

Knowledge Creation Through Collaborative Research: An Emerging Model

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1. Introduction

Knowledge creation through the development of mutually productive forms of collaboration between research and practice, has for a long time been an important issue for researchers as well as practitioners in different sectors of working life. In the social sciences there is a long tradition of criticism of traditional research models, and a corresponding interest in different models of action-oriented and collaborative research (e.g. Argyris, 1980; 1993; Clark, 1976). However, in spite of the enthusiasm for collaborative research models in many quarters, and not least in Swedish working life research (e.g. Brulin & Ekman Philips, 1997; Gustavsen, 1990; Sandberg, 1981), the scientific value of collaborative research has not yet been fully accepted by the social science research community.

Rather, the ideal typical research model within mainstream social science research still appear to be very much influenced by the traditional concepts of basic and applied research; a linear model of the relationship between theory and practice; and a role model of the researcher as basically detached from the field of practice, a role with roots in the nineteenth century ideals of Wilhelm von Humboldt (Brulin, 1998; cf. also Sörlin, 1996). Furthermore, much of mainstream social science research is strongly rooted in scientific and epistemological ideals emphasizing an objectivistic, decontextualized, and universalistic view of scientific knowledge (cf. what Bourdieu, 1998 criticizes as the scholastic point of view).

From such an objectivistic perspective collaborative research is characterized by a number of difficulties and alleged flaws. A classical criticism

concerns the potential threats to "objectivity" and, thereby, also to the validity of the research results, due to the involvement of the researcher in practical activities. On the other hand, there are also counter arguments to the effect that a collaborative relationship between researchers and practitioners may contribute, first of all, to a better access to important processes, but also to more valid data compared to the more authoritarian relations that often underlie traditional research models (Argyris, 1980).

A perhaps more serious criticism against action-oriented and collaborative research models concerns the risk that maximizing, for example, the contribution to practice, tends to minimize the contribution to research, and vice versa (Sandberg, 1981; Seashore, 1976). By implication, there is the risk, as stated by Seashore (1976), that the notion of collaborative research becomes a justification for practical development work masquerading as research, and, conversely, for research being reduced to a more or less trivial service role.

How, then, can this dilemma be resolved or at least handled in a satisfactory way? In other words, how, if at all, is it possible to carry out collaborative research in a way that is productive both from a practical and from a scientific perspective? Although much has been written about action-oriented and collaborative research, there is a lack of empirically based studies concerning the advantages and disadvantages of this research approach.

In the text below, an emerging model for interdisciplinary and collaborative research on technical and organizational change in industrial settings is presented and discussed. The model, which has been developed through a series of long-term research efforts carried out in co-operation between the present authors and a number of Swedish industrial companies, represents an attempt to deal with some of the classical criticisms against collaborative research that were mentioned above. Through a presentation and analysis of the development and use of this model, the purpose of this paper is to contribute to our understanding of collaborative research, how to organize such research efforts, and some of the trade-offs that may be involved.

The paper is organized in five sections. After this introductory section, the concept of collaborative research is defined and discussed in section 2. In section 3, a case study is presented based on a collaborative research effort carried out at a company within ABB Sweden (ABB Stal AB). In the last two sections (4 and 5) an attempt is made to interpret and discuss the implications of this case study in more general terms.

2. The Concept of Collaborative Research

With certain ups and downs action-oriented and collaborative models of research have been part of the social sciences at least since the 1930s and onwards (see e.g. Chein, Cook & Harding, 1948), with perhaps its most intensive and creative period during the 1960s and 1970s (Clark, 1976). However, in spite of its long history, it seems as if the collaborative research approach never really got off the ground. Still, the separation of social science and practice is strongly institutionalized.

However, at the same time, there are signs of ongoing changes (and proposals for change) towards a stronger integration of research and practice (e.g. Etzkowitz, 1998; Sörlin, 1996). Specifically, in the Swedish context there is a legal requirement on the universities to engage in co-operative efforts concerning education, research and development with companies, agencies, different kinds of associations, and other organizations (the so called third task of the universities). With respect to the field of working life research, it has also been argued that this new legal requirement on the universities may prove to be an impetus to a new model for research, development and innovation based on a collaborative model of knowledge creation and use (Brulin, 1998), a model which appear to come close to the concept of collaborative research as used in this study.

