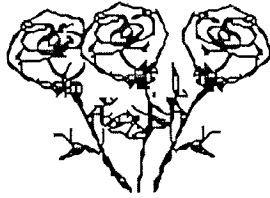# A Feeling for Systems Development Work
– Design of the ROSA Project

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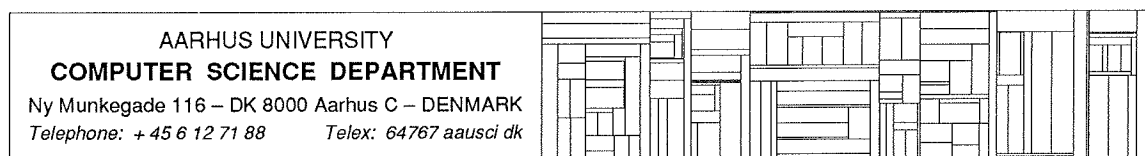
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Abstract: This article is based on the design of a research project that will look at intuition, learning processes, language and roles in the development of computer systems. The research project, called ROSA (a Danish acronym for Roles and Cooperation in Systems Development) grew out of our interest in the informal working practices among systems developers, because it is these informal working relationships that are most often overlooked in research about computer science methods and tools.

The project applies a gender perspective to look at the informal work relations of systems developers. The concept of a gender perspective means that we do not intend to look for, or prove, the existence of differences between men and women, but rather to use gender awareness to 'listen to' and get a 'feeling for' how systems developers work together. Our research methods are interdisciplinary and based on action-oriented, participatory methods that help system developers reflect on their own working practices.

The article reports on our theoretical starting points and on the design of the research project. The empirical research will be reported on in a forthcoming document. This article was prepared for the IFIP 9.2 Conference on Women, Work and Computerization, April 1988, Amsterdam.

The Abacus and the Rose

I, having built a house, reject
the Feud of eye and intellect,
And find in my experience proof
One pleasure runs from root to roof,
One thrust along a streamline arches
The sudden star, the budding larches.

The force that makes the winter grow
its feathered hexagons of snow,
And drives the bee to match at home
their calculated honeycomb,
Is abacus and rose combined.
An icy sweetness fills my mind,

A sense that under thing and wing
Lies, taut yet living, coiled, the spring.

J. Bronowski, *Science and Human Values, p.119.*

As teachers and practitioners of systems development[1] we are, of course, caught up in the whirlwind of debate about how computer specialists and users can better interact with each other. This debate is not new. The spread of personal computers and workstations in the '80s along with the accompanying pre-packaged software applications have clearly brought computer "users" into the forefront of discussion. In fact, the increased knowledge, and to some extent influence of users, has reshaped the lines of the old debate. The issue is no longer whether users should be involved in computer system design, but rather, how their knowledge and experience can be put to good use. And more importantly, from the perspective of computer specialists, the question of how to design systems for, by and with users, has rightfully dominated the debate.[2]

These issues were running through our heads last summer while we were attending a working conference on design and use of information systems. In the midst of the three day conference we were struck by the fact that while the debate had shifted to enfold users' interests, the methods and suggestions were stuck firmly in the historical frame of computer science and its reliance

on formal problem-solving. Presentation after presentation addressed the need to find new methods to build better bridges with "the users". But like engineers building bridges, the solutions mostly seemed to focus on quantifiable techniques to *solve* the problem of user-involvement.

The reliance on formal methodology is not new. What was new, however, was our intense desire to climb outside the frame of formal model building and to set up a research project to highlight the *social construction* of computer systems and to pay close attention to the often overlooked *informal* nature of systems development work. The ROSA project,[3] as a small pilot study, was born of that moment. It was one of those points in time when one simply has to stop complaining and "go out and do something" about the situation.

The "something" we chose to do was to construct a research project where we would ask systems developers to reflect on their working practices. The systems developers themselves, with help from researchers, would actively participate in *noting* their ways of working together and seeing if *conscious* awareness of their discussions would provide them with an useful base to influence the way they interact. While we were, and are, keenly interested in the interaction between system developers and users, we thought that our best starting point was within the terrain that we knew the best – the working practices of systems people themselves. This pilot project can, perhaps, serve as a bridge to other studies focusing on the interaction of users and systems developers.

What we present here is first, a discussion of our theoretical base and points of departure for doing the project. It represents for us our 'feeling' for the way systems work is done. And like all feelings, it rests on our past experiences. The second part outlines the research project itself. While many people note that the emphasis on social interaction and informal working practices reflects women's values, our *focus is not on supporting arguments about the differences between the way men and women work in this field.* Rather, we have chosen to use a *gender perspective* as a way of organizing our thinking and, most importantly, as a pattern for carrying out our research. As Bronowski's poem tells us, we 'reject the feud of eye and intellect', and hope to find our way through the 'honeycomb' to see 'abacus and rose combined'.

