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SIGIS

SQUARES AND CIRCLES. GETTING WOMEN INTO COMPUTER SCIENCE

Vivian A. L. Berg

SIGIS Trondheim working paper no 2

SIGIS: Strategies of Inclusion: Gender in the Information Society

CONTENTS

1. Rationale for choosing the case

In many countries, there has for a long time been a concern about the lack of women in science and engineering disciplines. In particular, there has been uneasiness about the lack of female students in computer science. Arguably, the situation of female students in computer science is very indicative of the gender and ICT relationship and provides a key to the understanding of this relationship. Moreover, initiatives to get more women into computer science probably represent some of the most important actions to get more women into the ICT profession, not just as users but also as designers of this technology. The Women and computing initiative at NTNU has been a quite large, successful and rather broad-spectred inclusion initiative that allows a quite rich and interesting analysis of the inclusion strategy as well as the underlying assumptions about gender and ICT.

2. Introduction

Women's under-representation in engineering has been conceptualised and interpreted in different ways, which in turn has led to different actions and attempts to recruit more women. Catherine Cronin and Angela Roger (1999) have done a comprehensive review of international literature about Women in Science, Engineering and Technology (SET) in higher education. They identify five different positions or rationales in relation to women in SET:

- To foster public understanding of SET
- To recognise SET's economic contribution
- To promote equality of opportunity
- Subject SET to critical analysis
- Change SET culture.

The fifth position is based on a critical understanding of the dialectic between the social construction of science/technology and gender. Science and technology are seen as social constructions that cannot be neutral. The traditional symbolic relation between technology/engineering and masculinity is recognised, and consequently also the potential conflicts between women's feminine gender identity and the masculine SET culture. Moreover, proponents of this position see girls and women as actively resisting some sciences and technologies, having valid reasons to do so, rather than being victims of misconceptions about the image of such disciplines (Cronin and Roger 1999). The examples of actions related to this understanding, listed by Cronin and Roger, include:

- Curricular changes, designed appeal to women as well as a larger pool of men,

- Inclusion of humanistic and socially oriented features within the courses,
- Emphasis on communication skills and technology assessment, and history of science and technology.

As we shall see, the Women and computing initiative came to use such actions.

Similarly to the concern with the low number of women in SET, the lack of women in computer science has been a public issue in many Western countries in the last fifteen years (Wright 1997, Cronin and Roger 1999). However, in computer science the problem has become even more severe, since the trend in fact has been a decline of female students. For instance, from the middle of the 1980s to the middle of the 1990s the proportion of women taking a higher education in Information and Communication technology at the Norwegian University of Science and Technology (NTNU) dropped from 20% to 6%. This trend was also evident at other universities in Norway and gave rise to a growing concern about the low numbers of women within the computer science profession.

The concern was based on two arguments; an equal opportunity argument and a resource argument. The equal opportunity argument pointed to the fact that women was deprived of an opportunity to contribute and influence a growing and important technology in all parts of the society. The resource argument referred to societal losses when the scientific and technological talents of women were not utilised. Also, the concern for the general supply of computer science educated labour to the industry was also evident in this.

The challenges to recruit more female students were several:

- Few women had the necessary science subjects needed to apply for the programme. Of those who had, very few women applied to enter the computer science programme.
- Those who applied and were admitted often did not accept the offer.
- The dropout rate among female students was high compared with the male students.

In 1997 the initiative "Women and Computer Science" started at NTNU. The intention was to turn the trend and get more women to study to get an engineering degree in computer science at this university. The initiative comprised a diverse set of actions, which make the analysis of the inclusion strategy as well as the thinking behind this initiative very interesting. This report will describe its main activities. In addition to clarifying the inclusion strategy and its ingredients, the analysis is concerned with the co-construction of ICT and gender in the initiative. It is based on the theoretical notion that gender as well as ICT are social and cultural constructions that shape each other mutually. We want to show how gender and ICT and the relationship between them are constructed among the actors in the "Women and

Computing" initiative and how a gender stereotypical discourse on ICT is created and legitimised through its ability to serve political goals. In turn, this has lead us to question the way gender frequently becomes naturalised occurs in such initiatives. By naturalised we mean the tendency to take a particular meaning of gender for granted as if it was "natural". We will look at how gender is naturalised and inquire into its consequences. Also we ask if it is okay to naturalise gender to serve politically "good purposes"?

3. Method

The analysis is based on interviews with the main stakeholders in the Women and Computing initiative in combination with documents, campaign material and web sites. The main stakeholders were:

- NTNU top management
- Management and Staff at the Department of Computer and Information Science
- The management of the Women and computing initiative.

Interviews were conducted with 8 key informants from these three groups of stakeholders:

- Professor Rigmor Austgulen, Prorector when the initiative started and its initiator
- Professor Eivind Hiis Hauge, former Dean at the Faculty of Physics, Mathematics and Informatics, today Rector at NTNU
- Professor Kjell Bratbergsengen, Head of Department of Computer and Information Science, NTNU
- Professor Reidar Conradi, Head of Department of Computer and Information Science in 1997 (when the initiative started)
- Associate Professor Øystein Nytrø, Department of Computer and Information Science and part of the "Women and Computing" team. Nytrø was one of the younger staff at the department and had previously been involved in reform work at the department. He had strong visions about this initiative and was a driving force behind it
- Associate Professor Guttorm Sindre, Department of Computer and Information Science
- Kirsten Rye Ramberg, Initiative manager 1997-1998. She had previously worked as a manager in the Technical Division at NTNU and her educational background was computer science.
- Kristin S. Karlsen, Initiative manager 1998-2002. She also had an educational background was in computer science.

The interviews took place in the spring of 2002 and were taped and transcribed. Each interview lasted about an hour. The informants were asked to give their version about the initiative, how it started and why. They were also asked to evaluate the initiative and give their

opinion about what had been successful and what had not been so successful, and what could have been done differently. Further, the informants were asked to give their opinion about the advertising material used in the campaign and the critique that has been raised toward the initiative by outsiders. Through the interviews we aimed to see how the different actors co-constructed ICT and gender and how this shaped the inclusion strategies that were planned and implemented.

Almost all of the interviewees, except from Guttorm Sindre,[1] have played an important role in the initiative. Moreover, many of the informants possess important positions within the NTNU organisation. Their answers must therefore be viewed in the light of the fact that their responses might not be given only on behalf of themselves, but also on behalf of the initiative and the NTNU organisation. Especially informants that still occupy leading positions seemed to find it important to tell a story about success and downplay any unfortunate consequences. One reason for this is of course that the initiative still is running. Further, it is often a tendency that narratives about "successful" initiatives are developed and diffused in a way that result in a more or less conscious adoption by others. Also, it seems that the arguments in support of the initiative and against the criticism that has been raised by some outsiders, have been collectively developed and refined during the history of the initiative. At the time of the interview, the same points of view were shared by many of the actors.

