following:

A Graduate School for Women at Luleå University of Technology – Pilot project

Research training programs for women

Luleå University of Technology intends to start a pilot project in order to increase the number of female research supervisors, teachers, and leaders within the university. The presence of female role models is important in recruiting women to technical training programs and research studies.

This effort is a long-term commitment where the final goal for the university is to train female research supervisors with good leadership qualities, personal maturity, and a devotion to research, teaching, and management.

In a government bill from 1992, the importance of increased efforts towards gender equity in the academic world is emphasized. Measures leading to an increased share of women among university teachers are specifically mentioned.

Gender equity is about how we as a university, and in general as a society, will benefit from the talents and capacities of women as well as men.

Luleå University of Technology has a low number of female PhD students and research supervisors. In 1999 75 were women, i.e. 22%, out of a total number of 345 PhD students,. The university had at that time 47 professors; none of them are women. The number of senior teachers is only 10. Among our associate professors, only one is a woman. This situation is for us highly unsatisfactory.

For approximately 15 years, the university has worked consciously towards increasing the share of women educated in engineering. This effort led to 27% of the engineering students admitted in 1992 being women. To get more women to continue in research, female role models are needed as PhD students and as supervisors.

Accordingly, LTU wants to start a project with the following aims:

- to increase the number of female research supervisors, teachers, and leaders at our university – female role models – and to increase the quality of the research training programs
- to demonstrate that our university can do something concrete to recruit more women to the research training programs, and to show that LTU in the long term is a university for women
- to create a model of research training programs that prioritizes quality and a high rate of success, and also takes the needs and prerequisites of the individual PhD student into consideration
- to increase the number of female PhD students

The purpose is also to educate and train the PhD students in the three main activities of a department: research and courses, teaching, and departmental tasks such as planning, organization, leadership, and administration. The obvious focus will be on research and a substantial part will be devoted to teaching and leadership.

The final definition of the project was:

"The Graduate School for Women at Luleå University of Technology is the first graduate school for women at a technical faculty in Sweden. The purpose of the graduate school is to increase the number of female research supervisors, teachers, and leaders within the technical sector and to promote the recruitment of women to technical programs and research. The university also wants to use the graduate school to develop a model for a well functioning research training program that considers the prerequisites and needs of the individual PhD student. The long-term aim is more female research supervisors with good leadership qualifications and a commitment to

research, teaching, and leadership. The PhD students of the graduate school perform their research at their home departments. They come together for common research courses, seminars and development projects, and for exchanging experiences."

3.2 Establishing the project

The project initiators understood early on the importance of marketing the project idea properly, i.e. contacting the most important actors. These actors included the head of the PhD students' association at LTU, the president of LTU, the administration manager, and the vice dean. This first test came out very well.

   The second step was to anchor the project on other important persons/groups such as the president council, the department heads, the faculty board, the professors, the students' union, and their education committee. The project was identically defined in wording for all target groups. In the application to the financiers, and foremost the county administration board, the commitment of the university to co-finance at least 50% was stressed. It was also explicitly stated that it should be a long-term effort with the purpose of increasing the number of women in technical training programs.

The establishment of the project went on for a long time, about one year from its conception until the decision was made to plan for the start. The ministry of education granted 250,000 SEK for a pilot study. After this positive response, the work for internal information and the search after external financiers continued.

Early in the process, at a meeting between the department heads, some hesitation occurred. Somebody questioned the need of a graduate school for women, somebody else questioned if "we really are to adjust the research training program in this manner, i.e. are women not capable of passing the normal research training program?" The vice dean wondered if there were enough qualified female PhD students to proceed with this project. Conversely, the project initiator wondered whether there was enough interest and competence among the supervisors. Initially, financing was a problematic issue. The faculty thought they would have to give up something else if resources were to be allotted for this project. It was considered as a project "on the side". The project initiator, Inger Medin-Olsson, judged it unlikely that the project would have become realized without the 5 million SEK granted by the County Administration board.

These were the first processes in establishing the project, to get it accepted in the organization, and to get it funded. As shown below, the work to get it established then continued throughout the course of the project, at different levels (e.g. the faculty board, the departments, potential supervisors and PhD students, research-funding authorities) and with different purposes.

3.3 Financing

The ministry of education assigned 1 million SEK in total to gender equity initiatives. Out of this resource, Luleå University of Technology was granted 250,000 SEK to complete the pilot study for the graduate school. The program of the graduate school (see chapter 4) was then based on this study.

In June 1994, the County Administration Board granted the university 5 million SEK for the project. The County Administration had thus contributed 50% of the extra costs for the graduate school (i.e. 5 million SEK during three years) with the university contributing the rest. The County Administration Board motivated their decision to grant the money by considering it important to engage more

women in research, from gender equity as well as a quality point of view. This was also emphasized in the government bill on research from 1992. LTU is located far away from most potential students' hometowns; therefore, it is important to create a distinctive university image. A Graduate School for Women at LTU was deemed to strengthen the profile that the university already had within the area (the chair of Gender and Technology).

In 1994, the ministry of education announced resources for supporting pilot projects with graduate schools. The graduate school should not only be an extension of the traditional departmental research training programs, but should be a further development. The Swedish Research Council granted the funds and after submitting an application, the Graduate School for Women at LTU was granted 380,000 SEK.

The board of the Technical Faculty at LTU decided in May 1995 to support the graduate school with grants for ten PhD students (170,000 SEK per student per year). After further discussions within the faculty board, there were wishes to increase the number of participants. After actively working with the budget, the faculty board guaranteed grants for a total of 13 PhD students in the graduate school.

Total cost for the project, 1995-1998:

Activities within the project [CAB]	2 513 000 SEK
Grants for the PhD students (part of salary, Supervision, laboratory costs etc.) [CAB]	3 080 000 SEK
The 13 grants from the faculty board	6 630 000 SEK
Other salary costs for the PhD students [U]	5 500 000 SEK
Total	17 723 000 SEK

[CAB] County Administration Board; [U] Luleå University of Technology

Additional costs are the departments' costs for each individual PhD students, rooms, administration, library, etc.

3.4 Management and organization

A project director and a project group were appointed to manage and organize the project.
    The task for the project director was to plan, lead, co-ordinate, follow-up, and evaluate the project, but also to keep the group of PhD students together during the course of the project and to be responsible for the budget, the program, and contacts with the County Administration Board and other interested parties. Her assignment should cover 25% of full time for three years, and be financed within the annual budget of the project.

The purpose of the project group was to support the project director and the project. Its tasks were to:

- initiate and stimulate the project
- catch up ideas and suggestions and bring these to the project
- continuously inform about the project and establish it and its results in the permanent organization
- discuss ideas with the project director

The project was run in close collaboration with the faculty board. The president, the heads of department, and the supervisors were continuously informed.

Lena Trojer, acting professor at the Division of Gender and Technology, Department of Human Work Sciences, was appointed to the position of project director. This appointment implied that the responsibility for running the project was put on a person with competence in gender research within a technical faculty.

Among the persons engaged in the project group were the dean of the technical faculty, one professor with a genuine interest in the project, one female senior lecturer and researcher, and the head of the Personnel Development Office at LTU. During the project time, the person in charge of the matter at the County Administration Board also regularly participated in the meetings of the project group.

4. The pilot study

4.1 Issues and procedures

In parallel with the recruiting process to the Graduate School for Women, a pilot study was performed. Its aim was to get access to a large pool of experience concerning research and research training programs at a technical faculty, and a knowledge basis to formulate the activities of the Graduate School. In the pilot study, a number of issues emerged, central for the goals defined for the project, i.e. getting more female research supervisors, lecturers, and leaders within the technical sector of the universities.

The issues dealt with in the pilot study identified areas where an effort is needed to achieve permanent change. It was pointed out that after nearly two decades of efforts towards increasing the number of women within the production of technical training programs and problem solving as well as towards taking advantage of women's qualifications, there is still a need to pursue these efforts. The pilot study is documented in the report "Crossing Borders and Carrying Norms – female PhD students within a technical faculty (*Gränsöverskridare och Normbärare – kvinnliga doktorander på teknisk fakultet;* in Swedish*)*".

The pilot study was based on
- A literature review, from which a number of central issues on research training programs were identified.
- A questionnaire with open questions concerning the central issues. Open questions were considered for the opportunity to obtain the needed qualitative knowledge. The questionnaire was sent to all female PhD students, active at the technical faculty at LTU during 1994/1995, including those who chose to interrupt their research studies. In total, 97 PhD students received the questionnaire.
- Interviews with eight female PhD students and three male supervisors active at LTU. At this time, only men acted as main supervisors[2]. The female PhD students represented six departments at LTU.

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[2] At LTU, a formal supervisor for a PhD student must be either a professor or an associate professor (*docent*).

The interviewees, and a few key persons at LTU, commented on the preliminary report. Their comments were considered in the final version and parts of the compiled material were used later on as a background to discussion seminars in the Graduate School.

4.2 Some results

 Research processes, supervision functions, work environment and work conditions, the university system, and questions concerning evaluation and legitimization were the focus of the problematic issues.

In the introductory chapter several contexts for the challenges, which were illustrated by the pilot study, are presented. The theoretical frames of reference, giving new possibilities in the striving towards gender equity, have been found in gender research. This involves shifting the focus onto science itself. Consequently, it is within those areas of gender research that put pressure on the development of a deepened intra-scientific self-reflection, from which we find functioning points of departure and frames of understanding. A deepened self-reflection is far more important than research moving the obstacles one-sidedly to the androcentric science within which we work. The latter strengthens the dualistic and polarized views that have proven to be an increasingly problematic dead end.

In the pilot study, the female PhD students discussed their motivation for research studies, their own view of knowledge and that of the research complex, and how legitimization processes work. These discussions display an important issue, which needs to be worked on, namely the development of a certain qualifications within the academic society, that we may call "research transforming qualifications".

The male supervisors of the Graduate School dwelled upon the question of legitimization concerning produced scientific texts, where they focused a central area of negotiation about legitimacy within our academic institutions. This is a complex area, where the understanding of what contributes the scientific status to a text is poorly developed within natural science and technology.

One conclusion drawn from the pilot study implied the Graduate School for Women to have a chance to develop into a unique effort for permanent change. The school had the possibility to create a framework for a broader understanding of *what* we do as scientists, *why* we do it the way we do, *how* the research complex works through us, and *how* we contribute to maintain it.

To be able to develop the searched-for understanding, we have to problemize gender at a deeper and more complex level in the research processes and avoid the deadlock that too often occurs when the discussion turns into either an attack or a defense. Sharon Traweek (1996) raises the question of why it is so difficult to say anything about modern science, which we want to say so much about. A middle course, which is neither an attack on nor a defense of the system, still lacks elaborate frames of interpretation. In attempts to problemize gender in research training programs, we often see a relatively strong polarization.

The challenges pointed out in the pilot study as important and possible to achieve within the framework of the Graduate School for Women are to:

- expand the knowledge concerning different phases and contexts of research processes
- contribute to a development of the supervision function

- develop a well functioning research training program, where research can be combined with family life and other interests important for a rich life
- seriously consider the motives and wishes concerning the research of female PhD students
- develop a preparedness for long-term changes in research transforming work.

4.3 Reactions

The pilot study was distributed both inside and outside the university. It has been a well suited document for handing over to various interested actors, e.g. university officials and other authorities, research councils, and women's (research) organizations in Sweden and in the Nordic countries. One reaction, which is probably not entirely uncommon among male researchers at well established faculties, is illustrated by the following exchange of notes[3] between the project director (pd) and one male professor (prof):

(*prof*) Thank you for the report about the pilot study for the Graduate School for Women. It is nice, but there is one thing that slightly bothers me or actually makes me almost sad. Specifically, the gloomy feel throughout the whole text. It feels as if only the problems are pointed out; that male supervisors and female PhD students' experience research as just a lot of problems cannot be. The joyous search for knowledge in research has been lost somewhere. I refuse to believe that it is a typically female quality to always think about the problems rather than about the possibilities. Always dwelling on problems is not constructive.

(*pd*) Thank you for your opinions. They are very valuable. I interpret the possibilities/problems in a completely different way than you do. I believe the pilot study shows the very serious attitude towards research female researchers have. *This* is where the possibilities and a large potential for developing knowledge can be found. The problems, rather, do seem to be located within the academic system, which is unable to fulfill their wishes for serious research work.

(*prof*) I don't think the women in the Graduate School should be taught that the only meaningful research is that with a comprehensive view which solves the global problems. To be able to come out with something new, it is often necessary to dig deep down into something that appears to be a small and specific question. On the other hand, it is the duty of the supervisor to show the research project's larger context to the student. Despite what you say about what possibilities you see with women's views on research, I think it is crystal clear you have to enjoy doing research to be able to become a good researcher…

(*pd*) I hope you see that the program for the Graduate School not a direct revision of the results of the pilot study. I believe that we work constructively in the Graduate School, inspiring research, and developing forms for a well working research and, in the long term, for the responsibility as supervisors. If I didn't enjoy my own research, I would do something else. I think I can bring that about to the students. No woman in the Graduate School considers their work uninteresting, and most of them enjoy it a lot.

(*prof*) What I so far have seen of the Graduate School for Women seems very good and from /…/ I have only heard good things. It was just something with the tone in the report that made me a bit gloomy.

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[3] At the time of this exchange of notes (through e-mail), the pilot study had been published and the Graduate School for Women had been active for half a year.

5. The recruiting process

5.1 Procedures

The criteria for admission to the Graduate School for Women were thoroughly discussed by the project group. The recruitment included the female PhD student and her intended supervisor. It was important the supervisor was also consciously recruited, in order to be a resource and a positive driving force for the project. Therefore, admission criteria were postulated for the presumptive student including the supervisor.

Criteria for admission of a female PhD student

- Active within the technical sector
- Has been a PhD student at LTU for no longer than one year
- Good results from her studies
- Skills in oral and written communication
- Fluent in Swedish
- Personal qualities indicating a potential for good leadership development, i.e. social skills, personal maturity, and an interest of taking on a leadership role
- Ability to assimilate a research training program (estimated by a suitable person from the subject point of view, i.e. the supervisor)
- Interested in lecturing as well as research

Criteria for the supervisors participating in the project

- Previously shown interest for the role as supervisor
- Interested in the plan and goals of the project
- Interested in developing as a supervisor
- Willing to devote time to the project and contribute to fulfilling its goals
- Accept to leave the position in the project to someone else if their participation doesn't work

The recruitment plan included internal as well as external recruitment. Advertising and circulation of information took place in April and May, and selection and admission of participants in between May and August 1995.