Our Starting Point

Evelyn Fox-Keller's *Reflections on Gender and Science,*[4] nicely points out how societally-shaped notions of men and women strongly influence the way that science is done. In her work she shows us, both historically and in practice today, how these notions or myths place women and men on binary poles where their differences are emphasized in the questions asked by scientists and the methods used to answer those questions. These binary poles, or dichotomies, shape the man's world as rational, objective, and quantifiable, while the woman's sphere is painted as emotional, subjective, intuitive and qualitative. As with all myths, their validity is certainly not the issue. What is at stake is the fact that they shape our consciousness and therefore our behavior.

We quite agree with Fox-Keller's analysis, and, as illustrated in Joan's article entitled *The Head and the Heart* [5] we see clear examples of the ways that these myths effect the development of computer systems. But, and this is an important point of departure for us, we believe that emphasis on the dichotomies gets us stuck within the frame of only analyzing the differences between men's and women's practices. It unfortunately leads us back up the trail where we find ourselves, once again, looking at "women on a pedestal" or "women as victims". A great deal of the literature about women's work behavior has been trapped into explaining or bemoaning differences using a *sex-role model analysis.*[6] We feel that this was not Fox-Keller's intention, and nor is it ours.

Instead, we look at the *working relationships* for both men and women system developers. In doing this we will focus on four aspects of informal working relations that often are associated with women. These four: intuition (which, for us, is experience-based use of practical understanding) learning processes, language use and roles (ways of acting in different situations), form the themes of our research project. Using these themes as a working definition of informal work relations lets us highlight aspects often kept out of the research spotlight.

While these themes help us focus on working relations that traditionally fall on the woman's side of the dichotomy, we do not do so to claim some pre-

conceived pattern. As practitioners of systems development we don't feel that an increase, for example, in the use of intuition as such would make better computer specialists of us all.

We are women, who work as researchers, and whose interests lie in constructing useful computer systems in ways where we can support rather than compete with each other. This statement about *who* we are says alot about the way we see ourselves in relation to *what* we do. Perhaps, it characterizes the main points of the gender perspective we apply to our work. Fox-Keller, in describing the research of Barbara McClintock, also describes a research method of 'feeling for', or 'listening to', the subject of the research.[7] Barbara McClintock, a well-known, although un-conventional cytogeneticist, marked her research with a strong belief that one should be "letting the material speak to you". Instead of descending on a research topic with sets of preconceived categories, McClintock choose to think of herself as being part of the material. For her, scientific work was living and being involved in the subject matter, or what she referred to as "a feeling for the organism".

We hope to work in a similar way. Our *gender perspective* starts from our personal involvement in our work and uses this involvement to frame the questions, issues and hunches that we feel are important in the construction of computer systems. In this way, we begin on the "women's side" of the gender dichotomy, but try to use our conscious awareness of this to frame the direction we want to go in. We firmly believe that the material conditions of our work (i.e. that we are *women* who work as researchers in computer systems development) shape our consciousness about our work.[8] All research is, of course, affected in this or similar ways. Our starting point is to use this awareness as a conscious function in the research design and outcomes.

The ROSA project then, develops from this perspective: as women, we highlight the informal, social and supportive aspects of computer system design; as researchers we are constructing a project where the participants speak for themselves and where the research methods reflect their values and opinions; and as systems developers we are interested in ways that people can effectively work together in constructing new applications. In fact our starting point wraps itself around to become our ending point. For our belief is that our perspective and research approach can be useful for systems developers in their work.

Our purpose is not to recommend a new systems development method, or to suggest appropriate tools for better system design. We believe that this emphasis on finding the right solution to the correct problem is too strongly rooted in the technical, scientific (and mainly male) side of the gender dichotomy. It has formed the building blocks of both 'good research' and 'good systems design' for quite some time.[9] The idea that the right solution can be found is a myth that lingers on. Indeed, it was at the conference that we mentioned last summer, that the constant repetition of this myth led us away from the one-solution path. We have chosen not to follow any one, specific path, but rather to find our way through a terrain that, hopefully, bends its way around the poles of gender mythology. By letting systems developers speak for themselves, we hope, that like Barbara McClintock, we can learn to 'listen' and get a 'feeling for' their work.