However, we have also used other written sources, like evaluation reports and progress reports made by the team:[2]

- "Women and Computing: Background, State of affairs and Actions" September 1997. By Øystein Nytrø and Judith Rødsten. http://datajenter.ntnu.no/1997/status0997.html
- Final report Norwegian Research Council-project Women and Computing, Project No. 124994/440.1999. By Kirsti Rye Ramberg. http://www.ntnu.no/datajenter/NFR_sluttrapport.html
- Women and Computing: A success with rub-off effect to other technology studies at NTNU. Internal report by Reidar Conradi and Kirsti Rye Ramberg http://datajenter.ntnu.no/1997/suksess.html

In addition, material from advertising campaigns carried out during the initiative has been analysed, in particular in order to examine the co-construction of ICT and gender.

The "official" talking was less evident when gender and gender differences were discussed since it seem that many of the informants had their own personal view upon gender issues, often based on their

[1] Guttorm Sindre was part of the reformative work that was initiated at IDI before the Women and Computing project started and was interviewed to shed light over the ideas that existed about the content in the study prior to the project.

[2] These are available on the projects web-site http://datajenter.ntnu.no/2002/),

own experiences. Sometimes this went along with the initiative's ideology and sometimes not. Therefore, this was a fruitful point of departure in order to move the discussion on to other topics.

4. Establishing the initiative

The initiative to start 'Women and Computing' was taken in the autumn 1996 by the newly elected prorector Rigmor Austgulen, a professor in medicine and a feminist. She proposed to introduce an extra annual quota of only female students to the Department of Computer and Information Science (IDI). Just before this happened, another initiative had been taken by the Dean of the Faculty of Physics, Mathematics and Informatics (FIM), professor Eivind Hiis Hauge (today Rector of NTNU). He wrote to Rector Emil Spjøtvoll about his concern related to the increasing demand for ICT competence. Professor Reidar Conradi who was just about to become the Head of IDI, took a third initiative. He wrote a memo to the Rectorate too, where he argued the need to double the capacity of IDI, based on statistics he had gathered about the expansion of the ICT industry.

All of these initiatives may be seen as responses to an increased attention in Norway towards the need for more people with IT education. This was partly triggered by the planning of and debate about the establishment of a new national IT-centre, to be located at the previous national airport, called IT Fornebu. According to Hiis Hauge, he saw this as an opportunity and wrote to the Rector that the national capacity of IT-education needed to be doubled. NTNU ought to take its share of the responsibility to achieve this and thus double the numbers of students within IT. Hiis Hauge's and Conradi's proposals fitted neatly into prorector Austgulen's initiative to get more female students to the Department of Computer and Information Technology by allowing an extra female quota. According to Hiis Hauge, it was easier to induce a female quota when it came along with a general increase in student admissions.

Thus, an important factor behind the success that followed is probably the solid anchoring of the initiative in the top leadership of NTNU and among the staff at the Department of Computer and Information Science (IDI). IDI had, according to Head of Department, Professor Kjell Bratbergengen, for many years been concerned about the low number of female students. Also, they had made some modest efforts to recruit more women by shaping information material and brochures in a way that was intended to make it more attractive to women, and by inviting women explicitly to apply.

After a short and hectic debate, the Rectorate made a resolution of an annual quota of 30 extra students (for the first year and 45 for the next) exclusively for women, allowing a 10 % reduction in credit points. NTNU's Board approved the resolution the 20th of February 1997. In

April the same year the University Director appointed a team that was supposed to work on both short term and long-term goals for the Women and computing initiative.[3] The short-term goals were to work effectively with information and recruitment toward the closing date for applications and to make efforts to get the female applicants (who were admitted) to accept the offer and actually start the programme. On a long term basis the initiative team was supposed to "*motivate and take initiative*", as well as to "*serve as a body entitled to comment*" to IDI, regarding:

- Actions and modifications/changes in the curriculum
- The general offer of computer science subjects to other study programmes especially programmes with an already high share of women
- The study of actions, changes and consequences in the long view.
- A initiative manager was hired half time for a period of six month.

The initiative team immediately initiated an extensive information campaign. They hired an advertising agency, which worked closely with the initiative manager and a representative from IDI. The campaign consisted of a screen advertisement (shown in one month at all cinemas in Norway), a website, and information brochures that were sent to girls, science teachers and advisors at 326 different upper secondary schools. The campaign was funded by NHO (Confederation of Norwegian Business and Industry) and some large Norwegian companies like Telenor, Sintef, Statoil and Hydro, with NOK 750.000, ~ € 100 000.

During the spring of 1997, the number of female applicants doubled, compared to previous years. In 1996, the number of women who applied was 217. Among them, 55 had computer science as their first priority. In 1997, 565 women applied and 109 had computer science as their first priority. 22 of the women were qualified according to the general admission criterion (60,2 points) and 46 were qualified with a 10% lower score (54,2 points). 54,2 points were still among the highest scores compared to the other engineering programmes. By the closing date, 52 women and 86 men had accepted their study place as first year students at IDI. This meant that the proportion of women among first year students increased from 5,7 % in 1996 to 37,7 %. This was sensationally high in the Scandinavian context.

A survey was conducted in 1997 (the first year) among all the first year students. Its conclusion was that good job prospects and the variety of different job options were the main motivating factors among the female students to start the study programme, along with a strong interest in science subjects, especially mathematics. The survey also showed that the male students were more motivated for the discipline

[3] This account is based on the web-published report: http://datajenter.ntnu.no/1997/status0997.html. The authors was Øystein Nytrø and Judith Rødsten.

itself, than were the female students when they chose the programme (Berg and Kvaløy 1998). The information sources considered most important to the decision were job prospects, the NTNU information brochure (not the commercials), mass media, the Women's Day and their fathers (Berg and Kvaløy 1998).

5. Enrolling women into computer science

One of the most successful local actions was the "Women's Day", organised by the initiative team in collaboration with the Student and Academic Division at NTNU.[4] All admitted female applicants were invited to visit NTNU and offered a comprehensive presentation of the department and the university. They also heard talks from female representatives of the ICT-industry (supposed to work as role models), attended popular science lectures, participated in an internet course, etc. The participants were divided into groups and guided by female computer science students during the weekend. The idea was to make the programme visible and to show the good social environment among the students. 52 women participated at the "Women's Day". All expenses were covered by NTNU. Approximately 80% of the females who participated in the "Women's Day", did accept the offer and started at the study programme. Thus the "Women's Day" is regarded as one of the most successful actions in the initiative. Evaluations show that the number of female applicants who accepted their offer, increased from 30-35% to 80% after the 'Women's Day' was established.

The initiative management and the organisers really put much effort into the 'Women's Day'. According to the initiator of the initiative, Rigmor Austgulen, they used "a whole lot of seductive tricks" towards the female participants. A cunning plot was the way they used the popular and charming male student choir "Pirum" to entertain and guide the young women around in Trondheim after the formal part of the presentation was concluded. The women were invited to the choir's own premises in the House of the Student's Association where they were served strawberries and champagne. The initiative management emphasised that what happened in the evening was not something they meddled in.[5] The party that followed was informal and unofficial but still deliberately initiated by the management, who also instructed the members of the male choir to treat the young female participants well and 'gentlemenlike'. One of the other initiative managers admitted though in the interview that one of her biggest concern about this effort was that anything would happen during this part of the arrangement.