Internal advertising was directed towards all professors, department heads, recently admitted female PhD students, final-year students, the student's union, and the PhD students' association at LTU. Letters were sent to female PhD students and final-year female students. Advertisements were published in a few newspapers.

Professors and associate professors from all departments at the university announced their interest, either with or without a suggested PhD student candidate. In total, 32 applications were received, including external applicants. In May 1995, an information meeting with respect to admission criteria and the recruiting procedure was held for those interested. Questions were answered and unclear points were discussed.

The admission was made after the female applicants were interviewed, which rendered a first selection. After interviews with the potential supervisors, the final choice was made.

The project director and a person from the project group conducted the interviews with the female applicants. The project group also prepared the first choice. Only the project director performed the interviews with the supervisors. For the final admission, the project group gave a suggestion and the project director made the decision.

Interest from the Department of Computer Science and Electrical Engineering, which had few female PhD students, was considered very important. A delayed application from this department, while awaiting responses to their own advertisements, was allowed.

5.2 The supervisors

The interviews with the supervisors raised several thorough discussions on supervision. One of the purposes with the Graduate School was the development of the existing supervisory competencies. From the interviews it became apparent that the views on supervision and PhD students at the different departments varied significantly, depending on the background and personalities of the supervisors. It should be noted that all available supervisors were men, which again indicates the gender-segregated conditions prevalent at the technical faculty and the need of the Graduate School with its goals.

One problem during the recruitment interviews was to get sufficient information about the PhD students' economic conditions from their research divisions. The project plan explicitly expressed the following: if the PhD students had external financing, an annual amount of 70,000 SEK per student should be granted (from the County Administration Board). In this case, a full PhD grant from the project would not be considered. Depending on the overall economic situation of the research divisions, and on the project director's lack of experience regarding the economic strategies of various departments, it became apparent after the projected had ended that some of the PhD students had received a twofold or even threefold financing. Consequently, the Graduate School contributed to financing other PhD students, outside the Graduate School, which the divisions in question could not have afforded in other ways.

The low degree of activity in the project most of the supervisors showed later on also demonstrated that the main motive for these supervisors to join the Graduate School was indeed financial. At the same time, however, it should be pointed out that several of the supervisors were genuinely engaged in the gender equity issue within the research training programs.

The criteria for choosing the supervisors meant that their competence as supervisors was evaluated, which could be interpreted as a provocation when considering that the supervisor is a professor with high status in the academic world. During the recruiting process, only a few negative reactions on this emerged. The main impression of the recruiting process was that it created room for reflection about supervision, reflections, which appear to be uncommon in the everyday faculty life. The occurrence where a PhD student was not admitted because the supervisor did not fulfill the criteria did come about.

5.3 The PhD students

Several women – from inside and outside the university, Swedish and foreign – contacted the project group on their own initiative and showed a great interest in the Graduate School. During the

recruiting process it became obvious that several foreign research students wanted to participate in the Graduate School. However, an unclear point from the project management created frustration and disappointment with both the foreign interested women and their supervisors. It was clear at an early stage that the working language of the Graduate School had to be Swedish. The main argument for this was that the activities in the Graduate School were built upon deep reflections and personal development and that this confusion of languages would be a disadvantage. There was obviously a need for a female Graduate School for the foreign colleagues, but with another focus. The financial support of the participants of the Graduate School probably increased the frustration since many foreign female PhD students have a particularly difficult economic situation.

The motives for applying to and accepting an appointment in the Graduate School varied from initiatives and interest of the supervisor, the importance of the information meeting, and publicity in papers, to the interview during the recruiting process.

5.4 Reactions

Information about the Graduate School was also spread via internal newsletters at the university, in articles with headlines such as "A Graduate School for women in technology – why?" and "Untraditional graduate school seeks female PhD students". The reactions were mixed. Some thought it was a good initiative, and that a Graduate School for women would be the right way to strive for gender equity in the academic world while others were generally against affirmative action and therefore hesitant to the Graduate School for Women.

Some male PhD students reacted to the special treatment of women that they thought the Graduate School involved. There was a perception saying that "in the Graduate School for Women you become selected to an exclusive group of young career women, who are to be manipulated to dislike their male colleagues and to strengthen their bitter and grieved view on the male-dominated society. They are to become strong by cracking down on men within the university." Prejudices like this are not surprising, as the project touches deeply, structured conditions favoring a male-dominated system. The reactions were thoroughly discussed throughout the project group. To handle these reactions, it was decided to inform, but above all to clarify that the PhD courses of the Graduate School were open for all PhD students, male and female. The competence developed in the courses – leadership within research organizations – was of equal value for all PhD students, both men and women.

Another, more interesting reaction came from some female PhD students already a few years into their research training program. Their experience was one of provocation when gender affiliation is exposed in a project like the Graduate School for Women. It is probably only female PhD students (and undergraduate students) who can explain this reaction, which deals with identity and with lack of identity. To be a woman in the world of technology means to deviate from a male-defined norm. To be a woman from a technical field in a world of women means to deviate as a consequence of being a technician. For these female PhD students, the permanent divergence from the norm, the feeling of not being in their own element, is trying. The Graduate School for Women clarifies the effort in trying to cope with this lack of identity.

The Graduate School was also seen as a threat regarding the acceptance of childbearing during PhD studies. Some believed the participants of the Graduate School were protected from criticism from professors and employers who regard childbirth as a drawback. The concern that the Graduate School would rehash an old prejudice was significant. The cause for this anxiety originates in the long, hard

struggles the older female PhD students have fought at their departments, in order to get an acceptance for combining their studies with children and family life.

Some of the participants in the Graduate School had to deny false rumors, saying, for example, that the Graduate School was a shortcut to the PhD degree and its participants not really competent. Some felt their colleagues being jealous, but not accusing, during the whole course of the project. However, others experienced the very opposite where colleagues were pleased with the benefit they had received.

The fact that the participants performed their daily work at their home departments, and thereby had a situation like any other PhD student, has opposed opinions about segregated activities within the graduate school. This everyday situation has probably been very important for the acceptance of the project.

5.5 The Graduate School for Women at a Technical Faculty

Starting in September 1995, 15 PhD students and 13 supervisors were admitted to the Graduate School for Women. The PhD students came from the following departments:

> 2 from the Department of Human Work Sciences
> 1 from the Department of Business Administration and Social Sciences
> 2 from the Department of Chemical and Metallurgical Engineering
> 1 from the Department of Mechanical Engineering
> 1 from the Department of Mathematics
> 2 from the Department of Materials and Manufacturing Engineering
> 3 from the Department of Environmental Engineering
> 2 from the Department of Computer Science and Electrical Engineering
> 1 from the Department of Civil and Mining Engineering

As a result of this distribution, all departments at the technical faculty were represented. From 1997, a philosophical faculty was started at the university. One of the participants thereafter belonged to the philosophical faculty.

The opening of the Graduate School took place in the newly built university library. Apart from the PhD students and their supervisors, the managements of the university and of the technical faculty, the representative from the County Administration Board, and the press were all present.

6. The project group

A project group for ideas, support, and the establishment of the school, was tied to the Graduate School. In addition to following and supporting the project, the project group made a great effort in creating the right conditions for running it. The group met for the first time in November 1994, and worked intensively via monthly meetings until the Graduate School started in September 1995. Thereafter, the meeting frequency decreased to 2-3 times per semester. Minutes were taken at every meeting.

The participants in the project group were well established in the organization and had strategic positions on the faculty board and the university governing board. In addition they had long experience with research training programs and a strong commitment to the project. The group mainly worked with issues concerning financing, recruitment, admission, the pilot study, establishment of the project, and the future.

The main aim of the graduate school, as the project group saw it, was to get more female role models, i.e. more female research supervisors and leaders at the university. The specific goal to create a new model for research training programs was emphasized. Further, the group emphasized that the project should initiate a spreading of the effects to the regular research education at the university within three years, which, preferably, should have become integrated in the organization.

6.1 The issue of financing

Financing from the university – i.e. the number of regular PhD student grants set aside for the Graduate School – was discussed until the autumn 1995. Initially, the project was planned for 10 PhD students and the board of the technical faculty decided accordingly to set aside grants for 10 students. As mentioned in chapter 3.3, there were strong wishes to increase the number of participants in the Graduate School and the project group supported these wishes. The dean, who took part in the project group, worked actively in the board of the faculty to find financial solutions for three additional PhD students. An application for a larger sum of capital to finance PhD students in the Graduate School was sent to the Swedish Research Council. The application was declined, but a sum of 380,000 SEK was offered to the graduate school, which was subsequently used to finance the activities of the project. After a decision to distribute the university's accumulated surplus from 1994/1995, resources for the three remaining PhD students during the first half of the project time were assigned. Resources for the remaining time were granted from the faculty's current assets. Without the efforts of the project group, the financing issue would have been difficult, if not impossible, to solve, with the ambition to have 15 participants in the Graduate School. The active support of the university's president cannot be overestimated.

6.2 Risk analysis

In order to be prepared for certain reactions within the university, the project group initially worked with risk analysis. The arguments *for* the Graduate School for Women was, according to the project group:

- Good profile for the university
- Time was fitting
- Develop individual independence
- Support from each other
- Strengthen skills
- Enthusiasm for the project

Arguments *against* the project were the following:

- The system and the conservatism
- Dissipative for the participants
- Time required to complete project

- Difficult to recruit (answer: no, it's easy)
- Out of the ordinary
- Can be considered less demanding than other programs
- Difficult to integrate
- Time and energy of the supervisors
- Jealousy from others (neutralized by openness, much information, continuous open seminars)
- Involves a demand for the supervisor to change, a demand that the supervisor is not ready to meet (counteracted by an early start in the research training program, and a well established project at the time of recruitment)

6.3 Recruiting

The project group contributed to the recruiting process with experience, ideas and work. The broad knowledge of how the system worked at LTU and a good knowledge of people contributed to a smoothly run recruiting and admission process. The group's ability in this process to respond to the various reactions was important for the project and its legitimacy.
The project group completed the project director's deficient organizational experience of LTU. The group members could be more direct and clear towards, for example, the supervisors. However, the loyalty towards colleagues became a delicate question at the admission interviews with the supervisors. There, the weakness of the project director, i.e. her short experience at LTU, turned into her strength. Her lack of connections created a basis for perhaps asking provoking, but for the project important questions.

6.4 Study plan

The project group commented on the results from the pilot study and gave their opinions on what it indicated. They tried to identify the core problem of research training programs, and thereby suggested central parts and themes for the study plan and activities of the graduate school. The first discussion concerned the time frame for the Graduate School and whether it would be included within the students' regular study plans. How extensive was the Graduate School allowed to be? It was warned against scheduling Graduate School activities outside of the students' regular study plans. The opinion of the project group indicated that the work within the Graduate School should be integrated with the other research training, and rewarded as ordinary PhD courses. After careful consideration, the project group suggested the faculty board to include the courses of the Graduate School in the research training program and count for 20 points[4] during the three-year period. The faculty board arrived at this decision in June 1995. The decision was also discussed with the supervisors, who had no objections. The 20 points frame included in the students' research training program implied that the space for other PhD courses had to be decreased. The remaining course points in the research training program – 60 points – were concentrated on courses directly related to the students' areas of research.

A program was approved in consultation with the project group. After revision half a year after the project's start, the program looked like this:

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[4] 1 point represents one week's full time studies.

STUDY PLAN
Research courses/higher seminars/development projects

Year 1 – *The own identity*

Communication student – supervisor	PhD course
Personal development and leadership	Development project
Building the network	Development project, exchange of experience, visits
Project planning and project financing	PhD course

Year 2 – *The group as a resource*

Personal development and leadership	Development project
Pedagogy and ways to spread information about research	PhD course
Building the network	Contd. development project
Workshop/conference at MIT	International network project
Research processes and theory of science	PhD course

Year 3 – *Leadership*

The system/The organization	PhD course
Building the network	Contd. development project
Mentorship program	Development project
Leadership at universities	PhD course
Planning the future	

The final, detailed program was discussed by the project group, but decided by the participants of the graduate school. The program was settled for one semester at a time. The activities were reported and discussed at the meetings of the project group.

6.5 The County Administration Board

The person handling the Graduate School at the County Administration Board took part in the project group meetings every semester. A continuous contact with the County Administration Board to obtain their opinion on the development of the project was highly valued. When the Graduate School had been active for half a year, the representative from the County Administration Board stated that

- the project is following its plan
- the degree of engagement in the project is high
- there are no problems with students quitting
- the pilot study is almost ready (i.e. in print)
- the mentorship part and the contacts with the industry should be developed
- the marketing of the Graduate School for Women and the university's other efforts for women should be developed

6.6 Challenges and future issues

After the Graduate School had been functioning for one year, the project group identified the big challenge the project now faced as getting the supervisors to take a more active part in the project. A thorough discussion on the supervisors' role in the Graduate School is found in chapter 8.

At the halfway point of the graduate school, the project group considered it time to draw conclusions from the project, and possibly suggest new graduate schools (or stop all such thoughts). The group agreed that a continuation within a new Graduate School was needed and wanted, possibly starting with an overlap to the present graduate school. A hearing with the faculty board regarding the future and the contents of next Graduate School was held in March 1997. During the spring 1997, the project group initiated the planning for the next graduate school, suggested a management for the next Graduate School, and started the establishment of a long-term financial plan to present to the university governing board.

The following meetings of the project group continued to deal with future issues, above all a new graduate school for women. When one year of the project time remained, the suggestions for continuing the present Graduate School looked like this:

- Graduate School nr. 2 – a new Graduate School for Women
- Graduate School nr. 3 – a mixed graduate school
- Increase the number of PhD courses supported and answered for by the faculty board with the courses developed in the present Graduate School (this opinion has also been expressed at a faculty board meeting and by the PhD students of the graduate school)
- Increase the network of the Graduate School with new female PhD students. The present Graduate School should initiate and take responsibility for this. Resources can be applied for from the 100,000 SEK (from the government) that are set aside annually for the build-up of a network between female researchers at LTU.
- A "graduate school" for supervisors in order to get a continuous development of the supervision function.

A work to establish these ideas in the organization followed.