What, then, do we mean by the concept of collaborative research? As used here, this concept is constituted by at least two basic ideas, called the idea of the threefold task and the idea of knowledge creation through interactive co-operation between researchers and practitioners (cf. Brulin, 1998), respectively.

2.1 *The Idea of the Threefold Task*

The first of these two basic ideas, i.e. the idea of the threefold task (cf. Ellström, 1984; Rapoport, 1970) refers to the idea that collaborative research aims to contribute *both* to practical concerns, e.g. how to handle practical issues in relation to the management of change, *and* to the creation of scientifically acceptable knowledge, e.g. new concepts, theories, and models. In addition, a third task may be included in the definition of collaborative research, namely the educative task of enhancing the competencies of the parties involved in the research process through processes of dialogue and experiential learning.

As argued above, a common problem, or rather dilemma, of collaborative research is the tendency to emphasize one of these tasks at the expense of the

others. Depending on which of the tasks that is emphasized, collaborative research may, in practice, be reduced to a strategy for problem solving and change, a research strategy, or an educational strategy. The position taken in this paper, is that the comparative advantage of collaborative research is its potential for combining and integrating the concerns of research, practice, and competence development. Of course, this is also where the problems start.

How, then, is it possible, if at all, to accomplish this threefold task, and, thus, to avoid the risk of, for example, maximizing the interests of practice at the expense of the interests of research and vice versa? In principle, there appear to be at least three ways of handling this issue. One possibility is, of course, the one already mentioned, that is, to emphasize primarily one of the three tasks. A common example of this strategy is to subordinate the research task to that of practical problem solving and change (possibly in combination with the task of competence development), i.e. to reduce collaborative research to a strategy for e.g. organizational change. In practice, although often implicit, this strategy underlies many applications of collaborative research in the fields of e.g. educational and organizational development (e.g. Zuber-Skerritt, 1996).

Another common strategy for handling the tensions between the different sides of the threefold task, is to try to accomplish an interplay between the three tasks over time (cf. Ellström, 1984; Sandberg, 1981). This means that one accepts as more or less unavoidable that, at any single moment of the research process, either research or practice takes precedence over the other. By implication, action- and learning-oriented activities are allowed to predominate during certain periods of time, while more research-oriented activities are allowed to predominate during others. This is also a strategy that, more or less deliberately, has been practiced in the present study.

A third possible strategy for handling the threefold task, and one that was used in this study, is to attempt to identify, and negotiate between the parties involved in the research process, an *integrative task*. That is, a task that has the character of a common denominator between the different sides of the threefold task, and, thus, which may be considered as significant from the different perspectives of research and theory development; practical action; learning and competence development.

2.2 The Idea of Knowledge Creation Through Interactive Co-Operation Between Researchers and Practitioners

The second basic idea of the concept of collaborative research as used here, is what we, in line with Brulin (1998), call the idea of knowledge creation through

interactive co-operation between researchers and practitioners (cf. also Ellström, 1984; Rapoport, 1970). This idea means essentially that there is a certain degree of sharing of responsibility and power between the parties involved in the research process.

Sometimes this and related ideas of dialogue between researchers and practitioners is interpreted in quite idealistic terms, emphasizing a subject-to-subject relationship and a personal encounter, while ignoring differences in identities, competencies, responsibilities and roles between the actors. Differences that may have their roots in cultural differences between the two spheres of research and practice, respectively (e.g. differences with respect to autonomy; cf. Edquist & Flodström, 1997), but which also mirror the division of labour in society at large. In contrast to such an interpretation of the relations between researchers and practitioners, we rather emphasize the importance of a clear division of labour between researchers and practitioners based on their different interests, responsibilities, and competencies. Thus, rather than trying to erase the differences between the spheres of research and practice we believe that it is very important to respect and preserve these differences (cf. Brulin, 1998; Edquist & Flodström, 1997).