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[4] 51% of the female students said that the Woman's Day had been an important source of information when they chose to study computer engineering (Berg and Kvaløy 1998). Also many of the female students interviewed emphasised that they had been encouraged to start the programme because of the Woman's Day.

[5] Interview with Project manager Kristin S. Karlsen.

The 'Women's Day' has been regarded as a big success. However, the general admission system for tertiary education in Norway today is that all applicants have to rank their preferred choices. If they are accepted at their first choice, they lose the opportunity to choose one of their lower ranked choices. So, in practice, the students who had computer science, as their first choice probably would have started anyway, regardless of the Women's Day.

A striking feature of the Women and computing initiative as an inclusion strategy is the wide variety of activities that were initiated. There is not space to give a detailed account, but the list of local actions that followed in the wake of the quota in 1997 is quite long. Here, we have tried to place them under a small number of headings, in order to make it easier to see what kind of activities that were put in motion:

A. Actions aimed making women apply to the programme:

- Two teaching assistants were hired to assist with various tasks in connection with the advertising campaign.
- In 2001, the initiative manager sent SMS-messages to one thousand 18- and 19 years old women. They were asked to press the OK-button if they wanted more information about the Women and Computing initiative at NTNU. 17 of the women pressed the OK button and were then called up by the project manager. It turned out that only 3-4 of the women were serious about it. The results were deemed too poor, considering the cost of NOK 7 000,- and was thus not repeated the next year.

B. Actions aimed at recruiting girls to choose science subjects in general (and encourage them to choose ICT):

- Student tutoring. A collaboration between computer students and an upper secondary school in Trondheim (Katedralskolen) and British Petroleum.
- A counselling and motivation course in mathematics for girls in the first grade in seven upper secondary schools in Trondheim. This initiative went on for two years before the Women and Computing initiative started, and was perceived as successful.
- A 'visibility' initiative directed towards youth in secondary school and college, aimed at making computing visible and looking fun, through popularisation, demonstrations and 'play'-laboratories.

C Actions aimed at getting the female students not to drop out

C1. Curricular and professionally oriented activities

- A module called "Know your subject" ("Kjenn Ditt Fag") became integrated in the basic IT introduction course that all first year

students had to go through. The module was organised as team projects, where the students visited and interviewed computer engineers in different IT companies. The purpose was to increase the students' knowledge of their future work situation and make them more motivated for the programme. Another goal was to make them see the importance of the courses they followed and to show them the relevance of their subject. The idea behind this was built on a notion among the initiative team that female students are more concerned about the usefulness of what they learn, to a larger degree than male students. The assumption was that women demand to know why they learn what they learn and how the knowledge is supposed to be used later.[6] A female assistant was hired half time to organise this module, and also to work with the female students. Two of the courses offered to the first year students, the IT introduction course and the Programming course, were new and based on project oriented teaching.

- A group of female students managed to get sponsors to provide funding for a computer lab called 'Cybele', which was an all-female lab. The Department supported the lab with premises, networking and teaching assistants. At least this was the official version. The unofficial version was that the initiative management actually was responsible for raising money to the lab, but nobody should know about it because it would cause too much unrest (and there was already a lot!). The Faculty had even made a resolution that said male students could not be excluded from any of the Faculty's areas. Some male students threatened to occupy the lab to protest against what they experienced as an unfair exclusion. The Cybele lab was therefore situated in a basement, a bit away from the rest of the Departments premises, in order to be unattractive to boys and thus provoke as little attention as possible. The Cybele lab now has 19 computers and the lab is predominantly run by five female teaching assistants. They organise courses in HTML, Unix, PhotoShop, hardware, etc. in which only women have access. In addition, two female tutors are hired to provide general assistance and tutoring in the lab four hours a week.
- The IT introduction course got an Italian female lecturer.

C2 Socially:

- The set-up of an advisory system where new students were taken care of and introduced to the programme by more experienced students.
- Controlled composition of groups in terms of gender. At the computer engineering programme students usually work in groups

[6] Interview with project team member Øystein Nytrø.

of eight, which is sometimes divided into subgroups of four. These groups remain the same throughout the year. The groups were now composed in relation to gender. The gender composition in the students groups was controlled, making sure that if there were women in the group, half of the group were females, and that all subgroups always had more than one female student. This composition was usually well received by the students, who argued that it was positive to be in groups of both males and females.

- One of the sponsors, Telenor, supported the travel and a one-day-ticket for 50 of the female students to a downhill skiing at a popular ski resort a couple of hours away from Trondheim. This turned out to be enormously popular and had a long waiting list. In return, Telenor gets to give a presentation of the company to the women.
- "A culinary evening" at the Culinary Centre. The female students were offered to participate in making a 3-courses exotic meal from the bottom. This initiative were sponsored by the Women and Computing with NOK 10 000,- and the participants had to cover the rest. This activity admitted 30 participants and was also very popular.

The Norwegian Research Council appreciated the results of the Women and Computing initiative at NTNU, and granted another NOK 1.8 million to be spent in 1998. The grant was given on the condition that the initiative took a national responsibility and included the three other Norwegian universities. Some changes were made:

- The initiative manager was hired full time.
- A national management committee was appointed, with representatives from all four Norwegian universities (Oslo, Bergen, Trondheim and Tromsø).
- A national series of lectures was planned and carried out
- An initiative to organise evening lecturers with women from the ICT industry was effected.

An expanded, national advertising campaign was carried out in order to motivate women to apply to computer science at all of the universities. The campaign was funded by the Norwegian Research Council and the industry. The distribution of advertising material was quite massive, and it also got a lot of attention in media. The brochure was printed in 25 000 copies and distributed to all the universities and 380 upper secondary schools. Also, every teacher who taught the mathematics course 3MX, the most advanced course in upper secondary school, received a copy. A simpler and smaller version of the brochure, shaped as a post card, was made in 60 000 copies and distributed to 550 restaurants, cafes and bars in the largest cities in Norway.

The NTNU initiative team sent 1630 of these cards to girls who took the required science subjects in upper secondary school. The card

included an invitation from the Head of Department (IDI) to apply for admission to the computer engineering programme. The initiative had a two-page advertisement in one edition in the largest weekly magazine for young women in Norway, "Det Nye". The initiative also had coverage in "Spirit" and "Night and Day", magazines that are distributed free of charge to young people, printed in 70 000 copies each. The initiative also advertised in each of the four universities' internal newspapers in order to reach women who where already studying other subjects. The initiative worked systematically to get editorial mention in printed and other media. The initiative was also present at the education fairs in Oslo and Trondheim in 1998. The national initiative went on only in 1998 and did not receive further grants.

After 1998, the Women and Computing initiative at NTNU has nevertheless continued, mainly with local actions. The percentage of female students at IDI has remained relatively high, between 34 and 38%. The initiative management has also tried out various new activities. One year, the initiative manager, Kristin S. Karlsen, encouraged some of the female students to write an essay about how it was like to be a computer science student and a woman in a male-dominated environment. She also got a photographer to take pictures of them and then contacted the local newspapers from the areas where each of the students came from and asked them to make an article about them. This was not very successful, considering the large workload of getting the students to write the essays. Only a couple of the local newspapers wrote such articles. However, some contacted the women and conducted telephone interviews with them instead.