7. **The visible activities**

7.1 PhD courses

PhD courses made up a large part of the activities in the Graduate School. The main theme for the entire project, and consequently for the courses, was *Leadership qualifications within research organizations*. The development of these specific course themes started out from the overall study plan, presented in chapter 6.4. The process to arrive at these specific themes and contents is described below.

The following PhD courses were included in the program of the Graduate School:

- Communication in the process of research supervision (3 p)[5]

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[5] 1 p represents one week's full time studies.

- Project planning and project financing (2 p)
- Pedagogy and ways to spread information about research (3 p)
- Theory of science (2 p)
- Research and EU financing (1 p)
- Leadership in research organizations (2 p)

As previously mentioned, it was a conscious and important policy to make all PhD courses open to all interested students at the university. The arguments for this policy were:
- to strengthen the dialogue and the contacts between the participants of the Graduate School and the other PhD students at the university. As such, this was a goal, but it also contributed to counteract possible tension between students within and outside the Graduate School, and was one part in the continuous work to establish the project at the university.
- to contribute with a certain competence considered generally important for the research training program, but not available in other courses at the university.

The only course not open to other PhD students was the Theory of science course. From reasons described below, it was not possible. However, in association with this course, an open lecture by Prof. Georg Henrik von Wright was held.

It is important to point out that the PhD students in the Graduate School discussed the types of courses and their contents (and also other activities) thoroughly. They also made the decisions to realize the courses. This teamwork started out from the three-year framework for the project and the identified needs of the research training program. The work took place during planning sessions at the university, through e-mail correspondence, and café seminars, which were the most appreciated form. The café seminars were held at small cafés possible to rent wholly or partly for a few hours after normal work hours. The project director would work out a suggestion for a course from which the discussion began. Because of her role as a project director, she had a preferential right of interpretation that affected the discussion. The project director thought a lot about this situation; her ambition was to get the participants to take a greater part in the process and to let them carry more of the responsibility. In practice, she tried to break hierarchical attitudes and show a flatter way to organize the work. It was also her way of expressing the pedagogical attitude that she wanted to emphasize throughout the project. She hoped this would be a contribution to the reflection about our situation as teachers, supervisors, and researchers at a university.

The responsible research division, Gender and Technology, administrated the practical performance of the courses. The project director was the examiner for all courses.

Below follows an account of the Graduate School PhD courses along with a few comments. It goes beyond the scope of this book to present in detail the contents of lectures, seminars, literature, and texts produced by the participants. Most lectures were taped, in order to give those students not present a chance to take part in the lecture. The students who were abroad could then, with some additional adjustments, take part of the course from a distance.

7.1.1 Communication in the process of research supervision

This PhD course was the first one given within the frame of the Graduate School. The main reason for starting with this particular theme can be found in the fact that most students were either new or had recently begun their research studies. The course was thus considered important in order to have a fruitful and conscious start to the relationship between the student and the supervisor. The fact that all the female participants had male supervisors made the contents of the course and the opportunity

to reflect even more urgent. An additional reason was one of the central purposes with the Graduate School – to develop competence and motivation for research supervision.

The lectures dealt with three themes:
- research supervision from the student's perspective
- research supervision from the supervisor's perspective
- gender theoretical perspectives on language and communication

Because of the constellation female students and male supervisors, which is not unusual in the academic world, knowledge around this situation attracted special attention. This issue was also treated by lecturers in the other themes.

For obvious reasons, it was crucial to get as many supervisors as possible to attend the activities; this wish was expressed in a letter to the supervisors. They had the option to take part as often as their schedules allowed them and were asked to come with suggestions on course literature. In particular, one supervisor responded to this request. The final choice of course literature was sent to all supervisors, regardless of their attendance to the course.

In order to create meeting opportunities in the recently started Graduate School, and to have the possibility to discuss the lectures more freely, the Graduate School met at "post-seminars". These seminars took place in the evening after the lectures had finished. They provided an opportunity to think out loud about what had happened during the day. Other issues dealing with the Graduate School and the research education were also brought up.

The examination form was a pedagogical experiment. The purpose of the work leading to the "examination" was to bring out the issues of the course, which the participants identified as the most important and interesting, and to work with these issues.

The course participants were divided into groups of two. For one week, each couple would then reflect upon the lectures, read all literature, and discuss and formulate an issue according to the instructions given. At a given date, the couples exchanged issues after a decided plan. During the following two weeks, the couples worked with the obtained issues starting from the lectures, the course literature, other literature, their own thoughts, and contacts with resource persons. No written documents were required. Instead, the work was presented at the discussion seminar ending the course.

The following issues were presented and discussed:
- What are the strengths and weaknesses with having one, two, or three persons as mentor, role model, and supervisor? What are their tasks in the research process?
- Is praise important in the PhD student – supervisor relationship?
- Define four ways to increase the gender equity in issues linked to the supervision process!
- How will the PhD students become independent?
- How is a well working research environment for PhD students created?
- What knowledge and skills does a PhD student need to succeed after getting her degree? What supervisor role does best support these goals?
- What is a reasonable amount of work to demand from a PhD student? Is overtime an unwritten rule?
- What are the advantages and disadvantages with inheriting a style of research and writing from your supervisor?

- Why do so few women stay in the academic world? Does it depend on the academic structure? If so, how?
- Women's language and ways of speaking, getting "bilingual".
- Gender or personalities – what is important in the long-term perspective?
- Why does the research training programs proceed in different pace for different students?
- How is a collective supervision achieved? Is it good?

In this course, 26 persons participated, 18 women and 8 men (31%). Five of these were PhD students from outside the Graduate School. Six supervisors actively participated, and only one participated at one single lecture. One supervisor participated, notably, in the preparations.

The evaluation of the course is interesting because it too reflects the conditions and thoughts that affected the theme of the course. After the course, the participants handed in a relatively thorough written evaluation. Below, the questions in the evaluation and a few comments on each question are presented.

1. Consider the lectures and comment on
   a) the contents.
   b) the presentation.
   c) the "post-seminars".

The evaluation revealed mixed opinions. A majority was positive to the subjects treated during the course. Some of the female PhD students as well as some of the supervisors found it rather heavy to deal with the trying experiences of women in the academic system, which were addressed during the lectures. The lectures aroused interest of having some areas of the course more highlighted, e.g. female researchers' situation within the technical sector. One male PhD student was of the opinion that those lectures perceived as heavy and trying were actually the best ones; they gave a good overview and presentation of all problems in a student – supervisor relationship.

2. What is your opinion on the course literature?

The participants were for the most part positive to the course literature, and thought it was generally useful and gave a good background and understanding that could be used in the course. However, there were mixed opinions. The book illustrated experiences highly valued by several participants, while others pointed out that the empirical material was scarce. Some had problems understanding the most specifically gender theoretical articles.

3. What is your opinion about the form and content of the pedagogic method?

This part of the course got a very positive evaluation. The participants liked the used form.

4. Comment on and evaluate the course as a whole when it comes to
   a) the course plan
   b) the working climate
   c) the working requirements
   d) what possibly was missing

The working climate was experienced as relaxed and good. Many thought that the labour requirements could have been higher. However, it was up to the individual participant how much

effort they put into the course. This model ought to work at this level of education. The thing missing concerned experiences from the technical sector. More lecturers were also wanted.

> 5. How well did the purpose of the course fulfil your own needs and interests?
> 6. Was the course arranged so that it actively helped you to understand and draw your own conclusions?
> 7. Do you think that you can use the knowledge from the course in practice? If so, when, where, and how?

The answers to these questions show that the course seems to have aroused several thoughts. About the academic system and its complexity, about what is expected from a PhD student and from a supervisor, and about not only the communication between the PhD student and the supervisor, but also between men and women in general.

Two things were interesting to note at the end of the whole project Graduate School for Women. Firstly, this course was brought about in the faculty board by the supervisors who participated as a potential regular course to be offered by the faculty. Furthermore, several students in the Graduate School remembered this course as highly valuable, and thought it would have been useful to take this course again, i.e. as a follow-up course at the end of the research training program using all the experience they have gained as a PhD student.

7.1.2 Project planning and project financing

Early on in the Graduate School, wishes of a course based on the theme *projects* were expressed. The course was planned together with the student group, and it consisted of two parts: project financing and project planning. For the financing part, two resource persons were needed, one representative from the applying side and one representative from the receiving side. For the former, a researcher with much experience was desired, someone who could share her/his views with the student group on possible ways of succeeding with financing. Especially important in this context was to acquire knowledge and experience on "how to create contacts with research financiers and how to keep these contacts active". A lecturer on this topic was the dean at the technical faculty. For the latter case, the receiving side, we wanted a person who presented and discussed how applications are handled – what is the procedure at a research council, what is important to think about, how to get in contact with the research council administrators, how to keep these contacts, etc. The lecturer was the secretary general of the Swedish Research Council for Engineering Sciences. The person responsible for the project planning part was an expert with comprehensive experiences in leadership, communication, and organizational development.

The project planning part started by having all course participants fill in a questionnaire and sending it to the teacher responsible six weeks before the course was due to begin. The answers, which concerned previous experience and ideas of project work and leadership, formed the basis for this custom-made course. At the course start, the participants were asked to express their thoughts about the most difficult and the most important aspects in project planning. This part of the course consisted of the following:

- starting a project
- realizing your project idea and obtaining results
- what is important to consider at the project start
- project model and structure

- creating good opportunities for the project
- efficient project control
- organizational prerequisites for a successful project
- to work target-oriented and to evaluate during the project
- planning and prioritization in the project work
- when things go wrong
- creating a preparedness for change
- pitfalls in project work
- project management
- the various roles of a project director
- authorities and responsibilities
- leading the different phases of the project
- motivation and human aspects
- to influence people and get their support

The examination form was to write an individual project application, and present it orally and in writing at a follow-up seminar. The assignment was to
- write an individual application, e.g. for a research project or as part of a larger research program/project, as a contribution to a conference trip, for a stay as a guest researcher, as a grant for project planning or publication. The application should be genuine and not fictitious.
- find a suitable financier to submit the application to
- get an opinion of the application from the supervisor or from a colleague

At the follow-up seminar, the various experiences were discussed.

During the course, the Graduate School had a café seminar where the contents of the course were discussed further. On this occasion, the planning of the following PhD course and other activities within the Graduate School also continued.

For the course evaluation, the same questions as for the communication course evaluation were used. The answering frequency was lower; however, those who answered were mostly positive. The intense practical work in the project planning and the examination parts were especially appreciated. For the participants, the relevance of the course in their daily work was considered high. A couple of students felt privileged to hear the opening lecturers and to get an insight into a world they previously did not know much about. The course literature was valued and regarded as useful. Wishes to get earlier access to the literature were expressed.

Many students were interested in taking this course. In total 37 applications were handed in, including those from the Graduate School. The principle first come, first served was used. Twenty-one persons were admitted, eleven from the Graduate School and ten "external" PhD students from the university, as well as four students who took the course at a distance (three were abroad and one was on maternity leave). Four male PhD students participated. More men had applied for the course, but were too late.

The large interest for the course among PhD students and researchers shows a need that was not sufficiently fulfilled at the university by other courses within the research training program. Increasing the knowledge and awareness of how research projects work probably contributes to both increasing the competencies among PhD students for their future works, and raising the interest for how the system, which they are a part of, functions. One participant in the Graduate School later

commented that female PhD students possibly need a particularly stable ground in order to advance, considering that more female than male students quit their research studies. She believed that she had acquired this base from the Graduate School, including an important insight into the management of the university.

A greater and more complex knowledge about the academic system was developed as the Graduate School proceeded with its other courses. Developing such knowledge is, as previously stated, an important part in generating motivation and interest for leadership within a university organization.

7.1.3 Pedagogy and ways to spread information about research

In the pilot study preceding the Graduate School, it was noted that many female PhD students showed an interest in teaching. Many liked the combination teaching and research, though an imbalance usually occurs where teaching is often favored. The need for pedagogical reflection in the technical sector was a motive for this PhD course. In an attempt to bring out other pedagogical attitudes than the traditional "supplying pedagogy", various pedagogical development efforts at the university were emphasized. University education involves meetings between adults, and thoughts from the adult education pedagogy made up a natural part of the course. Among the lecturers invited during the course was an assistant professor with a background in pedagogy and a lecturer, now a politician, with vast experience in adult education at a Swedish university. Development in alternative pedagogical strategies from LTU was also shown.

The so-called third assignment of the universities includes a dialogue between researchers and non-researchers, clearly a pedagogical challenge. The phrase "ways to spread information about research" implies a one-way communication. This concept was expected to be discussed. The course focused politicians and young people as receivers of information. The political decision-maker who participated in the course was the then Swedish minister of education; his participation created a possibility and a challenge above what can normally be expected in a PhD course. The Swedish Council for Planning and Coordination of Research has a mission from the government to work with research information; accordingly, its previous head of research information participated as a lecturer in the course. When it comes to information intended for children and young people, LTU has stood out with the House of Technology Science Centre. The initiator of the House of Technology Science Centre was also a lecturer in the course.

Although pedagogy is linked to the spreading of research information, the course consisted of two separate parts, brought together in a panel discussion where representatives from different areas of the university participated. At this discussion seminar, each representative made one short contribution. Then, a very intense discussion followed, with questions prepared by the students. Among the issues brought up was the quality in teaching, the spreading of information within the university and to other sectors of society, and the question about what is our main task at the university (teaching? research? spreading information about our activities and results?).

Again, an experimental examination form was used. It consisted of two elements. The first element was a diary, where each student wrote individually. It should not contain lecture notes, but rather thorough reflections from the lectures and comments on the course literature. In this way, a continuous evaluation of the course was also achieved. At the end of the course, the diary was handed in. The other examination elements were the preparations and responsibility for the discussion seminar.

The course gathered 23 participants, female and male PhD students and research teachers, including all women from the Graduate School.

7.1.4 Theory of science

During spring 1997, a PhD course with the theme "Theory of science – Special" was given only for the participants in the Graduate School. The reason why this course was not open to all PhD students at the university was its structure. The preparations for this course included lectures in Helsinki and Boston; these lectures were combined with other activities within the framework of the Graduate School, see below. Therefore, it was considered impossible for others to participate.

The development of this course was a lesson in itself. The course was planned as an experiment in learning processes by defining problems as close to the participant's own activities and experiences as possible. It was also an opportunity to reflect upon epistemological understandings of their own research activities and its place in the techno-scientific world. The course was planned to end with a meeting with an expert, and, as it turned out, there were two expert meetings. Another idea with the course was to avoid repeating the theory of science courses already existing at the university. Several of the PhD students had already taken such a course.