At the same time, co-operation between researchers and practitioners is likely to bring to the fore a number of problems concerning authority, power, and participation, which need to be carefully analyzed and taken into account in the planning and conduct of research. In addition, there are important ethical issues that need to be dealt with. In order to establish a mutually acceptable ethical framework it appear to be necessary to discuss and establish a consensus concerning the values and goals underlying the research effort, the methods to be used, and the expected outcomes of the research at the outset of the research process.

Of course, co-operation between researchers and practitioners also have a number of methodological implications. At a general level, it is a rather well established fact that the relationship between researchers and subjects affects the outcomes of research (Argyris, 1980; Rosenthal, 1966). Concerning the more specific question of in what way a co-operative relationship between researchers and practitioners affects the reliability and validity of research data, there is little or no direct evidence. As already mentioned in the introductory section, there exists, however, rather general assumptions and speculations of about such effects. These assumptions range from those emphasizing co-operation as a threat to the objectivity and validity of research, to those stressing the importance of co-operation for getting access to organizational processes and obtaining valid data. However, taken together available

methodological analyses seem to indicate that collaborative research designs, when used under favourable conditions and competently conducted, is not inferior to traditional forms of research with respect to the validity of the research results (e.g. Argyris, 1980; Werdelin, 1982).

Although crucial to the advancement of collaborative research, these methodological problems and the underlying problems of epistemology will not be further dealt with in this study. The focus of the rest of this paper will rather concern how to conceive and organize the process of collaborative research.

3. The ABB Case

ABB Stal AB is a member of the ABB Group, which is a world leading electrical engineering corporation, with companies in all parts of the world. The company operates primarily in the field of generation, transmission and distribution of electrical energy. ABB Stal AB develops and manufactures steam- and gas turbines for the generation of heat and power. Service maintenance and training are also part of the world-wide deliveries. The company has been on the international market for about a century. The company is located in Finspång and in Ludvika, Sweden, and has about 2.250 employees, of which 620 persons work within the production department.

3.1 The Production Department

ABB Stal AB can be described as a complete company, containing R&D-, product and process development-, manufacturing-, market and sales-, and service and maintenance departments. Within the production department the manufacturing process can be described as one-piece production, which means that larger components normally are manufactured without any serial- or volume favours. Mixed production with 25-50 new articles in the production department each day, implies a complicated management- and production process. The demands on the production quality is very high, since some of the products are sometimes of a value of billions of SEK. The skills among the workers are quite high, and for some jobs you need ten years of experience or more to be a well-qualified worker. The work content can be described as ranging from precision craft work to fully automated work. The long lifetime of products, they are sometimes used for 30-50 years, calls for high demands on the company concerning the availability of spare parts and service for its products.

3.2 The Change Programme - Workshop 2000

The production department have had several experiences of organizational and technical changes over recent years. However, in the mid 1980s something new was added to the visions and the ideas concerning change. With the well known "T50 project" it was not only the efficiency concerning the machines and the technology that was high-lighted, the changes also included improvements for the human resources with a strong focus on issues of competence and learning.

In the beginning of the 1990s a project was launched, addressing these issues. At this time the company aimed to create a more learning intensive production. In addition, there were some changes in the structure, one level of managers was eliminated, and operators were supposed to work in production teams. The overall objective was to develop a more creative, flexible and learning intensive organisation through a better utilization of the competence and experiences of the work force.

In the mid 1990s it was obvious that further changes were indispensable in order to be competitive for the future. The problems concerned machines that were not flexible enough, and a overall production system that had to be more flexible. In order to design a more flexible production which could respond better to variations in market demands, as well as the overall necessity to reduce lead times, the production system had to be changed in several important respects. These demands for changes formed the basis for a new change project, called Workshop 2000 (W 2000). The aims for this programme were in broad terms:

- * to make large investments in new technology and to change the structure from a functional production to a more process oriented production process;
- * to develop new working methods in the production through the constitution of new production teams, where learning, competence and continuous improvements should be a natural part of every day work.