The following year they tried something similar but less demanding. The initiative manager contacted local newspapers before the 'Women's Day' and informed them that a girl from their area had been admitted to the Computer engineering programme and was going to participate at the 'Women's Day'. She then encouraged the newspapers to make interviews with the girls. She also hired a photographer, who took pictures throughout the whole arrangement, so that she had pictures to offer to the newspapers. 3-4 newspapers took on the idea and wrote such articles. Initiative manager Kristin S. Karlsen also conducted interviews or talks with the female students in order to learn more about them and how they experienced being students at the programme.

The quota system has continued since 1997. However, in 1999, the Ministry of Research and Education (KUF) took over the administration of the quota and changed the way it worked. Now, the quota does not actually give priority to women before men. The 30 best women are admitted first, and then the rest of the men and women compete for the remaining places. The reasoning put forward from the Ministry was that they wanted all the quota systems in Norway to be the

same. NTNU is currently negotiating with the Ministry in order to try to change this new system back to the old one.

The curricular changes due to the initiative have been minimal. There were made some very small adjustment in one of the courses, and also some improvement in the teaching capacity, by increasing the number of teaching assistants, and also making sure that there were as many female teaching assistant as possible.

6. Advertising computer science: Circles and squares

After the 'Women and Computing' initiative started in February 1997, the initiative team immediately started to develop an extensive information campaign. A local advertising agency was hired to make an information brochure and a screen commercial. The team at the agency consisted of two women and a man. The agency team worked closely with the initiative manager and a representative from IDI.

The first advertisement was a brochure and a screen commercial. The brochure was sent to 326 different upper secondary schools, while the screen commercial was shown at all the cinemas in Norway during one month (April). The next campaign was produced the year after. Since the initiative became nationwide in 1998, they needed new brochures. A new agency in Oslo got the assignment. This time only a brochure and a postcard was made. A third brochure was made during spring 2002.

Professional advertising is very much concerned with providing clear and attractive messages. Thus, we have good reason to assume that the campaign material made through the Women and computing initiative would be quite informative about the main features its thinking. For example, Austgulen told us how impressed she was with the agency's ability to transform their ideas into catching slogans. Thus, we have chosen to analyse this material in some detail, as a potentially important source of information about the perception of gender and ICT.

6.1 "Tom and Linda"

The first campaign was called "Tom and Linda". This was a brief story about a young man called Tom and a young woman called Linda. The picture of a young man appears on the screen. A voice reads:

> *"This is Tom. When Tom started the computer science programme he used one hour to get himself into the database of Pentagon. Today it takes him only ten minutes. Well done, Tom?"*

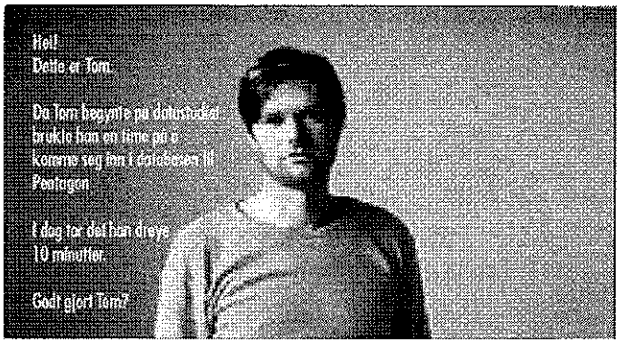

Figure 1. Tom

Then the picture of a young woman appears on the screen and the text is: "And this is Linda. Linda knew nothing about computers. Today she talks to people, analyses problems and solves them. Besides, she can get into the database of Pentagon – if she wants to."

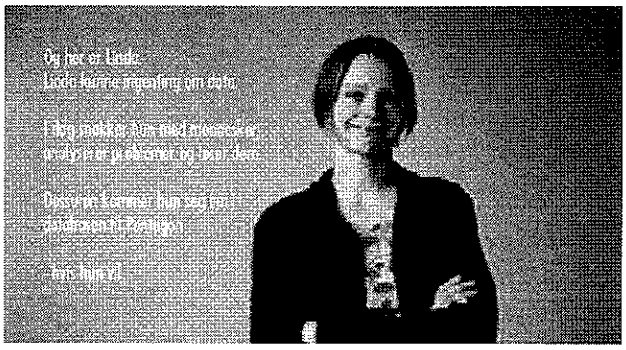

Figure 2. Linda

The punch line of the next advertisement is: "The computer science programme is more about human beings, than about machines. NTNU wants more women to computer science."

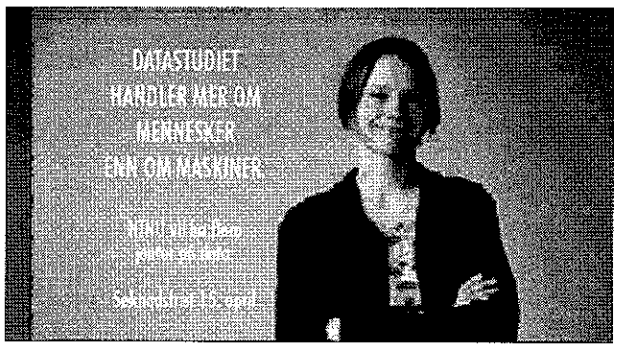

Figure 3. Conclusion

This advertisement has a very dichotomous message about gender and competence. The male student is presented as a 'hacker', narrowly occupied with technical aspects of computing like, in this case, an illegal activity like cracking. On the other hand, the female student is presented as mainly interested in analysing and solving problems and communicating with people (Buholm 1998:4). Also, the rhetorical character of the question given to Tom: "Well done, Tom?" serves to ridicule Tom's interests and indicates that this might be seen as a useless achievement. Even if Linda seems to be predominantly interested in communication and problem-solving, the advertisement also indicates that Linda *is* capable of doing the same as Tom and thus she possesses the same technical knowledge as he – she is just not interested in applying in a useless way.

The advertisement may also be seen as an attempt to extend the understanding of computer science and to include non-technical aspects, but it also introduces a change of focus from a technical, machine-oriented knowledge and interest to a non-technical, communicative and human-oriented knowledge and interest. It even ranks the latter competence above the first. This attempt to introduce a new discourse about computer science was of course not entirely taken out of the air. The Head of IDI had in an article in the University Paper emphasised that computer scientists were mostly involved in interdisciplinary project work in order to design information systems that affect other humans and organisations.[7] Problem analysis, knowledge about society, creativity and ability to collaborate were equally important qualities as computer-related, technical knowledge.

6.2 "Women makes circles, men makes squares"

The second advertisement was made the year after, in 1998, by another agency, this time from Oslo. The material consisted mainly of a pamphlet that was sent to upper secondary schools, and also a postcard that was sent to every schoolgirl who was in the last year of upper secondary school and had taken science subjects. The front page of the pamphlet is very simple and symbolic and the text also:

"Women make circles and men make squares. The universities want more computer science students that make circles."

The brochure appears as made by young women from the universities of Oslo, Bergen, Tromsø and Trondheim who have studied computer science themselves. The text is shaped as a 'voice' from these women, which address young female readers directly, explaining why they should choose computer science. The reasons focused upon are two-fold: First, that the social consequences of the work done by computer scientists are too important to be done by men only. Second, that the computer systems will be better adjusted to users if women

[7] Universitetsavisa (University Paper) No. 6, 1997.

made them, because the utility aspect is a greater concern for women than for men. The reason for this is that men often become too occupied with technical aspects and details.