Myths, myths and more myths

The phrase 'women's intuition' has the power to allow women to use and acknowledge their intuition, as well as the pain of stigmatizing women's conclusions as 'hunches' or 'not logical'. In a similar way, the idea that men are rational and objective gives weight to their conclusions, allowing them a positive, persuasive power. Yet, at the same time, it may hinder men in making them feel that they must perform in these predefined rational ways.

These and many similar stereotypes are reenacted at work every day in the ways people relate to each other and reflected in the things that are said. In many situations they are played out as roles, or forms of behaving in different situations. The power of the mythology behind these stereotypes influences much in our daily working lives. The 'good' or 'nice' girl is a role that women are socialized into. Daily, she appears in work situations where, for example, a disagreement threatens a deadline for completing part of a project, and a woman, as systems developer, may be expected to smooth things over by playing this part. The 'capable' or 'clever' guy may be played in the same situation.

There are a variety of myths about women in technical fields that have found their way into computer systems design. Most focus on the fact that women

are not interested in technical details, but rather in social interaction. A new version of these old arguments has appeared in the form that women make good (better) project leaders because of their social skills. These stereotypes are often used to *explain* things, like why there are so few women in the computer field, or why women have not advanced very far up the organization/technical ladder, and, more recently, why women should be project leaders. Using socialization and stereotypes as a way of explaining events seems rather like circular reasoning to us.

What interests us here is that these stereotypes push people into believing or behaving on one or the other side of the gender dichotomy. 'Women as better project leaders' plucks women out of the ordinary world and places them right up there on a pedestal – the very place that the women's movement has worked hard to show is not where we want to be. For we all know that the woman on the pedestal can be easily pushed off, if she makes a mistake. And 'women as not interested in technology' moves in the direction of 'woman as victim', where women are denied jobs or promotions because they supposedly lack this interest and skill. In dealing with myths we find it important to consider the difference between the (gender) roles *ascribed* to a person, and the (gender) roles with which the person herself *identifies*:[10] A male manager, for example, may well see (ascribe), a woman as a " sweet girl", but in her work situation, she sees (identifies) herself primarily as a good systems developer. Looking at ways that systems developers identify themselves may help understand how people behave outside of stereotypical roles.

In the ROSA project we will be looking at a specific system development project in a large company where 20% of the system developers and programmers are women. We are focusing on the working relationships among all system developers, keeping in mind the ways that gender may cause possible differences or be an influencing category. We will ask people what they think about these myths and stereotypes, but we can reasonably expect that the women who have been successful in these positions have, themselves, steered a path between gender myths. In our own experience we find that we are both interested in technical details, and in developing the social contacts that keep a project running smoothly. Our personal experiences and those of men and women we know in the field have formed the basis of the ROSA research design.

Description of the ROSA Project

The ROSA project is set up as a small pilot project to study the work processes of systems development. By looking at the themes of *intuition, learning processes, language and roles* , we set the stage for getting a feeling about informal working practices. These themes are outlined here. In addition to the themes, we have chosen a range of research techniques that bring together a group of inter-disciplinary researchers in order to get a variety of qualitative interpretations. The research methods include *conversation analysis, observation, participant-observation, in-depth qualitative interviews and workshops*. The methods are briefly explained here also.

An important consideration in designing the project in this way, was the fact that we wanted to let the participants speak for themselves. In our double roles as researchers and systems developers we knew that the systems developers we studied should play an active part in reflecting and interacting within the research project. Thus, the use of workshops and participant-observation were intended to let the participants set their own agenda. Researchers, like systems developers, go in and out of a workplace, often leaving behind a wake of 'subjects' whose interests are cut off, as if they were suspended in time. We felt that the project could be seen as a set of action-based themes and activities that would help the participants as well as the researchers, explore the issues from the perspective of their own experiences.

One of our first steps was to outline some central questions about the themes of our work. We illustrate a sample of these here, along with our working definitions of the themes:
• what is the role of *intuition* in the development of computer applications? what does it mean to act according to intuition, or to use experienced-based knowledge in systems development - how does that contrast and supplement the use of formal methods?
• what *learning* takes place during the development process? learning about what (work practice, new methods and other aspects concerning the *process*? and learning about the work of users, the technology and other *product* oriented aspects?) how do systems developers teach each other?
• what types of *languages* are used by systems developers in their daily work

and in their meetings? in relation to each other, to management, and to the users.

• what *roles* are played by systems developers as they adapt to work with users, the equipment, and in meetings?