Two historians of science and ideas participated in the course planning. The PhD students took a larger responsibility than before in both developing and carrying through the course. The course was also used to activate and create meetings with the supervisors.

The course program was divided into two parts:

Part 1   Literature seminars
Part 2   Lectures with prepared discussion seminars

The examination consisted of written reflections on the literature and the preparation of and responsibility for discussion seminars with the invited lecturers.

The literature included A. F. Chalmers book "What is this thing called science?" and two books of the philosopher Professor Georg Henrik von Wright. Professor von Wright was invited to give a lecture, which he accepted. This lecture was greeted with much interest from people at the university, and it was therefore opened to others and not only those from the Graduate School. During the afternoon, a discussion seminar was held between Professor von Wright and the Graduate School. Examples of the issues discussed are:
- What is biologically suitable for the human being?
- Would more women within science and technology have led to a different scientific development?
- Does democracy still work?
- Is the energy debate in Sweden an example of the conflict between the political system and the techno system?

The final expert meeting included one discussion seminar with only the PhD students and one discussion seminar where their supervisors also contributed. At the first seminar, the two invited experts in the history of science and ideas discussed the issue "how to connect views on knowledge and science with our daily research work". At the seminar with the supervisors, the theme was "the

role of the university in Sweden", where five of the supervisors and a representative from the university board (LTU) participated.

7.1.5 Research and EU financing

The idea to focus on the theme *Research and EU financing* was born at an early stage of the Graduate School, when one of the supervisors started an assignment in Brussels as the university's expert on EU and research. This theme continued the course on project planning and project financing (see chapter 7.1.2).

The course was given in two public PhD seminars, covering the themes "The research financing system of EU – what's in it for me?", "EU and research politics", and "Coordinating an EU program between Sweden, Germany, and Austria – the application phase". Those participants of the Graduate School who were abroad listened to tape recordings of the lectures and wrote comments about them and the literature. Special attention was given to material from the EU R&D Council about the 5th frame program for research and development (1998-2002).

Except for the participants of the Graduate School, only a few other persons from the university attended the seminars. We can only speculate at the relatively weak interest in the theme. Do PhD students perceive EU-financing as too complicated? Are EU financing issues something that only concerns persons with high research statuses and longer experience with financing?

7.1.6 Leadership in research organizations

In cooperation with the Theatre Academy of Luleå, the Graduate School gave a final PhD course in the spring 1998 with the theme "leadership in research organizations". This theme connected the various activities of the Graduate School and focused the long-term and fundamental goal to get more female research supervisors with good leadership qualifications into the technical sector.

Thanks to the cooperation with the Theatre Academy (which belongs to LTU), a course with a totally different profile compared to what is usually expected in PhD courses could be developed. The meeting between the first-year students of the Theatre Academy and the PhD students created a particularly inspiring dynamic in the course. We could observe what we had in common: that we work in organizations where we are expected to be creative, preferably innovative, though the forms of our creative work look different. The theme of the course could more precisely be described as "what can a well functioning leadership in creative organizations, where knowledge is created/developed/constructed/produced, look like?"

The purpose of the course was to give an opportunity to widen the views on leadership through meetings and discussions with lecturers and other course participants. The requirements for the course were presence, an active participation in the discussions, and preparations for the seminar. Optional was the writing of an essay using personal experiences or literature. Well thought out reflections were encouraged and requested. For the PhD students, the essay should summarize their three years in the Graduate School. The essays were presented orally at a seminar at the theatre.

Among the lecturers were the president of the university, a personnel developer, and the director of the University College of Film, Radio, Television and Theatre. Also integrated in the course was a two-day seminar. As this item included practical exercises allowing a restricted number of

participants, it was offered only to the students of the Theatre Academy and of the Graduate School. The purpose of this seminar was to stimulate the creativity of future actors and researchers using the body as an instrument, and to reflect upon the theme "body, gender, and power". The exercises were based upon basic body awareness, which are bodily exercises that aim to integrate conscious actions with unconscious processes in the body. The chosen exercises were very simple, and originally developed by Jacques Dropsy. Basic body awareness is a type of phenomenological and hermeneutical practice where our silent bodily experience presents itself. The dialectic perspective (to feel, to make, to experience, and to perform) is built-in into the actual exercising. The exercises embrace two basic components – strength and recovery – and were performed lying, sitting, standing, and walking. After the exercises there was time for reflection. There was a great value in the meetings between people whose professional experiences were dominated by intellectualizing and artistic creating, respectively. The exercises took place in the ballet room at the Theatre Academy.

At the following-up seminar, which was held after the summer, the students of the Theatre Academy wanted to discuss power. The essays that were ready at that time were presented in association to the discussions about power.

Including the PhD students of the Graduate School, 39 students had applied for the course, 32 of these participated actively (21 women and 11 men). Seven students chose to write an essay.

7.2 Personal development and leadership

During the planning of the Graduate School, the personnel developer Barbro Huldén from Helsinki was contacted. The university had engaged her before at several occasions, and her method of working was considered to be of interest for the Graduate School. Two standpoints were important: the participants should get access to professional supervision for personal development, and the Graduate School as a group should get access to professional supervision for the development of functioning group dynamics.

The overarching idea of the work of Barbro Huldén was to elucidate the obstacles, found in all persons, to communication processes that would make contacts to others possible. The result is – at best – an ability to take the responsibility for oneself and to answer to signals from the surroundings. This ability is a necessary qualification for a PhD student who wants to become independent and ready to take the responsibility for the own research and other important parts of life. It is also a precondition for being able to meet the idealistic view that many supervisors have of a PhD student without knowing how to realize it. This idealistic image is a PhD student that is active, productive, and full of initiative in the own research as well as in the contact with the supervisor.

The group of PhD students in the Graduate School met with Barbro Huldén at a three-day seminar during the first semester of the project. After this seminar, an evaluation was made to see what interest and needs there were to continue the co-operation. The students had experienced the exercises with Barbro as "… very intense, a hard work, but very rewarding…", "I felt uplifted and exhausted… I have a feeling that we want to proceed." Barbro Huldén also commented on the seminar:

> "…so many ambitious and capable women. The all-pervading interest they have in their work shows that you have got hold of the right persons. The course itself went OK. As always when it's a matter of relatively young people, some are more affected than others, some are more stuck in their defence and some may have problems with accepting that there is no simple code for becoming 'perfect', as one so much wishes and hopes…"

An overwhelming majority wanted to proceed with the development project with Barbro Huldén. The following program was planned:

Part 1
My resources (professionally, relationally, personally)
The individual – the group
Polarities

Part 2
Contact – avoiding contact
How does it influence my personal leadership?
Communication – motivation

Part 3
Contact – confrontation – conflict
Feedback – responsibility

Part 4
Unfinished situations
How do they influence my personal leadership?
My needs (personally, relationally, professionally)

Part 5
Personal development work
Group dynamics

The method of working was holistic and experimental, and was based upon a gestalt therapeutic frame of references. The method required an active, personal participation and responsibility, and a willingness to become engaged. The purpose of the development project was an increased awareness concerning

- the individual personality
- the personal leadership
- communication, motivation and feedback
- confrontation and conflict solving
- group functions

This project ran all through the project time of the Graduate School with in total 22 days of seminars over the three years. For most of the participants of the Graduate School, the work with Barbro Huldén became very important. Two PhD students chose not to follow the whole project. According to Barbro Huldén, there was a great difference between the first and the last seminar. At the first one, a process, which is hard to describe started. Openings had to be created, that provoked and could lead to trust and contact. Barbro Huldén thinks that the result was a nourishing group with an inherent power and a wish to start a dialogue outward. She interprets the latter partly from how the group worked and partly from the activities in and around the Graduate School.

7.3 Comparative perspectives on Women and Engineering

During the project time, the PhD students of the Graduate School had the opportunity to make two longer journeys to present and discuss experiences from the project and issues arisen in the Graduate School.

7.3.1 The trip to MIT, Cambridge, Boston, USA

Through the contacts of the project director, the idea of a collaboration with Evelyn Fox Keller, professor of history of science and philosophy of science at the program "Science, Technology and Society" at MIT, was born. The collaboration was extended to comprise also Ruth Perry and the program "Women's studies" at MIT. The planning started during the fall 1996. It included contacts for each individual PhD student with researchers at MIT or other universities in Boston or New York for visits of benefit to the own research project. Intense preparations followed, from the Swedish as well as from the American side.

In October 1997, the Graduate School spent ten days in New York and Boston. The president of the university (Ingegerd Palmér) and the secretary general of the Swedish Council for Planning and Coordination of Research (Arne Jernelöv) also participated. The program comprised
- individual visits at research departments
- a graduate student roundtable on women and engineering
- a state dinner with the management of MIT
- a faculty roundtable on gender and techno-science
- café seminars in Boston and New York with the president of the university

Graduate Student Roundtable
Ruth Perry opened the graduate student roundtable. After a short presentation of the project Graduate School for Women, the PhD students introduced four themes for discussion:
- What are the arguments used in Sweden and in USA for more equal numbers of women and men in techno-science?
- Our situation as women and post-graduate students at a technical faculty
- How to combine a family life and a research career
- Graduate School for Women – what does it mean for us?
The further discussion included topics like
- How to develop a research training program inspiring and functional also for women?
- What kinds of strategies are used for realizing the needed/desired changes? Compare Sweden and USA.
The discussion circled around questions of gender equity (only 14% of the researchers at MIT were women) and the difficulty at MIT to get an acceptance for the fact that women are just as good as men. The problem is complicated in USA, as explicit concern must be taken also to race and ethnic minorities. The issues raised by the students of the Graduate School were apparently highly relevant for the situation at MIT, and there is much work to be done before it is no longer a disadvantage to be a woman as a student or a researcher.

State dinner
The state dinner with the management of MIT was initiated by professor Evelyn Fox Keller. Its purpose was to discuss the questions mentioned above at the highest level of MIT. Questions concerning integration- and transformation processes in knowledge production within science and technology from gender perspective were also considered important. Among others, MIT's president

Charles Vest and provost Joel Moses participated. Despite the fact that several issues were raised, the discussion at the dinner came to deal almost exclusively with the project Graduate School for Women and what such a project could involve in a context like that at MIT (e.g., only 8% of the senior researchers are women). Although President Vest's statistics from the graduate education looked good, the purpose and activities of the Graduate School stood out as conscious strategies with a long lead over MIT.

Faculty Roundtable
The faculty roundtable focused on techno-science and gender research. Six short lectures were presented by Evelynn Hammonds, Lena Trojer, Sherry Turkle, Arne Jernelöv, Lynn Stein, and Ingegerd Palmér. Professor Evelyn Fox Keller chaired the seminar. Ingegerd Palmér made a thorough and strong analysis of the importance of self-reflection in knowledge producing organizations. Her analysis probably contributed to the following discussion being mainly about MIT internal problems: the difficult situation for gender research as well as for women in general at MIT. Feminism and how it is met at MIT, and other science-theoretical concepts important in gender research, e.g., relativism and post-structuralism, were also discussed.

Café seminars
During the trip, the Graduate School had two café seminars with Ingegerd Palmér. At the first one, the graduate roundtable was discussed and prepared. At the second, the experiences from MIT were summarized and future issues were discussed. It was decided to send a joint abstract to the Conference *Winds of Change: Women and the Culture of Universities* in Sydney, July 1998.

7.3.2 The trip to Sydney, Australia

The Women's forum of the University of Technology, Sydney (UTS) organized an international conference, *Winds of Change: Women and the Culture of Universities* in Sydney in July 1998. The conference was introduced as follows:

> "The Winds of Change conference will provide a forum to consider and compare the issues confronting women in higher education internationally; to explore the ways women are participating in higher education; the diversity of conceptual models used to analyze their participation; and the strategies from around the world that have produced real outcomes for women. The conference will be an opportunity to revitalize and re-energize our thinking and strategizing around a broad range of issues for women in universities. The focus of the conference will be on the re-thinking required to achieve real and lasting change for women."

The participation in this conference and this trip was outside the frame of the Graduate School, but a majority of the PhD students chose to take part. It felt meaningful to contribute with experiences from the project in this context. The PhD students of the Graduate School decided to apply for a specific workshop at the conference. The following abstract was submitted:

> *Comparative perspectives – Graduate School for Women at Technical Faculty*

> The workshop will open up for sharing experiences and discuss research education for women at technical faculties. The starting point for the workshop is a short presentation of a project called *Graduate School for Women at Technical Faculty*, which started at Luleå University of Technology in 1995. The aim of this project is

- to increase the number of female research supervisors, teachers, and leaders within the techno-science sector
- to support the recruitment of women to higher technical education and research
- to contribute to the ongoing process of developing a model for a research education that is well functioning and takes into account the preconditions and needs of each individual research student

Members of the Graduate School for Women at Technical Faculty will introduce the following four themes:

- Arguments for equal numbers: what are the arguments used in Sweden and elsewhere for more equal numbers of women and men in techno-science among research students?
- Our situation as women and graduate students at a technical faculty
- To balance life: how to combine a family life and a research career
- Graduate School for Women: what does it mean for us?

One Graduate School student described the workshop like this:

"At the last day of the conference, the Graduate School for Women presented their workshop. All workshops were held in small halls to create an environment where thoughts and ideas easily could be exchanged, and the atmosphere was less formal. We introduced new statistics from Sweden, where the number of female professors of technology for the first time exceeds 10%. The number of female students in Sweden increase, but we do have problems with the so-called 'pipeline effect', i.e., decreasing number of women at higher levels in the academic world.

We also described the purpose and goals of the Graduate School, and the individual participants shared their experiences of research and research training and how we come across our workplaces and its culture. The workshop closed with a discussion about the circumstances under which women in different countries live when it comes to research and family life. As six nationalities were represented at the workshop, we hope that our Graduate School can inspire women in many countries."

The conference gave insights in the situation for female researchers in Australia and a reference for the own work. We can assert that the situation in general is difficult for women in the academy and that the need for measures towards gender equity is more urgent in Australia than in Sweden.

7.4 Seminars

A need for seminars emerged in the Graduate School. The seminars were held as follow-ups to courses, as meeting with persons visiting the university or as meeting between the PhD students and their supervisors. Below follows a summary of these seminars.

September 1995
Seminar with Professor Evelyn Fox Keller, MIT, on the theme "Challenges for feminist research in the US towards the turn of the century".