Figure 4. Circles and squares

The text continues:

"Women listen. Women talk with each other. Our experience is that women ask "why"-questions, like: What is the point with this button? Who will benefit from this function? How will the user understand how she begins? "Listen up!" women say. "This is too difficult! We must make the system easier!" (...) This is why we want women. This is why the skilled staff of a Department is ready to welcome you. Because it seeks what you've got: femininity "

In between the "voice-text" there are presentations of and statements from young women who either study computer science or have studied computer science and are now working as professionals. These women talk about why they chose computer science and why they like it so much. Through their statements they are reinforcing the discourse about computer science not being about machines and programming, but rather about human beings. Kristin, a computer engineer and consultant says in the brochure:

"And then it is funny that so many women says: 'I want to work with people' and then they choose something traditional. But computer science is 80 percent about humans and only 20 per cent about technology. I think that mixture makes my job very interesting.

The voice in the advert goes even further, stating explicitly that with a computer education, job tasks can vary from the completely technical to not working technically at all, but just dealing with people. However, the examples of tasks that are mentioned is quite telling about the construction of gender in the advertisement. We find three-dimensional ultra sound technique, working with patient systems within the health sector, inventing automatic tele-services that are easy to use, view-phones, organising art exhibitions on the Internet, and making a telling machines that people with fear of keyboards are not afraid of using. It is tempting to believe that the examples are chosen deliberately from the assumption that these are areas that women are particularly interested in, that medicine, health, telephones (because women love to talk on phones), art and user friendly technologies in everyday life are perceived as more attractive to women than to men.

Another important message that the advertisement tries to stress is that you do not need to have a lot of previous knowledge of computing before you start the programme. A third point is the possibilities for getting a good job and making good money:

"(...) How about a secure job? A high salary? Career opportunities? To be able to work almost anywhere? How about a flexible working hour? This is common in the computer industry."

The advertisement also focuses on the opportunity to work at home, through the Internet, which is suitable when you have small children, the brochure says. This argument is tailored towards a rather traditional view of what women want. At least, this is not what we would expect to find in an advertisement directed towards young men?

It seems as if the initiative, through the advertisements, brochures and commercials, wanted to change the discourse about ICT in order to try to make it fit with what was believed to be female interests and values. Which, as we saw, were quite traditional gender stereotyped examples like:

- working with people,
- pregnancies,
- the family,
- the health sector
- (perhaps also art?)

The circle and square-images can be seen as effectively dichotomising and freezing gender in quite strict terms. In other words we can say that gender seems to remain a constant here, at least when

it comes to women, while ICT and the culture of computer science are featured as objects of reshaping. Female characteristics are ok, ICT is not – and boys are a lost case! ICT is not actually about machines, it is rather about human beings. Male hackers dominate the culture of computer science. In the light of these observations, we might wonder if the opinions about gender, ICT and the culture at the department, which was described in the advertisements were representative for the stakeholders in the initiative and if so, if they were shared by all the stakeholders.

6.3 Winning?"

The third and the last advertisement is called "Winning?" This brochure is part of a larger advertising concept made for the NTNU in general. The information catalogue is designed to resemble a glossy magazine.

Figure 5. Winning?

The catalogue is covering all the different disciplines and programmes at NTNU. The information about the different disciplines/programmes is shaped as articles and advertisements. In between there is other magazine "stuff" like interviews with students, columns and even recipes. One of the concepts is the extensive use of verbs to describe the different disciplines/programmes. Each discipline/programme has got a verb followed by a question mark, often used as a heading for an "advertisement" for the programme. The idea is probably to ask the students whether they would like to take part in this (exciting) type of activity. For example "Visualising?" is the verb used for the Architect programme, "Reconditioning?" for the Energy and

Environment programme, "Understanding?" for the Psychology programme, "Investigating?" for the Physics and Mathematics programme, etc. In the brochure made for the Women and Computing initiative (which includes two programmes: computer technology and communication technology) the verb is "Winning?". So, what could be the reasoning behind associating women in computer science with winning? At the front page of the brochure we are given some clues. The sub-headlines are: "Are women better computer students than men?" "Make more money than your father", and "No previous knowledge". These three headlines are connected to some of the most important arguments used also earlier in the campaigns: First, that women, by their attributes, are better suited to be computer engineers than men (indeed followed by a question mark). Second, the emphasis on computer science as a career choice, and as a good opportunity to earn much money. Third, the argument that no previous knowledge is required.

The picture on the front page is not easily comprehensible. It shows the body of a woman (from her chest and down) standing on a chair with her legs in a position forming a caricature of women standing on a chair afraid of mice. On the floor lies a computer mouse. On the side a man is standing, with his hands in his pockets laughing indulgently.

The first article in the brochure focuses on the difference between girls and boys shaped as interviews with male and female computer students talking about differences between themselves. The ingress says:

> *"While women use approximately a thousand words more during 24 hours and wants to "talk about it", boys still prefer when they can do something straight and practical when they are to cope with challenges. Computer and Communication Technology is about both, and in order to get more women to understand how important it is that they study computer science too, NTNU has their own arrangement for women. It is simply called "Women and Computing"."*

In the interview that follows, the students express very stereotyped notions about men and women in general. One of the female students starts by saying that women are more concerned about why they learn what they do and how the knowledge can be used, while boys become absorbed in "gadgets" and technical things. Another female student suggest that women gain knowledge by studying, while boys do it by playing. Women are more afraid of trying out things, she says, and prefer asking someone for help, while boys hesitate to ask others and thus work more at their spare time. She is using quite negative words describing women as "puny" and as "cowards". The male student says that boys might feel that it is expected that they should know about these things, and that they are expected to know more about

computers than women, when they start the study. The other male agrees and suggest that the competition is heavier among the boys, and that is why they want to manage on their own, without asking anybody for help.

Figure 6. Illustrations

The interviews are illustrated with two pictures. One is showing two male students fixing a hard disk, in a bright sharp light. The other picture is a close-up, showing two female students having a conversation with their face close to each other, smiling. This picture is filtered and in a pink colour, and thereby giving a much more cosier and "soft" look. The paragraph between the two pictures says: "Who do you think will get the task of making a system that makes the everyday life more easier for both patients and doctors?"

At least two points can be derived out of this. If we take a look at the course of development in the advertisements, they have followed a quite straight line. It is difficult to find any break away from the dichotomous and stereotyped narrative about men's and women's different practices in relation to ICT. On the contrary, the narrative about men's and women's different ways of relating to ICT are actually strengthened and refined through the different advertisements. The first

one about Tom and Linda can be seen as ambiguous, not explicitly focusing on gender. (Even if we know that the advertising bureau making the advertisement was making an argument about gender.) It also had distinctive humorous touch[8] that the two others lack. The second advertisement, "Circles and Squares", is even more dichotomous and symbolically gendered. The arguments about ICT being about problem solving and human beings are pursued and elaborated in this advertisement. In addition it focuses upon the prosperity related to work in the computer science business, the variety of jobs and the economic benefits. The third advertisement "Winning?" is more extensive and designed differently. However, the content is the same, only shown in more varied ways, as interviews with students, and as articles about different topics. They have also expanded the career argument to include an article about the opportunity for an international career. Also they focus even more explicitly on economic benefits ("Earn more money than your father") and the managerial opportunities, by interviewing a female top manager in an internet company (with four children, of course).