We began our working definitions with the concept of *language,* because we see language as action. Rather than viewing language as just an exchange of information, we see human activity as involving language games[11]. Language games capture the ways we participate and how we make commitments. They are different for different groups and reflect different *roles.* Language then, reflects the relation between individuals, and groups. In systems development, the participants always take part in new language games: the developers deal with users who, under normal conditions, are part of other language games, and have different backgrounds. For this reason it is important to see design as an ongoing *learning* process, where the different backgrounds of the participants is an ever-lasting concern, yet, at the same time a source of learning and change.

Intuition is not a matter of magic, but of practical knowledge or 'know-how'. While intuition is usually associated with some kind of instant insight, we see it as an impression of how people use their experience to react in different situations.[12] And *roles* are the way people adapt as their situations change. Roles usually reflect people's values and assumptions. Like language, learning and intuition, roles point to the overt and informal ways that people react within the formal organization of developing computer systems.

A never-ending characteristic of systems development work is that it always changes. People caught up in the process of designing and constructing computer systems find themselves in new situations, adapting as best they can. Sometimes project deadlines change, often design descriptions change, and most often, decisions are made by others that effect what work is to be done. Having experienced the chaos of constant change ourselves[13], we hope that the ROSA project can help shed some light on it for the participants and for other system developers and researchers.

Our themes have led us in the direction of looking at *situation-based action* and the process of change. Within this framework we will use a broad con-

cept of roles to examine how people adapt. We might expect, for example that traditional 'boy-girl' roles may enable system developers to adapt to some situations, but that in many other areas they use a wide variety of other, non-gender based behavior. As the following discussion of our research methods shows, the techniques attempt to let the participants identify their own issues.

Our use of multidisciplinary techniques puts together a research toolbox that includes: conversation analysis from linguistics; qualitative interviewing techniques from the humanities; and action-based workshop methods[14] from the social sciences. *Conversation analysis and observation* of different meeting situations will be used in order to focus on language and roles. The in-depth *interviews* with systems developers will be applied to focus on their work life, home life, qualifications, and of course, their feelings about their work. And *participatory workshops,* using techniques like role-playing, diaries, story-telling, and future workshops[15] are intended to help the system developers raise issues that are important to them. The workshops will focus on the questions raised in connections with the project themes. With this wide net of techniques, we hope to learn more about the social interaction of systems development projects; an aspect which is often neglected in systems development methods and theory.

This pilot project will take two research months. Here is an overview of the activities we are involved in:

1. *Organizational analysis* – a study of organization charts, project group structure and history of project objectives and changes in work organization, including organizational culture, and interviews with project and group leaders.

2. *Conversation analysis and observation* of project group meetings – tape recordings and observation of selected group meetings plus tape recordings and observation of selected work situations.

3. *In-depth interviews* with group leaders and system developers – interviews of approximately 2 hours each with 6-9 people concerning their reflections about the project themes (intuition, learning processes, language use and roles).

4. *Workshops* with system developers – 6 workshops of 2 hours each. The workshops, combining the methods discussed above, will include participants from the in-depth interviews. There will be an equal number of men and women in the workshops, with two workshops where the men and women will be asked to discuss the issues separately.

The company where the pilot study is conducted has its own Systems Development department. The computer system that we focus on aims to provide computer support for financial functions in all branches throughout Denmark (more than 3000 users). The systems development work is being carried out by approximately 30 systems developers, organized in smaller groups with different tasks, and managed by group leaders. The group leaders refer directly to the project manager. Contact with future users is maintained through a reference group, consisting of experienced users selected from the business branches. The systems developers are trained either as business assistants with additional systems development training, or as programmers, engineers, or computer scientists. They equally participate in all aspects of the development and implementation process, with little or no division of work between systems analysis, design and programming.

Discussion and expectations

The project is intended as only a very limited pilot study. We feel that it is a good place to start, because we need experience with the toolbox of methods that we are using, as well as preliminary feedback from systems developers. Barbara McClintock describes her "feeling for the organism" as an experience where "I wasn't outside, I was down there – I was part of the system".[16] We hope that our research methods can help us 'get down into' the experience of systems development work.

Accounts of these kinds of empirical investigations are almost absent in literature about technology. We feel that this should be rectified from both a feminist and a systems development point of view. In the feminist 'world' there are many accounts of women as victims of technology, but few of women as active participants in the shaping of technology. In the systems

field there are an almost endless number of books about how systems 'should' be constructed, but not about how work is actually done.

In order to fill this empirical gap, our research questions, focus on three general areas:

1) What are examples of some of the informal working practices used by systems developers in the design of a large system? How do informal practices support or contrast with formal project organization and methods?

2) How does a gender perspective differ from general multidisciplinary research efforts? Does it let us 'listen to' the systems developers, and is this useful for better understanding their working-practices?