At the time when decisions to start the project W 2000 were made, ABB Stal AB had a good financial position, and the volume of orders was increasing. The first contacts between CMTO and the company were made in 1995, a more intense co-operation process started early in 1996. The process of collaborative research is described in the text below.

3.3 The Planning of the Collaborative Research Process

One important point of departure for the collaborative research effort at ABB Stal AB was a common research interest of the CMTO researchers into issues of organisational change, based on concepts such as team based production, continuous improvements, quality, flow- and process orientation, and learning organizations. At a general level, this research interest came close to issues that were discussed within ABB Stal AB in relation to the project W 2000.

Research Issues

During the early stages of the research process a discussion was initiated between the CMTO researchers and the management of the production department within ABB Stal AB concerning the more specific issues to be dealt with within a collaborative research effort, the methods and strategies of research to be used, and the expected outcomes of the research process.

Concerning what issues to focus on, the criteria was to find issues judged to be of relevance both in a research perspective and in a practice perspective. The representatives of the company emphasized the importance to find issues that could support the company's development of an overall strategy for the change process, and the W 2000 change programme. During this early stage three disciplines from the CMTO were represented, i.e. education, information systems development, and industrial ergonomics. Based on these discussions, the following issues were decided to be the focus of the research process:

- * the management of the overall change process, including an "improvement of the company's vision of the W 2000 programme";
- * the formation and start-up process of the new production teams;
- * issues and methods of management training and development, specifically with respect to first-line managers;
- * forms of employee participation in the ongoing change processes.

Methods and Strategies of Research, the Roles of the Researchers, and the Division of Labour Between Researchers and Practitioners

In addition to discussions concerning research issues there was also discussions, although in quite general terms, of the methods and strategies of research to be used, the role of the researchers, the division of labour between the researchers and the company, and last, but not least, the expected outcomes of the research process.

With respect to methods and strategies of research, the researchers argued for the need to use a broad arsenal of research methods, including interviews, observations, documents etc. Furthermore, the importance of combining empirical studies with theoretical work, i.e. development of concepts and theories, was emphasized. An important outcome of this initial phase of the research process in early 1996 was an agreement between the researchers and the company about the general design of the research process. This general design may be illustrated by the model shown in Figure 1 below.