April 1996
Language seminar. After requests and as an extension of the course "Communication in the process of research supervision" (see chapter 7.1.1), all PhD students and supervisors in the Graduate School were invited to a seminar that discussed some further aspects on the role of the language.

November 1996
Literature seminar. The students that followed the course "Project planning and project financing" (see chapter 7.1.2) from a distance organized a literature seminar about the course book "Goal oriented project management". In this pedagogical masterpiece all participants became involved in a project planning according to all the recognized rules as they were described in the book.

January 1997
Café seminar with AKKA – the students' women's club at LTU.

June 1997
Discussion seminar: The university's role in Sweden. The PhD students and the supervisors in the Graduate School and a few invited persons discussed the above theme.

November 1997
Lunch seminar with Bodil Jönsson, Department of Rehabilitation Engineering, Lund University.

January 1997
Discussion seminar: "A Graduate Round Table No. 2". The first Graduate Round Table was held at MIT (see chapter 7.3.1). The Graduate School now invited their supervisors and other persons interested in research education to a corresponding round table with the same main themes, at home. The purpose was to, starting from the work already done within the frame of the Graduate School, discuss the research education at LTU.

7.5 The mentorship program

During spring 1997, preparations started for the mentorship program planned for the last year of the Graduate School. As a preparation the participants tried to make themselves an image of what a mentorship could imply and to identify their personal wishes of the content of a mentorship program. Varying ideas, wishes, and geographical locations made this project diverse, rich in experiences and difficult to keep together as a homogeneous project, although the latter was not necessary or even desirable. Three meetings were held:

- A first impartial discussion from our own thoughts
- A discussion with Ingegerd Palmér (president of LTU)
- A discussion with Barbro Huldén (responsible for the course Personal development and leadership)

It was decided to document the experiences from the mentorship program in individual diaries. Each participant chose a mentor on her own. The time for establishing contact with the mentors-to-be depended on the participants' needs and wishes. During fall 1997, four PhD students established contacts with mentors. During spring 1998, the establishment of mentor contacts continued for eight of the PhD students. Some students chose to wait further with getting a mentor, while others had no needs for a mentor. Here follows some examples of what the mentor contacts looked like:

- Mentor: a female professor at Stockholm University. "It feels good to have somebody outside my everyday-life who is interested, has experiences and can give advice."
- Mentor: a female associate professor at the Swedish University of Agricultural Sciences. "She is a wonderful role model. We haven't met so often, it is hard to get enough time."

- Mentor: a man at the mining company LKAB, Kiruna. "It was very exciting and I think I have found a good mentor."
- Mentor: a female consultant in Dusseldorf. "The first meeting was very nice. I've found my new role model! She has worked as a manager with 400 employees, and I was very impressed by her experiences that she shared with me. My mentor is positive to a meeting with the other mentors and finds the mentorship program seems to be a good thing."
- Mentor: a male managing director at ASSI Domän (a large Swedish company in the forest industry). "Our first meeting was a great success! He is a PhD and a father with small children, which feels right for me at the moment. We had met before and it was no problem to ask him. It felt as if we were on the same level at once, we had similar ideas about what would come out of this."
- Mentor: female researcher at LTU. "It has been very rewarding since she is a role model with a PhD and two children, and has also made a career. She also know what it is like to be a PhD student at the university."
- Mentor: a man who has had high positions in banking. "We have met once, spoken on the telephone a couple of times, and communicated by letter every now and then. He has read through and commented on, i.a., drafts to my licentiate thesis."

A working group for the mentorship program was formed within the Graduate School. In January 1999, they organized a mentor seminar at the university. The PhD students of the Graduate School, their mentors, and other interested persons at the university were invited. Issues that were discussed included:
- Mentorship from the student's view
- Mentorship from the mentor's view
- What happens afterwards? Do we continue?
- Is there a need for a mentor although you have come rather far in your career?

7.6 Building the network

The single activity that probably developed the network between the participants in the Graduate School the most was the development project led by Barbro Huldén. In addition the group started visiting each other's departments during 1996, in order to see how their research was conducted and to get a more thorough introduction to each other's research projects. This professional exchange proved to be an important part of the network. This was also an interesting, if not entirely clear, interdisciplinary development process. During 1996, visits were made at the Divisions of Experimental Mechanics, Geographic Information Technology, and Steel Structures. The visits continued during 1997 at the Divisions of Industrial Work Environment, Management Control, Materials Processing, Engineering Materials, and Applied Geology, and at the Department of Mathematics. Thereafter, the network developed in various ways. Spontaneous and private initiatives started to dominate.

8. Focusing the supervisors

Supervision at the Graduate School can be placed at several levels. It has been central to the entire project – to test in practice, reflect upon, develop, and build competence for. Supervision is a complex issue of the relationship between the PhD student and the supervisor. This chapter deals

mainly with the student's perspectives. Several of the PhD students of the Graduate School expressed experiences of a well functioning supervision. However, too many of the students experienced a supervision that is deficient. These unsatisfactory situations gave painful, but valuable experiences leading to analysis and reflection and in turn a wider and deeper understanding of research supervision. By reflecting upon these problematic experiences, a lot of knowledge has been acquired, and, paradoxically, motivations for research supervision work of their own.

8.1 The supervisors of the Graduate School for Women

As mentioned earlier, it was clear from the beginning that recruitment to the Graduate School would include supervisors. A number of criteria for supervisors were set up, which resulted in interesting discussions about the meaning of research supervision rather than a trying quality control (see chapter 5.1). In the pilot study preceding the Graduate School, a number of supervisors were interviewed. The pilot study brought up the following aspects.

The relationship between the PhD student and the supervisor, from the supervisor's point of view, led to certain reflections over their own role as a supervisor. The student should, for example, become more proficient than her supervisor in her specific project. This expectation was based on the hope for a development of new knowledge starting from the student's work, in which the supervisor would have a share. Other expectations regarding the supervisor's own contribution were to develop both the ability to pass on knowledge and social competences.

"Having PhD students is like having kids" was another view of the relationship between the PhD student and the supervisor.

> "Being a student's supervisor doesn't mean that you have to be friends all the time. Sometimes things go wrong. There's nothing strange about that. We are not spared from conflicts. It is a natural part and we have to be prepared for it. It's like with your own children – 'now, damn it, it's got to stop'. I believe one has to talk about it, nobody expects us to be friends the whole time. What we need is a mental preparedness, an ability to deal with conflicts, and straightforwardness."

Male supervisor in the pilot study

Clarifying the expectations of the supervisor's function means clarifying the framework within which you want to act. One supervisor indicated it was important to clarify with the student what he did and did not allow in the beginning of the research training program – e.g. the work hours are free and the responsibility lies with the PhD student. This framework also includes the work plan, time and form for supervision, and following-up.

Regarding the supervisory function for research studies already in progress, three items arose. One supervisor stressed the ability of the student to take initiative. The ideal situation for a supervisor was an active, productive PhD student, who took initiatives both in his/her own research work and in asking the supervisor for help. The question of how the PhD student develops these ideals remains to be answered.

The second point was the need for the supervisor's functions to be wider. There is often a shortage of qualified supervisors at research divisions.

The third point concerned how the PhD student's research is viewed. Here, the interviewed supervisors had differing opinions. One idea suggested the student should adapt to tight scientific (theoretical and methodological) norms. This idea does not only seem to apply in techno-science, and is confirmed by the following quotation from a study[7] dealing with research training programs in general:

> "Another important area is the learning of certain scientific or disciplinary rituals. The rituals have methodological norm- or value aspects. Supervisors try to supply these scientific norms and teach what is good and accepted science at a certain historical point of time. The PhD student reacts against this straitjacket of rules and norms, but gradually finds herself easily wearing it without feeling deprived of her freedom. This process can be seen as a very imperceptible form of indoctrination."

A completely different view of the PhD student's research was the one quoted above, that can be expressed as a demand upon the student to become better than her supervisor within her field of science. This doesn't happen by an uncritical adaptation.

From the standpoint of the staff of the Personnel Development Office at LTU, the issue of supervision was central to the Graduate School project. They saw this project as a way to also develop the competence of the participating supervisors. How this competence should be developed was unclear beforehand. The question is what processes are needed to get a desired level of development that becomes more than only lip service, and attains sustainable results to the advantage of the PhD students and their research training programs. This assignment was placed in a context characterized by prestige, competition, academic traditions, trying working conditions (concerning time as well as economical resources), and relationships almost exclusively between men[8]. The situation involved a complex and difficult challenge. From the project director's point of view, this was not an obvious task because the time required was thought to exceed the available time within the frame of the project. The matter was discussed at several meetings with the project group, whose members were of various opinions. Suggestions for how a professional development of the supervisors should be done included, for example, personal development with experts such as Barbro Huldén, participation in the courses and seminars of interest offered to the Graduate School, and the creation of meeting points for discussion and reflection.

Thirteen completely different men were chosen as supervisors to the Graduate School. Experiences from three years of the project reveal the impossibility to make any general statements regarding the supervisors' contributions. The variation among the supervisors was large considering their:
- Commitment in the Graduate School
- Commitments in their PhD students' education and research
- Willingness to set aside time for activities in the Graduate School
- Willingness to set aside time to supervise their PhD students
- Willingness and ability to resolve conflicts and problems always emerging in the PhD student – supervisor relationship
- Ability to consider the whole life situation of their PhD students and act accordingly
- Capability to take the responsibility for the economical support and the careers of their PhD students

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[7] Jensen, Nilsson, Maini and Lundahl (1991)

[8] As a result of the uneven distribution of male and female professors and associate professors, all supervisors of the Graduate School were men, see chapter 5.2.

These items reflect quality aspects of a supervisor's work, which are not only associated with scientific competence. The wide range of qualifications among the supervisors created a basis for exchanging experiences between the PhD students. It also provided opportunities to identify several necessary competencies of a qualified supervisor. As always, it is the problematic situations that require more time and effort for discussion and reflection than the well working situations. Structural factors are also important, i.e. a situation cannot be understood merely from the individual characteristics of the supervisors.

In general, the supervisors have shown a low activity both at the courses and seminars offered at the Graduate School and in taking the initiative (though there are exceptions). Various requests from the project director and the PhD students concerning the supervisors' participation did not give satisfactory results. Threats were not used. One aspect of tradition-loaded and hierarchic systems is that some issues are given priority at the expense of others. In a hierarchical organization, it is relatively easy to place oneself in order not to have one's plans disrupted.

Considering these experiences, the first course of the Graduate School, *Communication in the Process of Research Supervision*, should have been compulsory for the supervisors as well as for the students (with threats of economic sanctions). The supervisors' presence would have been valuable in two more courses: *Theory of Science* and *Leadership in Research Organizations*. Their relatively frequent participation in two seminars was particularly important: "The role of the university in Sweden" and "A graduate round table no. 2". At the latter, the students explicitly presented their experiences of the situation as PhD students. For some supervisors, these seminars presented a completely new insight into the PhD students' everyday life. This way of transferring experiences with the opportunity of a discussion is valuable, and can be further developed both in terms of form and content.

It cannot be excluded that the formal position of the project at the Division of Gender and Technology brought about notions among the supervisors that restrained them from taking their own initiatives and decreased their commitment.

Regarding the supervision of the individual PhD students, the situation was not much different from the picture presented in the pilot study[9]. Some supervisors functioned satisfyingly, but much remained to be done before the conditions for most students were acceptable and on a level with their needs and wishes. This is a matter of quality that can be developed into a competitive advantage for a university such as LTU. It was not always entirely clear who was the real supervisor. Research colleagues, representatives from the industry, and younger PhDs, who subject-wise were close to the PhD student, rather often represented the functional supervisors. In some case, the mentor turned into being the supervisor.

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[9] From the PhD student's perspective (students questioned in the pilot study, who did not get to participate in the Graduate School), the opinion of the supervision they got varied between:
- Non-existing, the supervisor hardly present, must help oneself
- Supervisor is benevolent, but has no time
- PhD student given low priority to
- PhD student feeling powerless, talks to colleagues instead
- Two supervisors, of which one is good, but too kind, and the other less good, but responsible for the project finances
- Supervisor is committed, questions the student and keeps her on the right course
- Good supervisor with an ability to adapt after the situation
- Supervisor is very competent, actively committed, honest, can take criticism, lets the student grow

The answers to the questionnaire were distributed as follows: of 49 answering PhD students, 13 got a relatively good supervision, 19 (including 3 students who quit their studies) got a bad supervision or none at all, 16 got a not entirely satisfactory supervision. One students did not answer the questions related to supervision.

At the beginning of the project, the supervisors were encouraged to express their views of supervision in writing. Some, but not all, responded to this request.

One recommendation is to make it compulsory for the supervisors to write down and clarify what supervision means to her/him. Thereafter, the supervisor and the PhD student should, together with a third party, discuss this paper. The purpose of a third party is to make it easier for the student to ask questions of all kinds. By making the notion of supervision as clear as possible, increases the likelihood of the supervision to become successful and the expectations to become more realistic.

The Graduate School for Women has not explicitly worked with the group of supervisors in raising their qualifications, though some consequences of the activities within the Graduate School may have contributed to a certain development among the supervisors[10]. The Graduate School concentrated on developing qualifications for supervision and leadership among the female PhD students.

8.2 Supervision qualifications among the PhD students

The PhD students in the Graduate School underwent a double project concerning the motivation and development of supervisory qualifications. They experienced the regular supervisory processes of a PhD student, and built up their own broad supervision qualifications through the courses and development projects of the Graduate School and the experiences of their supervisors' guidance.

Reflections of their own thoughts regarding the supervisory process must not be underestimated when considering the build-up of qualifications, especially not when it coincides with a supervisory education. In the Graduate School, the development project with Barbro Huldén involved thorough reflections. The own network, including discussions with the project director, has also functioned as an arena for reflections.

The supervisory problems dealt with have been linked to PhD students quitting their research training programs[11], the supervisor's demands for teaching that leaves less time for research[12], formal questions concerning their employment, time for supervision and the presence of the supervisor at the workplace, different views on what supervision is, children[13], and the personal prerequisites and needs for the research work.

The components of supervision qualification brought up in the activities of the Graduate School can be summarized as follows:

- Personal development
- General studies of research supervision
- Project planning
- Research financing
- Studies of the academic system
- Reflection of knowledge
- Pedagogy

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[10] See chapter 11.4.
[11] See chapter 9.2.
[12] See chapter 9.1.
[13] See chapter 10.1.