The second point is related to the concept of the double hermeneutic circle (Giddens 1991). Not only the advertising campaigns, but also the research literature is a part of this circle, in which the results become interpreted by the society and incorporated and transformed into popular narratives. The students in the "Winning" brochure talk about the differences between male and female students in a way that resembles very much the arguments used in the previous commercials in for instance "Squares and Circles". Also, much of the research has focused upon these aspects, like the preference for usefulness vs. the preference for playfulness, etc.

This narrative has thus not just been conveyed through the advertising campaigns but also through research done in within the area.

7. Initiative narratives: Common effort, diverging opinions

As mentioned above, the newly elected vice-rector Rigmor Austgulen initiated the 'Women and Computing'. Among its stakeholders, she is regarded as "the woman behind the Women and computing initiative". When I interviewed her about how the initiative started, she said that it was because of her concern about the low number of women in what she perceived as a very important area of R&D. But that was just a part of the incentive. She also saw the initiative as a way to cure the culture at IDI. According to her, the male-dominated environment there had facilitated the dominance of an

[8] It was made by a now very popular author, known for his special kind of humour, a mixture of naivism and irony.

unfortunate hacker-culture among the students. This marginalised the female students and also discouraged others from applying.

The assumption put forward by vice-rector Austgulen, was that a larger number of female students would help to change this culture, because as she said, "*the department did not only want more women, but also more "normal" boys*". This is how she recalled it: "*the initiative was really two-sided. A bad culture had developed and in a way, we did want the women per se, but we also wanted to use the women to change the culture*". Further, Austgulen said she had got signals from the people in the IT industry that they were not really satisfied with the computer engineers they recruited from NTNU. The industry wanted more women as well "*because they wanted computer engineers who could communicate, who could grasp the customer's needs and who could more than just sit in the dark room and program*" . But, said Austgulen, they could not just ask women to apply to the programme, because there was no good reason for women to do so because there existed a hacker culture that was not very attractive to women. In order to be able to attract women, they had do something else. "*We had to advertise, we had to change the programme and to make certain arrangements so that it was guaranteed that we got some attention from young women*". This was how the idea of a female quota occurred.

However, as mentioned above, the curricular changes in the initiative have been minimal. Austgulen admitted in the interview that if it had been up to her, more changes in the curriculum would have been made. That was the one thing she did not achieve, she said. Austgulen mainly blamed the rigid and bureaucratic system at the university. But she also said she had hoped that the staff would be even more willing to move some modules or make some new and different combinations.

Among the staff at IDI, Associate Professor Øystein Nytrø had been a motive power in the initiative. Nytrø belonged to the younger generation at IDI and had been educated there in the 1980s. He was part of a group that was very engaged in the educational strategies of the department, and he had previously been leading a committee engaged in the teaching strategies at IDI. He, as well as some other among the committed younger people, including Guttorm Sindre, had also worked a lot with a so-called "quality reform". This was a reform aimed to apply a more critical perspective in the computer-engineering programme. Nytrø wanted to make the programme more applied and to increase the quality and the level of information in the programme's first year.

When prorector Austgulen brought forward the idea of the Women and computing initiative, IDI was very receptive. According to Nytrø, IDI had "*the motivation, the consciousness and the wish to reform (...) The quota was just a part of a larger plan (...) We wanted to used the quota to bring about changes in the study programme*". This was Nytrø's vision, and the "Women and Computing" initiative fitted into this. In a

way, he was offered the possibility to use a gender argument to legitimate changes in the study programme. The need for a better programme was thus linked to the problem of the missing women:

> *"The nerdish sub-groups dominated more and more. Not only the women disappeared, but also the sensible boys. We were left with people who were unfit in a study that was about making things for people. The candidates did not fit with the profile of the programme. Before the programme used to be gender neutral, and there was a lot of women and a totally different environment. (...) The sub-groups became larger and started to influence the terms of how the subjects were taught. This led to internal controversies: For what purpose do we educate people? What is our product? In addition we got signals from the outside, from the industry, with outspoken demands for "applicable" candidates, which included the ability to look beyond their profession and to work toward other professions. And the question was: How do we ensure this? How be conscious about this in the programme? That is why we wanted subjects like history of science and critical perspectives to be integrated in the programme."*

In this regard, Nytrø shared the concerns about the hacker-culture with Rigmor Austgulen (and was perhaps the one who delivered these arguments to Austgulen?) He was of the opinion that the change in the student body was threatening the development of the programme.

Nevertheless, Nytrø's engagement in the problem of recruiting women seemed genuine and extensive. He had for many years wanted to conduct a initiative where the recruitment problem in computer science was dealt with more generally and at a lower level, mainly by motivating young girls in schools to choose mathematics and science subjects. He thus wanted to increase the pool of women who were qualified to apply. He had hoped this could become a part of the Women and Computing initiative, but it did not.[9] Another hope was that it would lead to a greater focus on educating better teachers in informatics. This did not happen either.

Nytrø admitted in the interview that he had become a bit disillusioned because the basic education did not get the attention he had fought for. He also said it did lead to a withdrawal among the rest of the committed people in the group. "*We were a gang, we had great ambitions, but it was the case of UF (unrealistic framework) (...). One gets a bit disillusioned and gives up*". The reason that it did not work

[9] This has now become a reality, and the 'Computing pilot project' has been going on for two years now. In this project, computer science students are trained to go out in the upper secondary schools and teach and motivate boys and especially girls to choose science subjects and informatics. Nytrø initiated this project. However, he realises now that this is a endless task. He see that what is needed is to politically influence the curriculum and to educate better teachers in informatics, something he thinks that NTNU should be more active in doing. He thinks that what they lack in informatics, is a leading star who can make a stand for the subject. Informatics does not have a position in the educational system, he says.

out was mainly because other influential people at IDI and elsewhere at NTNU were critical and against these initiatives. As Nytrø put it: "*There are always some 'old hawks' that blaze up from time to time to show off. They won in the end. They were the most persistent.*"

However, some changes in the curriculum were made. Nytrø was responsible for the module "Know Your Subject" that was described above. Another modification was the introduction of a module called "IT-intro" that replaced a module consisting of pure programming. "IT-intro" had integrated historical and social criticism and was a module just for the computer engineer programme.[10]

Not all of the staff at IDI shared Nytrø's and Austgulen's view that there was a hacker culture at the Department. Bratbergsengen's urging for more female students was mainly a resource argument:

> *"We thought that our programme did fit women and we also wanted more women into the study. We had professional reasons for wanting more women. You see, we do not only follow the laws of nature here. Computer systems are the work of human beings more than most other things, and we wanted women to contribute in the process as well. Because, even if we deal with technology, we also deal with a lot of other things. We deal with values, languages, communication and visual design. And all this made us want to include the reservoir of ideas, knowledges, values and attitudes that women possess into the discipline. It was very 'deep-rooted'. We wanted more women in order to develop the discipline".*

However, Bratbergsengen denied that a hacker culture had ever been a problem, neither at the department nor among students. The hacker culture, he said, was a myth created by outsiders, especially sociologist (who wanted to make them selve interesting).[11] Nevertheless, he is a bit ambiguous about it because there are some hackers at the department:

> *"There is a small number, but we have never had any need for them, even if there has been attempts to describe it that way.*[12] *My opinion is that they [the hackers] have got undeserved attention. Actually, we should pity them, because they become so single-tracked. But there are not so many nerds, who I really will call nerds, so I don't know ... I see a few of them but ... perhaps they shut themselves out? And you will find those anywhere. (...) But we have no reason to call the ordinary boys at the department nerds. And it is not them [the hackers] who do a good professional job at the outside, because in industry and*

[10] Most of the courses in the first year are large basic science subjects which are common for all engineering students.