3) Will our research toolbox be useful to systems developers? Can they use both our research methods and outcomes in their work?

Systems development theory in general, seems to be moving in a direction away from formal methods to situation and experience based action[17], but there is very little empirical work focusing on these aspects of systems development. In fact, as systems development theory moves away from formal, science-based methods and questions, it begins to move into the open, undefined territory between the gender myths. Formal, scientific computer systems methods were clearly associated with the 'male' side of the gender pendulum. As system developers lose some of their reliance on 'the right solution' and move to embrace a wider range of methods and
perspectives, the possibility for effective change, can, we believe, increase. We hope that both our toolbox of methods and our use of a gender perspective can be useful to systems developers in their daily work.

Footnotes

[1] We will use the terms system and systems development even though these terms as such reflects a certain view of computer applications and their development and use, which has its roots in the rationalistic tradition discussed by Fox-Keller (see below). The reason for using the terms is mainly familiarity. If the reader prefers, the term system can be substituted throughout the text by the term application.

[2] Bjerknes, Gro et al., ed.: *Computers and Democracy – a Scandinavian Challenge*, Avebury 1987.

[3] The members of the ROSA project are Berit Holmquist, Randi Markussen, Regine Hansen, Lisbeth Rasmussen, and Tage Stephansen, and the authors. The actual research scope of the project is broader than that described in this article. Our focus here uses a gender perspective to look at system development work. Other research perspectives include frames of reference from organizational theory and linguistics. The ROSA project was born out of the research program on computer support for cooperative design and communication at the departments of Information and Media Science, and Computer Science at Aarhus University.

[4] Fox-Keller, Evelyn: *Reflections on Gender and Science,* Yale, University Press, 1985.

[5] Greenbaum, Joan: *The Head and The Heart*, DAIMI PB-237, Aarhus University 1987.

[6] Kvande, Elin and Bente Rasmussen: *Who Lacks Courage-The Organizations or the Women?*, in *Women Challenge Technology*, Vol. II, European Conference on Women, Natural Sciences and Technology, Elsinore, Denmark, 1986.

[7] Fox-Keller, Evelyn: *A Feeling for the Organism: The Life and Work of Barbara McClintock*, San Francisco, W. H. Freeman, 1983.

[8] Of course the works of Karl Marx on materialism represent a rather well-documented example of this way of thinking.

[9] Op. cit. Fox-Keller, Greenbaum.

[10] Cockburn, Cynthia: *Machinery of Dominance. Women, Men and Technical Know-how*, Pluto Press 1985.

[11] The reader may think of Wittgenstein's definition of language games (Wittgenstein, Ludwig: *Philosophical Investigations*, Oxford University Press 1953). For our purpose here, a specific understanding of the term is less important than the notion of situated action and language as action.

[12] See for instance Suchman, Lucy: *Plans and Situated Actions: The problem of human-machine communication*, Xerox ISL-6, 1985, Winograd, Terry and C. Fernando Flores: *Understanding Computers and Cognition: A New Foundation for Design*, Ablex Publishing Comp. 1986.

[13] See Greenbaum, Joan and Lars Mathiassen: *Zen and the Art of Teaching Systems Development*, DAIMI PB-238, Aarhus University 1987.

[14] Different action oriented approaches similar to ours are described by Freire, Paolo: *The Pedagogy of the Oppressed*, Herder and Herder, New York 1971 Engeström, Yrjö: *Learning by Expanding*, Helsinki 1987. In our version it has roots in the Scandinavian trade union projects (see Ehn, Pelle and Morten Kyng: *The Collective Resource Approach to Systems Design* in Bjerknes, op.cit.).

[15] Future workshops are described in Jungk, Robert and Norbert R. Müllert: *Zukunftwerkstätten, Wege sur Wiederbelebung der Demokratie*, 1981 (Danish version *Håndbog i fremtidsværksteder*, Politisk Revy 1984). We are strongly inspired by this way of facilitating brainstorming. We will, however, not apply Jungk and Müllert's method too strictly, but try several different techniques.

[16] Fox-Keller, Evelyn: *Women, Science and Popular Mythology*, p. 141, in Joan Rothschild, ed.: *Machina Ex Dea,* Pergamon Press 1983.

[17] Floyd, Christiane: *Outline of a Paradigm Change in Software Engineering*, in Bjerknes, op. cit., Ehn, Pelle: *Work centered design of Computer Artifacts*, Aarhus forthcoming, Bødker, Susanne: *Through the Interface – a Human Activity Approach to User Interface Design*, DAIMI PB-224, Aarhus University 1987, or Winograd and Flores, op. cit.

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