- Leadership

The double project for supervisory qualifications of the PhD students involved a mix of problems and possibilities. Some PhD students had their focus on the problems, while others focused on the possibilities. However, they all had the opportunity to take part of the possibilities that were offered in the courses. Some of the PhD students already, towards the end of the project, expressed an interest to take on their own PhD students to supervise.

9. Graduating or quitting?

9.1 Graduating

The first licentiate degree among the Graduate School PhD students was awarded in October 1996. This PhD student had been admitted as a research student approximately one year before the start of the Graduate School. Four PhD students completed their licentiate degrees in 1997, one student graduated in 1998, and two students did their licentiate degrees during the spring 1999. In all, 8 students in the Graduate School became licentiates (7 within the technical faculty and 1 within the philosophical faculty) within the project time. Two students chose not to take the licentiate degree, but to proceed directly to a doctoral degree. At the end of the spring semester 1999, four students were close to obtaining their doctoral degrees. Among all PhD students admitted to LTU during the autumn 1995, 46% had taken their licentiate degrees as of May 1999, compared with 54% of the active Graduate School students[1].

The prerequisites for graduating varied between the Graduate School students.
- A well functioning supervision was vital for a relatively early graduation. However, there were also examples of students who took their degrees without satisfactory supervision.
- Childbearing and maternity leaves were not as important for graduating as we might have expected. Several students chose to have children soon after their licentiate degrees. There were, however, also examples of the opposite. No difference in time for graduation can be discerned for those with or without children.
- The amount of teaching required from the student had a more direct impact on the time of graduation. If the supervisor demanded that the student should teach more than the usual 20% of full time, there were serious consequences with impact on the possibility to perform research and thus obtain a degree.

The group pressure created in a tight group such as the Graduate School was more likely a driving force for graduating. For some, it was a positive incentive, though for others, it was a negative stress factor. The comparison with the others in the group was always there, but one had to decide what attitude to take when facing the others in the group.

9.2 Quitting before graduation

Of the fifteen PhD students who were admitted to the Graduate School, fourteen completed the three-year project. Three of the students discontinued their research studies before taking their licentiate

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[1] Statistics from the year 2001 show 9 doctoral degrees (60%), 3 licentiate degrees (20%); 3 left the post graduate studies for employment in industry (20%).

degrees. The reasons why these students quitted were related to supervisory problems, though the specific problems were different. All three students are now employed by companies.

The issue about continuing or discontinuing the research studies has been widely discussed in the Graduate School. In the general discussion within a technical faculty, it is often pointed out that it does not have to be a disadvantage for a PhD student to quit after taking his/her licentiate degree. The student might get a well-paying job. A doctoral degree does not necessarily lead to a higher salary, but rather might sometimes lead to difficulties in getting employment, which women especially may experience[14]. Despite this, none of the PhD students in the Graduate School have quitted after the licentiate degree, but have continued on to a doctoral degree.

Other matters influenced the motivation for continuing the research studies. The following reasons for quitting were considered by female PhD students (not belonging to the Graduate School) in the pilot study:

- Concerns about the labor-market, future job prospects
- Bad salary as a PhD student
- Bad supervision, loneliness, lacked confidence in the supervisor
- Conflict with the supervisor
- Having children, thereby leading to a difficult work situation
- Did not feel part of a context
- The research was regarded as meaningless
- Bad self-confidence, performance anxiety

In her investigation, Ulla Rilby (1992) confirms the reasons for quitting given in the pilot study. The main reason for quitting after the licentiate degree was, for women, that the research problem was regarded as meaningless, and for men that the supervision was unsatisfactory. The suggestions for change differed considerably between the male and female PhD students in this investigation. The women indicated that the conditions around the research work, e.g. concerning the family situation, must improve. The male students, rather, emphasized a better connection with the industry, a better follow-up, and a general tightening up.

The fact that students discontinued their research studies, and thereby also their participation in the informal network, caused frustration within the Graduate School. Much time was spent on discussing what had happened, especially after the second student had quit. That case was also preceded by discussions and actions both by the departmental and the university management, in order to resolve the problems. The matter was also brought up together with Barbro Huldén[15], which strengthened the student to take responsibility for her own action. The decision was thoroughly analyzed and became a personal victory rather than a failure, which she also managed to convey to the other PhD students.

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[14] See Trojer and Gulbrandsen (1996), p. 49-51.
[15] See chapter 7.2.

10. The whole life

10.1 The children and the family

One of the ruling norms in the Graduate School was the possibility to combine professional life, family life, and other interests. As a PhD student, it should be possible to have a whole life. That does not go without saying within the academic world, or for a woman within a technical faculty where the tradition holds completely different norms. In chapter 5.3, we get a clear illustration of the still prevailing old viewpoints. Some older, female colleagues of the PhD students in the Graduate School had the opinion that, in the Graduate School, you were protected from the criticism of professors and managers who look upon childbirth as a disadvantage. They were anxious the Graduate School would get prejudice to flare up again. The reason for their concern was the long, hard struggle they had had to fight at their departments to gain an acceptance to combine research with children and a family.

The majority of the students in the Graduate School were at an age and in a family situation where research studies and childbirth coincide. There were examples of supervisors who acted against the traditional norm by actively supporting his PhD student and were genuinely pleased for her and her children. One supervisor often asked his student if she did not have to go home when she was working late, and if she could leave the child to participate in various activities. The same supervisor did not question the student if she was not present at the university all day long. He could phone her at home to discuss different matters instead of meeting at school. This PhD student kept notes of her working hours, since she often worked outside of normal office hours. This flexibility would not have been possible at her previous job in the industry, where she first had to be on full maternity leave and then only work full-time, regular office hours.

The traditional norm saying children and research do not mix was obviously represented among supervisors and other departmental staff. One head of department thought that PhD students should not have children until they had achieved their doctoral degrees. It was nice when others had children, as long as it was not one of your own PhD students. One student's professor simply stated, in the beginning of her studies, that he considered it inappropriate to have children while being a PhD student.

There has been some uncertainty about the supervisors' actual acceptance, especially when the student was well aware of her responsibility for time schedules of ongoing research projects or for the planning of teaching to undergraduate students. Concerning maternity leave during research training, it should be pointed out that parental leave, fixed by law, should not be taken for granted by a PhD student in Sweden. The departments must guarantee that responsibility will be taken for any prolongation after the 5th year as a PhD student, caused by parental leave and possible part-time work. This raises some demands for adaptations and adjustments in the university system.

The fact clearly expressed in the Graduate School that childbirth should not be a disadvantage, but rather the opposite, and a source of leadership qualifications, had its consequences in practice:

Amanda Axel Julia Freja Albin Gabriel Joel Karl

During the three years of the project, the families (and the Graduate School) were endowed with eight small children.

This wonderful number of children attracted some attention. The delight has sometimes hidden the student's identity as being a researcher, which at special occasions was a trying experience. This is

again a sign of us embracing the idea of either/or – either a serious researcher or a mother (father). A complete life requires that we accept both. *The results from the Graduate School show this is possible and highly desirable.*

There was a special situation showing how this "dual" life could look like. As the Graduate School visited MIT, Axel and Julia were too small to be left home with their fathers. Consequently, they and their fathers joined the trip to Cambridge. At the café seminar just outside Harvard the PhD students were involved in intense discussions with the project director and the president of LTU. Preparations were made for the workshop with PhD students, professors, and faculty members of MIT. At the next table, Axel and Julia sat, lay, and crawled around safely as their fathers, who order beer and something to eat, were watching them.

These two fathers were also PhD students. The "dual" life would not have been possible without the cooperation of the children's fathers. It is also required that they take a part of the parental leave when the children are small (during the first year); several fathers of Graduate School children stayed at home for a few months. Without this gender equity in practice at home or in the family life, it would apparently be impossible to reach gender equity in the work life or research. Logically, having a family should be as noticeable to young men as it is to young women. If men were on parental leave to the same extent as women, there would probably not be such a great fuss about young female PhD students who are on maternal leave.

Two other children, Albin and Freja, followed on the trip to Sydney. This created an obvious cultural clash at the technical university where the conference was held. Albin and Freja received much attention and were mentioned in the concluding talk and Albin and his mother were even photographed for the conference newsletter.

One PhD student, who had earlier worked in the industry, found the environment at the university good when it comes to having children. She thought that it did not feel strange to be on maternal leave because they were several in the same situation. Further, it was nothing strange to occasionally bring the child with her to the university, which did not seem to disturb her colleagues. Supervisors and colleagues were positive towards these situations. The child was even present when the mother functioned as supervisor for undergraduate projects (though not when teaching full classes). Sometimes the PhD student left the child briefly with the division secretary, sometimes with a senior researcher, and sometimes with a Graduate School colleague.

Another opinion was that a maternity leave afforded time to reflect upon work, which in turn made the PhD students eager to continue their research.

The Graduate School showed examples of the importance of giving interests other than research a place in life. Even temporary study intermissions, with longer visits abroad to recover and reflect, had not only positive results on the motivation to do research, but also on the energy needed to keep up the pace for long term research.

For those in the Graduate School who did not have children, the difference between children and family is important. They too need a chance to create a fulfilling life. Some of these felt it more difficult to gain acceptance to spend time on things other than research, something that was hardly discussed. The general view within the academy seems to be that "then you have all your time for research". There was an understanding within the Graduate School for the importance of other interests than research in life. If you have a boyfriend or husband, it is important to have the time to nurture the relationship. Otherwise, it can easily become blocked with long workdays, work trips, etc.

Other family members, e.g. sisters, brothers, parents and relatives, are also important for a well-balanced life. Sometimes it seems to be more accepted to spend time with them than with the little nucleus family.

10.2 Staying abroad

During the project time of the Graduate School, five PhD students were guest researchers for stays, both short and long, in France, the USA, Canada, and Australia. One student visited both the USA and Australia. Shortly after the Graduate School had ended, two more students went abroad – to India and England.

Being abroad as a guest researcher at a foreign university is quite important because it provides many new experiences. Coming to a new environment can be both strengthening and demanding. It can be hard to enter a new culture with new values and customs. At the same time, it is fun and inspiring to see how others work – to get new ideas as well as to realize "how good it is at home", to see the many things making it easier to appreciate the situation in Luleå that you otherwise seldom consider. Other positive experiences for the PhD students who went abroad were the training in a foreign language, to meet people from many different cultures, and to have the opportunity to receive more constructive and external opinions on their research than would have been possible at home or at a conference.

10.3 The research work

One PhD student described her situation as using practically all her work time for research with only minor demands of teaching. Because the research was related to industry, the relationship between research and development work was under discussion. The student had to guard her work time from being monopolized by too much development work. Without support from the supervisor, it is a tough work situation. A large interest from both the industry and authorities for her research results and for the popular presentation of the same became a consequence of the particular research situation. This in turn created a conflict because popular forms of presentation are neither merits for writing a thesis nor for getting faculty grants, and the student's time was limited. Her experiences are an example of the problems inherent in the "third task"[16], creating in this case a strengthening of her self-confidence as a researcher, but which did not fit into the academic career system.

Two things mentioned by the students concerning research were the importance of having continuous periods of research and the importance of being part of a team. A prerequisite for a functioning research training program appears to be periods of time when research can be performed without the interruption of too much teaching. Teaching was experienced as a hindrance, which not necessarily implied that the PhD students considered it less important than research. The other wish – to co-operate in projects with other colleagues – implies that the traditional image of the lonely scientist is not an appealing norm for the female PhD students of the Graduate School.

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[16] See 7.1.3.

10.4 Teaching

The pilot study clearly showed that female PhD students valued teaching and put great effort into this task. The participants of the Graduate School confirmed this notion. Some supervisors, though not all, took a responsibility for their PhD students by making sure that there was a balance between teaching and research. Teaching may also have a positive influence on the research. Some of the students said they enjoyed teaching. Teaching made them reflect on their research and their role as a supervisor for undergraduate theses. At the same time, several students considered teaching as arduous and time-consuming work.

11. Movements within the university caused by the Graduate School for Women

This chapter presents direct statements of representatives from different parts of the university.

11.1 The Personnel Development Office

The Graduate School for Women is regarded as a valuable and constructive contribution, strategically concrete and down-to-earth, to the gender equity work of the Personnel Development Office. It is also a long-term contribution in the strife for more gender equal leadership and organization.

The Graduate School contributes by focusing on research training programs and, in particular, the supervisory process at the university. It has become possible and permitted, not to say desirable, to educate and train supervisors in supervising/leadership. In the long run, this leads to increased demands on quality and quality assessment in the supervisory process. Hopefully, this approach can influence future selection processes regarding the recruitment of senior lecturers and professors.

The Graduate School for Women, which can be viewed as a step in the university's long-term supply of leaders, contributes by focusing towards management and leadership in general at the university, and in particular female leaders.

There has been an increased interest in the system in leader development and gender equity issues. If we see the Graduate School as a gender equity project, it will have implications for the entire system. After their PhD degree, the next step in supporting women towards a senior lectureship or a professorship is to investigate what hinders and what supports women in proceeding. Based on the results of that investigation, a concrete plan of action can be written. Perhaps on the long run a "Professor School for Women" can be formed at LTU, where networks are built, financial possibilities offered, as well as possibilities to continue qualifying with an active support from management, the organization, and mentors. One vision of a future LTU is where female teachers and researchers do not have to navigate through a system based on conditions for men, but are given the possibility to proceed with the support of the system. It is about time to break the "male pattern" represented by many of our own male professors, where many women find the price too high. Rather than changing women until they fit, we shall change the system and the prerequisites. Men, too, would benefit from this change. It must be possible for a female or a male researcher or a teacher with a career, to have a family, children and a good life. If there is going to be a change within, for example, 10 to 15 years, it is time to start soon.

11.2 Other supervisors

There have been comments from supervisors other than those involved in the project, stating that the activities of the Graduate School should have been available to all PhD students. For example, courses in leadership and pedagogy are valuable. The Graduate School has been an eye-opener in these issues.

11.3 The PhD students of the Graduate School for Women

- The PhD students noted that legitimacy had been created for courses other than the subject-specific, e.g. courses in leadership and personal development.
- Those PhD students who had been members of the faculty board experienced the supervision issue being thoroughly discussed. The Graduate School for Women has pressed the faculty board to work with supervisory competency questions.
- The Graduate School has gained attention to women's situation within research training programs. The situation has changed somewhat. This question is now legitimate.
- The project has made the question of power and responsibility clearer inside some of the departments.
- External attention from, e.g. The Labour Market Board has made the Graduate School participate in the third task.
- New female PhD students seek the participation of the Graduate School, which then functions as a forum for the transfer of knowledge and experiences of research studies.