[11] Here, he is probably referring to a study that was done at IDI in the end of the 1980s by two female sociologists from NTNU. This study was not very well received among the staff at IDI.

[12] He is here referring to the previously mentioned study that concluded that the hackers were admired for their brilliancy by the professors at IDI.

in the education system, people have to be open and broad-spectred. There are no discipline so broad-spectred as computer science!"[13]

Bratbergsengen emphasises that the hackers or nerds are neither important to the department nor representative for the male students. Therefore he also admits that the advertising campaign has been unfair towards the male students:

"Yes, it is unfair! It is unfair to the male students because I think they more or less have the same values as the females, actually. A bit modified. (...) That brochure was maybe ... perhaps it was the price we had to pay ... in order to push things to extremes. I think the male students coped, but it has not been fair to them (...) the world isn't fair."

The fact that relatively few of the women who started at the programme, had dropped out, he interpreted as if the female students were satisfied with the study, both socially and professionally. He did admit though that they had made some adjustments because of the women, in the teaching capacity and the technical equipment. However, this was basically because of the responsibility they felt towards the women, because they in a way were specially invited.

Professor Conradi, who was Head of Department at the time when the initiative started, shares Bratbergsengen's views. Conradi collaborated with Austgulen in the preliminary stages of the initiative and during its first year. He relates the hacker culture to the school system that focused too much on programming when they introduced computer science and the diffusion of home PCs during the 1980s. This was, according to him, what created the hacker culture, and it has nothing to do with IDI. He too emphasised the importance of educating broad-spectred computer engineers.

As we see, Bratbergengen's version and Conradi's interpretation of the initiative is slightly different from Nytrø's and Austgulen's. They did not see a need for a change of the curricula or the ICT technology, but rather assumed that female students would learn to appreciate the programme as soon as they were admitted. He sees the high number of female students now as proof of that. Bratbergsengen's version of the initiative conceptualises it in a way that makes it closer to the third position in Cronin and Rogers' conceptual framework (see the introduction). Here, the main inclusion strategy is to promote equal opportunities for women, rather than change the culture or the curriculum. However, the latter was Nytrø and Austgulen's vision in the initiative.

The alliances that were made through the initiative are also quite interesting. Austgulen pointed out her feminist motives, but she also referred to her concern about the hacker culture at IDI. Nytrø showed a

[13] Inteview with Kjell Bratbergsengen.

great commitment to the need for a revised curriculum, and he saw the Women and Computing initiative as an opportunity to achieve this. Also, the argument in support of curricular reform is referring to the hacker culture and the problem of recruiting women. Bratbergsengen and Conradi wanted to expand the department by raising the number of students. The Women and Computing initiative was a great opportunity to do that (and at the same time be politically correct). Thus, the stakeholders had complex and slightly varied motives for their engagement. However, these motives did overlap and the overall goal was the same.

On the other hand, the initiative did meet with a very strong opposition and a lot of criticism, especially from students at NTNU. Most of the critique came from students outside the department. According to the stakeholders this contributed to unite the IDI.

> *"It [the criticisms] contributed to unite the students and staff at IDI, since it more or less came from the outside. It joined and united the environment.*[14]

> *"It was no disagreement among the staff, as far as I remember. Everyone supported this, we had a general meeting among the computer science students and mathematics students. The students, who were most involved, were most positive. (...) The majority of lecturers, research fellows, students and the administration have been positive toward the initiative. It does expose the whole environment, right? It is a very good way to reach out."*[15]

It also merged the Rectorate and the IDI in their common strive. Rigmor Austgulen emphasised how the support of the staff at IDI had been invaluable in the most turbulent stages of the initiative.

> *"At the Department of computer and information science the students were very supportive of the initiative. And I had a couple of the staff that were very supportive in this fight. Whenever I needed information they would work day and night to provide what I needed to be able to appear on radio or give presentations. So when you are taking such an initiative, you are very dependent upon people supporting you backstage."*[16]

Some of the criticism that was raised, was not entirely out of place. The initiative was decided very quickly, and Øystein Nytrø commented ironically:

> *"It was a pure abuse of authority. Everything was done in advance, and then we took the criticism afterwards. At least it is a obvious way to get things done! (...) Austgulen received a lot of shit, but she swept people away ".*

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[14] Interview with Øystein Nytrø.
[15] Interview with Reidar Conradi.
[16] Interview with Rigmor Austgulen

Despite the critique (or perhaps as a response to it?), the initiative is regarded as very successful by all stakeholders. Øystein Nytrø, who had hoped for more far-reaching changes, with a greater focus on recruitment of younger women to science subjects and more curricular reforms in the programme's first two years, may be an exception. As mentioned earlier, Austgulen was also satisfied with the initiative, even if she admitted that she wanted more changes in the curriculum. However, she said she realised that this was not done in a tick, and that they probably got the maximum from the initiative, considering the rigid and bureaucratic structure at the University.

8. The anatomy of the inclusion strategy

As shown, the Women and Computing initiative planned and implemented a variety of actions and attempts to include women into the computer engineering programme. How may we understand these activities, and how do they relate to the inclusion strategy? What is really the inclusion strategy here?

Sørensen's (2002) conceptualisation of inclusion reaches beyond a seemingly standard perception of it as mainly being about recruitment. He argues that inclusion may as much about *socialisation* processes as it is about recruitment. While recruitment is about getting on the inside, the concept of socialisation reminds and explains the needs related to *remaining* inside, getting accepted and becoming familiar (Sørensen 2002:3). Thus, the performed inclusion strategies should be expected to have a bearing on identity shaping and practices, recognition and well-being of the female students within the computer-engineering programme.

With reference to the Women and computing initiative, we observe that there are three types of instruments used in recruitment: Giving information about the study programme, convincing or seducing potentially able women to apply and to allocate quotas for them. Similarly, the socialisation part in this case consists of reforming the curriculum, improve the quality of teaching and make sure the social environment is satisfactory for the students.

If we try to place the concrete activities in this conceptual scheme, they may be placed like shown in figure 7, which summarises the anatomy of the inclusion strategy as a whole. Using this as an analytical backdrop for the analysis of inclusion strategies in the Women and Computing initiative we can make an "anatomical figure" of the inclusion strategy used in the initiative (see figure 7).

Figure 7 represents an effort to give an overview of the main features of the inclusion strategy that was developed and implemented in the Women and computing initiative. We see clearly how this initiative combines several inclusion activities. Above all, it is important to note that probably, there is no single inclusion activity that could

produce the same achievements as this initiative did. Even if there are diverging interpretations of the "real" content of the inclusion, everybody seemed to agree that the initiative was successful.

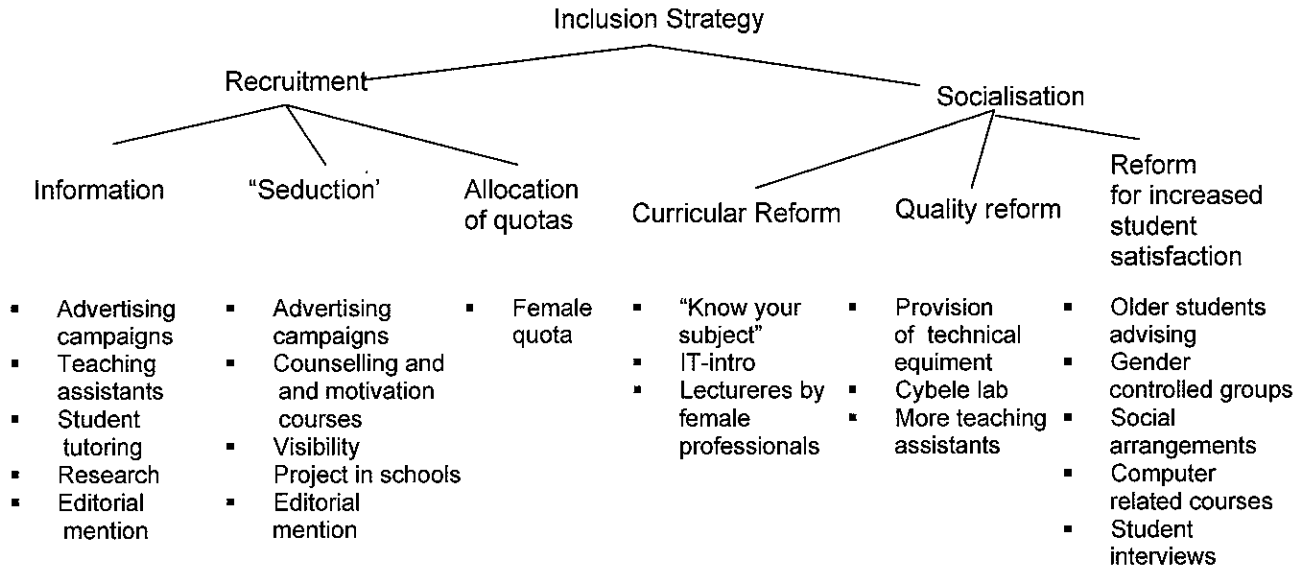

Figure 7. The anatomy of the inclusion strategies of the initiative.

Returning to Cronin and Rogers' conceptual framework, they argued that their position 5, changing the culture of science, engineering and technology, was the progressive one. This position allows a critical discussion of ICT as well as gender. Concerning the Women and computing initiative, the aim related to the programme to include a more critical approach and also to include women's perspectives as a way to change the subject, is in line with the understanding of science and technology as cultural constructions.

Arguably, the ideology of the "Women and Computing" initiative seems to be quite close the ideology proposed by Cronin and Rogers. The fact that the some of the stakeholders, like Bratbergsengen and Conradi, have arguments that point in a different direction does not necessarily change this impression. This is above all due to the fact that the inclusion strategy is an outcome of negotiations.

However, the seemingly very successful inclusion strategy appears to build on assumptions regarding the gender and ICT relationship that is quite problematic. A main problem is the lack of symmetry in the normative understanding of the shaping of gender and

ICT. ICT and in particular, the computer science culture, is by Austgulen and Nytrø seen as socially and culturally constructed in a way that needs to be changed. Gender is, on the other hand, more of a given quality. Nowhere in the Women and computing initiative do we find the assumption that women need to be changed. Rather, the essential and quite traditional qualities ascribed to women are used as arguments to get more women into computer science. The hacker problem is more or less assumed to go away when confronted with a sufficient number of female students. The thought that women could be hackers is impossible.

Consequently, in the Women and computing initiative there is a clear tendency to naturalise gender, in particular the female gender. This is especially well illustrated through the advertising campaigns. Women are attributed progressive qualities just because they are women. They are thus invited to take part in the computer science profession, not because they really are interested in computer science, but rather because of some female essence. Austgulen and Nytrø wanted the initiative to change the culture in the department by using women. An interesting feature here is that the naturalisation of gender is basically limited to women. Men, whether they are "hackers" or making squares anyway, are actually objects of potential change, due to the positive impact of "natural" women. The campaigns we looked at also ridiculed men and accused them of being hackers, perhaps as a way to invalidate the potent force in the masculinity-technology constellation. Thus, the male gender is also in need of re-shaping. The asymmetry of the shaping of gender and ICT in the Women and computing initiative is not just theoretically problematic. Also the political implications are questionable.

Let us briefly consider the efforts to do a rhetorical reshaping of computer science on the basis of the advertising campaigns. What we see is very much an image of computer science where computers have been moved backstage. Assumed female qualities, like communication skills, orientation towards usefulness, and understanding people, are used to provide new metaphors for the profession.

Clearly, in terms of recruiting and retaining more women in computer science, this is a success. The redefinition is a way to position women in the ICT discourse as carriers of competence really needed by the industry. Thus, it creates space for women in the computer science profession as particularly useful people. It might also serve as an argument to legitimise their presence within the profession, without having to use the equal opportunity argument alone. So, in this sense it might be viewed as a highly politically correct project to focus upon assumed traditional femininity as an important and valuable characteristic for being a good computer professional.

However, the resulting naturalisation of the female gender also run the risk of recreating a traditional figure of argument in gender and

politics, namely the relationship of nature/femininity versus culture/masculinity. History has shown that when femininity is translated into nature, it looses out to the identity of masculinity and culture, an identity based on efforts to create rather then just to display. To compete as a woman with mainly features of nature, with men that are struggling to produce cultural artefacts is a loosing proposition (Woodfield 2000). To social scientists, it might also be ironical that the way women's competencies are depicted in the initiative, women - by force of nature - becomes an alternative to the introduction of social scientists as part of multidisciplinary teams in the development of computer systems.

A final question is related to the asymmetry of the gender analysis in the Women and computing initiative. Do we believe that these gender stereotypes ("technical/non-technical") within computer science can be dissolved isolated from the "rest of the world"? If we take gender theories about the mutual and symmetrical shaping of masculinities and femininities seriously, how politically wise is it to hold on to some gender stereotypes, because we think of them as tools to realise what we see as important positive political goals? Clearly, there are considerable costs in the long run, since the use of rather strict gender dichotomies will contribute to the reproduction of dichotomous thinking and facilitate the use of rather traditional gender stereotypes in order settings. These are questions that may prove rather critical in the evaluation of the Women and computing initiative and its overall efficiency as a strategy of not just including women in the information society, but reforming gender relations in general.

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