11.4 The supervisors of the Graduate School for Women

The Graduate School has influenced processes of change concerning

1. Gender equity
2. Quality development within the research training programs
3. Recruitment of teachers and researchers
4. Organization and economic management

Gender equity
- The Graduate School has created an increased awareness of the importance of the gender equity issues and conditions for female PhD students, researchers, and teachers.
- The Graduate School has supported an increased awareness of the strategy to achieve a more equal distribution of men and women at all levels is to educate more female PhD students, and to make an effort to have a large part of these women continue their academic career. The idea of another Graduate School for Women, to carry on the work with creating female role models, has become accepted.
- Significantly more supervisors now than before consider it important to have an equal distribution of women and men among the PhD students.

Quality development within the research training programs
- The Graduate School for Women has clarified the supervisor's responsibility and the extent of this responsibility. Further, the question of "is there any difference between female and male PhD students?" creates a healthy debate where the image of the ideal PhD student becomes more heterogeneous. This type of debate is useful for several supervisors within the

technical area where a common belief is that a student resembles his supervisor like a father resembles his father.

- One important aspect is the discussions and ideas regarding the many ways of approaching the role as a researcher that have taken place. Furthermore, female PhD students get an apparently popular alternative research training program.
- Supervisors and others outside of the Graduate School have received positive ideas to better supervise male as well as female PhD students.
- "Following the Graduate School has increased my awareness of the role as a supervisor. Previously, I have merely organized good projects, got them financed, and ran them. It usually works, but I think I have become a better supervisor by thinking more about my own practice (if time admits, which it too seldom does)."
- More "soft" (non-technical) courses of the type that are given within the Graduate School are more likely offered to all PhD students.
- "The supervision of my other PhD students is influenced by the experiences I have got from the Graduate School. I now allow more individual variation in, for example, the choice of courses than I did before."
- "In every discussion about research education that I have participated in during the last few years, the Graduate School has been brought up. There is no doubt it has influenced the debate by, for example, making the supervisors clarify their standpoints and opinions."
- The Graduate School has given an opportunity to offer courses, which may not be needed in order to write the actual thesis, but to become a good researcher. Here, there is a need for a deeper discussion, though this need has been noticed in the work of the faculty.
- The Graduate School for Women has successfully shown and implemented a method for improving the possibilities to perform research (and, hopefully, quality) for all PhD students.

Recruitment of teachers and researchers
- More people (e.g. supervisors) have become aware of the importance of faster changes within the university in a positive direction by encouraging skillful women to enter research training programs and take on important tasks within research and teaching.
- Through the Graduate School for Women, PhD students have had access to mentors, which is an advantage for the student as well as for the division.

Organization and economic management
- The Graduate School for Women has involved extra financial support of research training programs at LTU, e.g. generous scholarships for researching abroad, where the Graduate School may have been a competitive advantage for the applicant.
- "Nowadays, I realize, clearer than before, the value of an extensive network between PhD students (and others) outside of our own research subject."
- The Graduate School for Women has had an important and positive PR value towards the surrounding world.
- "My PhD student has gotten an insight into how other female PhD students work and how they are supervised. Thereby, we have been able to discuss our cooperation in a more comprehensive way than we could have otherwise done. My PhD student has become a discussion partner and has participated in decisions about courses and research to a higher degree than other (male) PhD students."
- The Graduate School for Women has served as a model for the graduate school of the Small Business Academy and influenced the graduate school of the MISTRA project Urban Water.

There are viewpoints about having the type of previously mentioned effects increased, if the Graduate School had the financial possibilities to run the project until the PhD students had finished their doctoral degrees.

11.5 The departments

What is cause and effect in the movements followed at department level might be impossible to find out. The Graduate School for Women has probably pushed for change and development of some aspects.

- At least two departments have introduced a new standard with two supervisors – one main supervisor and one assistant supervisor.
- The introduction of new PhD students has been improved.
- The quality and diversity of the PhD courses has been paid attention to.
- The goal that all PhD students receive international experience has been noticed.
- The question of how creative interdisciplinary environments are created has been discussed.

11.6 The Faculty Board

- The faculty board's selection of PhD courses and some of the courses of the Graduate School for Women (e.g. Communication in the process of research supervision) have been discussed.
- There has been an increased understanding of the importance of networks and contacts between PhD students from different departments. Some parts of the action plan for the research training programs show traces of ideas from the Graduate School, especially concerning activities for creating networks between PhD students. Several voices also speak for a widening content of PhD courses.
- The Graduate School has inspired to new ways of working with the development of supervisory qualifications.
- In the development of research training programs and supervisors conducted by the faculty board and the departments, the experiences from the Graduate School are considered.
- The dean, who participated in the project, finds that the Graduate School has positively affected the research training programs as such. He himself has become more aware of the necessity in building groups and in actively working with attitudes. He believes the Graduate School has played a considerable role in the understanding of the interplay between PhD students and between PhD students and supervisors. Furthermore, it has given examples of how much fun you can have together and how developing and stimulating this can be.
- LTU has, through the Graduate School, improved the self-confidence of female PhD students. This can in turn lead to a positive "word of mouth method" between women. However, the effect between the involved supervisors and at least the spreading effect does appear to be moderate.

The technical and philosophical faculty boards at LTU established a plan of action for an improved research education in April 1999. In the plan of action for the technical faculty, qualifications for both PhD students and supervisors are scrutinized. This was also done in the program of the Graduate School[17]. Concerning PhD students, an example is a new faculty board course on organization and leadership. Within the supervisor training, a course on, among other things, leadership, supervision,

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[17] Compare with the project group's suggestions for the future, chapter 6.6.

and research financing, will be given. The faculty board wishes to make this course compulsory for those applying for a senior lectureship[18] and for promotion to professor.

11.7 The management of the university

- The Graduate School for Women has, above all, influenced the processes towards increased gender equity.
- The Graduate School for Women is an explicit and active effort to change women's conditions within the academic system. It affords more room for women to develop their own activities than do traditional gender equity efforts, often aimed at adapting women to the male norm systems.
- Clearly, a project such as the Graduate School affects and accelerates the changing process within research education in general, its contents and its forms, and especially supervision.
- It is encouraging to notice that the support given to the first Graduate School for Women by the faculty board still exists and will continue for another graduate school for women. Thus, there has not been any "backlash", and there are no thoughts like "now we have done enough for women". The understanding for long-lasting efforts has increased.

12. From a woman question in science to a question of research processes

As already mentioned in chapter 3.1, the purpose of the Graduate School for Women was to increase the number of female research supervisors, teachers, and leaders within the technical sector, and to promote the recruitment of women to technical education and research. The demands in the government bill on research (1996/97:5) made the motives for this explicit gender equity project even stronger. After a number of concrete proposals, it is stated that *"the government's gender equity policy within higher education and research involves measures… with the aim of achieving a more equal distribution between men and women among research students, teachers, and researchers…"*[19]. *"However, it is essential that all seats of learning intensify their local gender equity work at this very moment in order to guarantee that future recruitment goals will be achieved"*[20]. The question constantly present is how to achieve gender equity.

Genevieve Lloyds writes *"What is useful for diagnosing a problem is not necessarily a usable reaction of its consequences"*[21]. In our case, the overall problem diagnosis is too few female leaders (researchers) within the technical faculty. One usable reaction is to not let oneself be hypnotized by the number of women and by women as such. The activities of the Graduate School for Women did not include courses especially related to women and women's experiences. The main thread throughout the Graduate School was to develop other reactions, within the broadened understandings of research processes, in order to create change for the benefit of the gender equity goal.

A number of problems were identified at the beginning of the project. Interesting questions are whether any displacements in these identified problems have occurred and if so, what does it imply.

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[18] docent
[19] from "Forskning och samhälle" (Research and society), Government bill 1996/97:5, p. 53.
[20] ibid. p. 57.
[21] from Lloyd (1995), p. 11.

The answer to the first question is both yes and no. We must look closer at whose identified problems we consider and how they have possibly changed from what is written in chapters 2, 6, and 11.

We can clearly see displaced identifications for
    - The project group – an increasingly sharper focus on the supervisory issue as the project continued
    - The supervisors – from having identified most problems as deficiencies of the PhD students, their attention turned towards themselves (for some supervisors), either as self-reflection or as an increased attention to research education and supervision in general
    - The faculty board – a displacement towards the importance of networks
    - The PhD students[22] – displacements towards 1) power and responsibilities at their departments, 2) the need of a forum for the exchange of knowledge and experiences

Identified problems that have remained unchanged or have been strengthened compared with the ones made before and in the beginning of the Graduate School project are observed for
- The management of the Personnel Development Office – supervisory qualities and working conditions for (female) PhD students, and female role models
- The project director – self reflection and a complex understanding of contexts
- The supervisors – gender equity (some of those who had not considered gender equity very much have probably opened their eyes a little more)
- The faculty board – research training programs and gender equity
- The PhD students – research processes, supervisory issues, the working situation (i.e. research and family/other interests)

The displaced and increasingly complex identified problems – perhaps the strengthened ones too – contributed to make the work more difficult, and more interesting. The process may be described by the following quotation: *"with the loss of simple answers, the questions, too, have become infinitely more difficult"[23]*. This diagnostic means that the work becomes challenging not only for the system, but also for the participants of the activities.

If we return briefly to the woman question, two items should be paid attention to. Firstly, in our Nordic context, it is generally accepted to link "social competence", "ability to cooperate", "caring rationality", and so on, to women's ways of working and acting, both privately and professionally. This reasoning leads to quality arguments out of "female values" easily being used in the argumentation for an equal distribution of the sexes within, e.g., the technical sector. At several locations in this report and in the pilot study, a warning has been issued against the inherent expectation in the argument that the presence of a "critical mass" of women would automatically lead to more creative research environments and better research. These expectations are based on naïve, simplified conceptions of research and knowledge processes. The principal challenge in future gender equity work lies in working out more complex and integrated understandings of these processes. Hopefully, it will become impossible to base the argumentation upon short circuits between a critical mass of female "gender experience" and better quality of the research. With quality arguments of the kind indicated above, the room for transformative work, which is so important to keep open, will close.

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[22] The PhD students' answers in chapter 2 were given after the Graduate School had ended. We cannot use these as a starting point. However, after following them throughout the project, some conclusions can be drawn.
[23] Brink (1991)

The second warning deals with the tendency to externalize problems – on the one hand to the participants in and defenders of the established systems, and on the other hand to the "newcomers" who knock on the door. To point out others and criticize them does not create any major potential for change. Conversely, to clarify problems and test different, more basic, strategies beyond a directly reactive action may lead to more effective potentials for fulfilling the goals.

The main conclusion is that the Graduate School for Women has turned the woman question in science into *issues of research processes*, and thus created starting points for the development of gender equity strategies.

The Graduate School for Women represents one step on the road to resolve more complex and integrated understandings of knowledge processes, suggesting this report to have significance for other identified requirements in the modern research complex in need of change. We can see what large demands for change this complex is facing, as described in, for example, *The New Production of Knowledge*[24], which calls for corresponding efforts.

The Graduate School for Women was a *gender equity project*. It was necessary to set up a border to respect throughout the project time between the work for gender equity and the work of gender research. There are tendencies to mix-up the two projects described in the introduction of the pilot study. In the case where gender research in social science has gender equity as its goal, it can provide a base of knowledge for gender equity development[25]. Research with this knowledge basis is in line with a number of other disciplines, such as research of working life.

It also happens that arguments go the other way around – where more women within research will lead to more gender research, often considered as a qualitatively better research. We then get back to the previously mentioned quality argument, which underestimates the work and diversity of goals and processes needed for the attempts of transformation.

It should be emphasized that we, throughout the project, did not touch upon what is called the science question. Here, further boundaries must be kept apparent. Gender equity work is not a research-transforming project. Gender research is, on the other hand, to an ever-increasing extent, a research-transforming project. In international gender research, it has been a long time since the belief "adding women to the mix and stir" was acknowledged as leading to the desired change. Gender research is a transformative project becoming more and more radicalized. It has moved from identifying the principal challenge as *"the woman question in science"* to *"the science question in feminism"*[26]. Sandra Harding noted that the woman question within science is more about acting for female researchers taking their righteous place within the established scientific research complex. The science question in feminism (gender research) is considerably more radical, and questions the foundations of science by challenging the ability of science to transform in order to meet basic needs. This development must also be seen in the present context: no longer is it only social scientists performing gender research. Therefore, it is not only subjects such as "women", "gender", or "relations between the sexes" that define the field of research. In this way, gender research goes beyond the gender equity problems. It does not mean the work for gender equity or "the woman question" is not central or important, but it is no longer productive to consider gender equity and gender research as one and the same project.

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[24] Gibbons et al. (1994)
[25] See e.g. Thagaard (1994), Fürst (1998), and Kvande&Rasmussen (1990).
[26] Harding (1986)

13. Conclusions

THROUGH A PROJECT LIKE THE GRADUATE SCHOOL FOR WOMEN, IT IS POSSIBLE TO

- combine research activities with family responsibilities and a private life
- develop a functioning network among PhD students, in and between different levels at a university
- build motivation and qualifications for supervisory and leadership tasks among female PhD students within a technical faculty
- create driving forces for the development of research training programs and research supervision, in general, at a technical university
- develop and broaden the view on transformative processes in traditional and sluggish organizations
- work with equality in a strategic, concrete, and down-to-earth manner

Research and family
An important objective of the Graduate School for Women was to develop the prerequisites for – and to show that it is possible to – combine serious research activities with childbirth, other family responsibilities, and/or important interests outside of conducting research. Time is needed to realize this objective. The experiences from the Graduate School showed a necessity to develop these prerequisites. The combination of maternity leave and research studies did not have any negative effects on the time needed to take the academic degree[27]. Other explanations for delays of the research studies can be, e.g. problems with the supervisor, the amount of teaching, etc[28]. The objective in itself raises questions and creates some movements at a workplace such as a university, especially at a male-dominated technical faculty. The report shows reactions from both male and female PhD students and professors of varying ages. The stronger, more negative reactions indicate that the transformative element of the objective is fundamental[29]. An objective, that may appear trivial nowadays, may include one of several functioning entries to necessary change. Research may constitute a significant part of an individual's life, but research cannot be everything; it is a part of a complete life.

Networks
Research activities are often described as a solitary work. Several PhD students of the Graduate School expressed wishes to cooperate in research projects with other researchers. An affiliation also including research related issues appeared important and desirable. The Graduate School for Women tried to create opportunities for a supporting spirit, for shared reflections, and for the development of complex contextual understandings. An important factor in the supporting spirit of the group was the work with Barbro Huldén[30]. A project director who has followed the group closely and co-operated with the Graduate School has probably been important. The time aspect is also an invaluable factor, creating quality and confidence. Room for shared reflections also had a vital importance in the building-up of qualifications, in particular regarding supervision and leadership. The opportunities for the contextual understandings (courses, seminars, trips, etc.) are of vital importance for the build-up of motivation, commitment, and durability of a long-term research work with leadership responsibilities. These opportunities has above all been used by the Graduate School group, but also

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[27] See chapter 9.1.
[28] See chapter 9.1.
[29] See e.g. chapters 5.3 and 10.1.
[30] See chapter 7.2.

by other interested PhD students (male and female) and other university employees in the Graduate School courses.

Because the participants of the Graduate School came from all departments of the university, contacts were established right across the university in ways that would not have otherwise occurred. Networks were built between colleagues and within the organization. The participation and commitment of the president of the university, the initiatives and following-up of the Personnel Development Office, and the making of contacts with the faculty board contributed to developing networks at various levels for the participants of the Graduate School.

Supervisory qualifications
The pilot study and the present report clearly show how important the supervision issue is to research studies. Serious problems with supervision were identified in the pilot study and confirmed in other investigations and experiences from the Graduate School. Therefore, it is not difficult to understand why the Graduate School spent much time and effort increasing the understanding of this important issue. The development of motivation and qualifications for research supervision requires work, experience, time, and education at several levels. High quality research supervision is built upon a wide basis of qualifications – everything from personal maturity to research policy. In chapter 8.2, the base of qualifications from within the framework of the Graduate School is summarized. The majority of Graduate School activities have, more or less explicitly, contributed to supervisory qualifications.

How the Graduate School has tried to work through this problem area may create a base for an increased understanding and for alternatives in the development of supervisory qualifications. This work has involved a provocation of the organization – an example of a participatory provocation. It is still too early to tell whether or not the work has led to any changes within the university. Some indications of where these processes are heading are given in chapter 11. For several participants of the Graduate School, the work has motivated them in acting as academic supervisors or approaching different leading positions within organizations other than the university.

Driving forces for development
One of the three purposes of the Graduate School for Women was to contribute to the development of a model for a well functioning research training program that considers the prerequisites and needs of the individual PhD student. The response of the faculty board and the assessments of participating supervisors, faculty board representatives, and university management after the project had finished, indicate that a project such as the Graduate School creates obvious driving forces for the university to continuously work with the development and improvement of the research training programs and supervision. The response and the assessments are, above all, based upon the visible activities from within the Graduate School. However, they are also based upon the many consequences of the Graduate School coming about at the department and division levels. In Chapter 11, there are many examples of such consequences. One professor expresses the driving force in the following way: "In every discussion about research education that I have participated in during the last few years, the Graduate School has been brought up. There is no doubt that it has influenced the debate by, for example, making supervisors clarify their standpoints and opinions." Failures, such as PhD students quitting their research studies and the Graduate School, have also created certain driving forces, in particular the second case, which brought out the problems and achieved a number of changes.

The management of the Personnel Development Office points to some consequences of the Graduate School's focus on research training programs and supervision. The Graduate School has contributed to increased demands on quality and quality assessment of the supervisory process. What follows is

an expectation of influence on the recruitment and selection of future supervisors/professors. The Graduate School has, according to the Personnel Development Office, also been a driving force for an increased interest in leadership training and gender equity at the university.

One circumstance probably important for the positive driving forces of the Graduate School is that the school was active during a period favorable in terms of research policies. The current government bill on research[31] gave explicit support to the ambitions of gender equity and gender research perspectives within education and research[32]. The then Minister of Education expressed interest and support in the Graduate School[33]. The Graduate School for Women was also mentioned in the parliamentary report, *Forskning 2000* (Research 2000), which the government bill 1998/99:94 "*Vissa forskningsfrågor*" ("Some research issues") was based upon. The report suggested that "*through the education of supervisors, the attention to equality issues shall increase. Advantages and disadvantages with exclusively female graduate schools shall be analyzed*". Since there was only one graduate school for women at the time of that report, it is the one at Luleå University of Technology that is being looked at.

Transformation processes
The pilot study, along with the problem identifications of various university representatives, indicated a need to find ways towards a transformative work involving research training programs, in general, and the work and life situations, of female research students, in particular. The objectives of the Graduate school, based on the conclusions of the pilot study, shaped certain ideas of suitable transformation processes. The awareness of what would be required in the transformative work - like the consideration of several basic issues including issues dealing with research processes – was not always there.

Initially, some essential requirements had to be met before the transformative processes began. Time had to be set aside to get a satisfactory continuity in the transformative processes. The economical resources of the project, covering the project time span of three years, satisfied this requirement. The continuity was secured by, for example, having the same project director and the same members of the project group throughout the entire project time (including the preparatory work). A thorough preparatory work and getting the project well established within the existing organization were also important prerequisites. Several persons contributed in this work.

In all transformative processes – especially in traditional and hesitant, i.e. reluctant to change, organizations such as academic institutions – one must avoid to be in the well known, where everybody else is. Perhaps the most important requirement for carrying out transformative work is to ask questions that do not have any known or available answers as the work begins. The Graduate School for Women created possibilities to search – in new ways – the interesting, substantial, and developing questions. The courses and other activities of the Graduate School tried to develop complex answers instead of ones that are unambiguous and too simple. Each of the participants was responsible for adopting those answers making sense and relevance in the chosen context. This is not a simple work, since "with the loss of simple answers, the questions too have become infinitely more difficult"[34]. Therefore, the work can be challenging not only to the system, but also to the participants.

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[31] Government bill 1996/97:5, "Forskning och samhälle" (Research and society).
[32] For a closer presentation, see Trojer (1997).
[33] See chapter 7.1.3.
[34] Brink, (1991)

What signs should be looked out for to recognize changes in favor of the individual PhD student's requirements and needs and in favor of a supervising professor who wants something more than getting financing and doing the usual thing? Perhaps the next Graduate School can be even clearer in identifying these elemental signs. This report shows some of these.

The range of activities in the Graduate School is a conscious attempt, with new ways, to develop a potential for change, which the previously known ways have not been able to accomplish. Calling these attempts a "participating provocation", the Graduate School has confirmed the university's ability to stand this kind of provocation as well as leading to movements within the organization continuing beyond the project time of three years. The second Graduate School for Women is one of the university's answers to this attempt.

Gender equity
In the pilot study, arguments for gender equity within the university world were discussed starting with the formulations used in the public debate on education and research policies. The utility point of view was strengthened in the equality debate, supported by quality arguments based on "women's unique capabilities" and "female values". These arguments were, and still are, problematic and rarely supported by documented experiences. In chapter 2 of this report we find few examples of justified arguments explaining why gender equity is desired or necessary. Nobody explicitly opposes the idea *that* we should have an equal representation of men and women, but it is considerably more difficult to express why. "More women gives a better research supervision" was one argument, not necessarily built on "female values" taken for granted, but rather on the expectation that the Graduate School for Women would achieve examples of how to develop supervisory qualifications. This argument would need some additional explanatory links to be valid. Furthermore, it is easy to misinterpret the change and presence of women, which might lead back to the quality argument mentioned above and in chapter 12. Another argument for gender equity, as mentioned above, was that "a better gender balance creates conditions for educated persons to become better adapted for work in the industry". If this result is a consequence of the practice and experience in gender mixed groups, or if it depends on something else, it cannot be concluded from the discussions. Among female PhD students – along with other persons within the university – gender equity is regarded as a matter of course that needs no arguing.

In chapter 2, it is pointed out that research education is part of a long and well-established tradition where a patriarchal gender order still prevails and is deeply, structurally rooted, in spite of policy documents and activity plans where gender equity is explicitly dealt with. Great hopes are set on female PhD students. *They* are expected to carry out change in the research education system, or, even worse, the universities have the notion that change towards a more equal distribution between men and women can happen, and be maintained, only by increasing the number of women. However, creating a potential for change concerning gender equity is far more complicated. In the equality strife of the Graduate School, broadening understandings and knowledge about research processes have proven more important than a one-sided focus on PhD students' qualities based on their gender. The work with personal development did not concentrate on gender differences and "female qualities". This approach was identified by the pilot study, tested by the Graduate School, and turned out to be appropriate. Chapter 12 shows how the Graduate School has turned the woman question in science into issues of research processes, so as to form gender equity strategies.

The equality issue is not only relevant in the relationship between men and women, but also in relations within the organization. The intentions of the project director have included demands for the development of a culture based on equality, responsibility, and participation beyond hierarchical structures. Trust is a crucial prerequisite in order to achieve this. Time is needed for creating trust and

confidence, as mentioned above in the comments on networks. A base of values and conscientious work, permeating the activities, are also necessary. The project director's way of working is important for the possibilities to create confidence. It is also important that colleagues have similar ideas of the matter to avoid contradictory messages. One example of the attitude of the project director is demonstrated in chapter 7.1 concerning course planning. How the plans of the Graduate School were outlined and realized, how discussions in various situations were conducted, how sensitivity towards each other was developed, and the way in which motivation for a continued mutual work was created, are some of the keys to the development of a culture where all individuals have equal values.

Epilogue

Reflections
The project of the Graduate School for Women at Luleå University of Technology tried to find alternative ways to secure increasing numbers of female leaders[2] within a technical faculty. The leadership role at our universities is changing and must be changed due to significant transformation of the prerequisites for the universities. The understanding of the university as a public service with a traditional, autonomous structure is altering in favor of seeing the university more as a public investment for the development of the region and the society as a whole. We find intertwined connections between university, industry and society. Additional competences for academic leadership compared to traditional ones are increasingly emphasized in national as well as EU contexts[3].

A competence building for academic leadership included in an explicit and comprehensive gender equality initiative was the basic idea of the project. It might be natural (cultural) to suppose we should focus on knowledge about women's specific situation and conditions together with skill training out of gender perspective in the program of the Graduate School. *We believed something quite different was needed.* We identified the Graduate School as a transformation project not only for the female PhD students but for the whole organization, as the already established PhD education did not include competence building for leadership. The latter was identified as a serious lack by the management of the university and the faculty.

Quite some time after the project had finished, an article in Harvard Business Review[4] confirmed our ideas how to reach more sustainable changes. The authors stated it is not enough to assimilate women and teach them the games their mothers never taught them (play the boys' game), to accommodate the unique needs and situations of women by for instance offering mentoring program or to emphasize the differences that women bring to the workplace. All these solutions deal with the symptoms of gender inequality rather than the sources of inequality itself. Instead the suggestion is that we should turn towards the existing system itself and emphasize it can be reinvented by altering the raw materials of organizing and (we want to add) of knowledge production.

What has followed?

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[2] With leader is meant professor, associate professor, research supervisor, and in the very long run dean, etc.

[3] One example is a EU conference about the relationship between the academy and industry / society, 17 April 2001, Karlskrona, Sweden, where the Swedish minister of education and research, Tomas Östros, emphasized the academic leadership question.

[4] Debra Meyerson and Joyce Fletcher "A Modest Manifesto for Shattering the Glass Ceiling", Harvard Business Review, Jan, Feb 2000, pp 126 – 136.

Out of the 15 participants in the Graduate School for Women[5]
- 9 have a doctorate degree
- 3 have a licentiate degree
- 3 left to work in industry before any degree

This is just a measure of a quantitative surface. Under that surface hide competences, advancements, visions, strategies and further multiplicity of experiences, which need one book or two to be illustrated.

The annual report of Luleå University of Technology for the year 2000 gives a sign of what has followed. The report includes;

"An important reason for the increase of admitted women (to PhD studies) is The Graduate School for Women. In the autumn 2000 the second graduate school for women started at the university with 13 participants, 10 from the technical faculty and 3 from the philosophical faculty. The first Graduate School for Women in the country started 1995 at Luleå University of Technology as a strategy to contribute to an increasing recruitment of female PhD students and in the long term an increasing number of female teachers, researchers and research supervisors in technology and natural science. Out of the good experiences the University decided to start another one and broadened it to include also the humanities and social science."

In addition the University has taken several concrete initiatives for increasing the skills of leadership and research supervision among the staff. This can be followed at
www.luth.se/univ/arsredo

International outlook
The Graduate School for Women at LTU can be placed in an international perspective. Continually decreasing numbers of women from the undergraduate programs to research education and further to the postdoctoral and senior lecturer stages are not unique to Sweden. In 1999, *A Study on the status of Women Faculty in Science at MIT* was published. The origin of this report was some women at the School of Science, Massachusetts Institute of Technology, who in 1994 began to discuss the quality of their professional life. They had soon brought together almost all women faculty at the School of Science to a discussion group. Several common experiences soon emerged. On their proposal, the Dean of Science established a Committee on Women Faculty to deal with the status of women faculty. One interesting observation made by the committee was that most women felt included and supported by their departments in the beginning of their careers. Gradually, however, the women realized that "the playing field is not level after all and that they had paid a high price both personally and professionally as a result". Most senior women faculty felt "invisible" and actual inequities were found involving e.g. space, salary, teaching assignments, awards and assignments within the department. The percentage of women has been low and essentially unchanged for 10-20 years.

The committee encouraged the administration to work for improvements of the treatment of senior women faculty and to increase the number of women faculty. In order to repair the leaking pipeline carrying women through the career stages, junior women faculty also had to be considered. One important issue was how to combine family and work. The keys to this issue were to make the policies on maternity leave uniform and widely known throughout MIT, and, not least important, to change the false presumption that women with children do not achieve

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[5] in January 2002

equally with men or with women without children. Guided by the recommendations of the Committee, actions were taken to effect change, and indeed a highly significant progress followed, including an increase in the number of women faculty at MIT.

Looking in the rear mirror, the Graduate School for Women supported 12 women through their research studies. Now, they face their continued careers. It seems that a majority of these new doctors are leaving the university. Why? The next challenge for the University as well as for the research political bodies in Sweden is to answer that question.

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