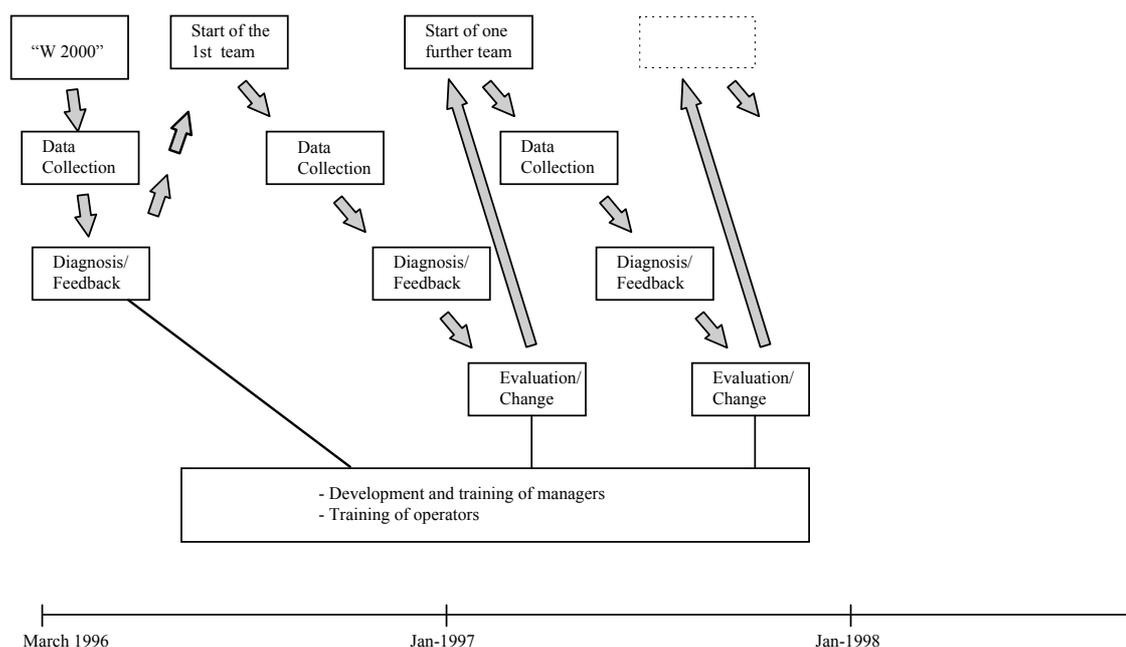


Figure 1: The general design of the collaborative research process as agreed by the researchers and the representatives of the company during the planning phase.

As is clear from Figure 1, the planned research process had a cyclical character based on recurrent "waves" of data collection, diagnosis and feed-back of results and interpretations. The first "wave" concerned the intentions and the "vision" behind the W 2000 programme, and how these intentions were perceived by different actors in the organization. This was planned to be followed by studies of the formation and start up of the first production team, and later a study of one further production team (for a more detailed description of these different studies, see section 3.4 below). As is also indicated at the bottom of the model in Figure 1, research results were seen as "cognitive input" in seminars for development and training of managers and operators.

Concerning the roles of the researchers and the division of labour between the researchers and representatives of the company an agreement was made to the effect that the primary role of the researcher was to provide research-based, "cognitive input" to the ongoing discussions within the production department

concerning the research issues agreed on concerning the management of the W 2000 program, i.e. the "vision" behind the programme, forms of employee participation, the management of the change process, and the formation and start up of the production teams. This "cognitive input" would comprise interpretations and conceptualizations of different aspects of the change process based on collected data (e.g. interviews, observations), theory, and previous research. In addition, it was agreed that the researchers, for examples during seminars, could act as critical discussion partners, helping to structure and articulate problems and solutions, but also drawing attention to contradictions and dilemmas in perceived problems and suggested solutions. Furthermore, it was explicitly agreed that the main responsibility of the researchers should be to manage, in co-operation with representatives of the company, the different steps in the research process as depicted in Figure 1, and not to be directly involved in, or in any way responsible for, the actions undertaken as part of the change process.

3.4 The Research Process: Different "Waves" of Data Collection, Analysis and Feed-Back

The First Study: "Vision Improvement"

The first substudy was carried out during the Spring 1996. This first study focused primarily on how the operators and other actors in the organization had interpreted the visions and ideas behind the change programme W 2000. There was at this time a concern in the management group that the vision was not fully understood and supported throughout the organization. Thus, according to their view at this point in time the vision had to be "improved" in order to make the employees more supportive and give them a feeling of "ownership" of the ideas behind the change programme.

In order to carry out this first substudy, a sampling of respondents had to be made. The sampling was made jointly with representatives of the company. Subjects from several different hierarchical levels and departments were chosen in order to get a rich picture of the company. In other words, a "multi-modal" data collection and analysis focusing on different actors was made. The actors were operators, union representatives, first-line managers, white-collar specialists and other managers. The methods for data collection included interviews, studies of documents and observations. The data analyses was made from several different perspectives represented by the different researchers' subject areas.

The first feedback seminar was held in June 1996. This was made in order to create a platform for further work and to make it possible, if necessary, to redefine problems/issues, strategies, methods and other aspects of the collaborative research process agreed on during the planning phase. The seminars aimed at establishing a dialogue and to reach a common conceptualisation and interpretation of the results from the data collection presented by the researchers. During the seminars, references to other research, theory, previous experience and studies, were also made by the researchers.

The Start-Up of the First Production Team

A second feed-back seminar, held in August 1996, was arranged in order to follow-up on the agreements made at the first seminar, and to plan the further work. Besides reconfirming that further co-operation was of mutual interest, this seminar was focused on the delineation and planning of a second substudy focusing on the formation and start-up of the first new production team. During the Autumn 1996 researchers from the CMTO followed the process of the start-up of the first production team. The data collection included observations of the everyday work in the teams, and interviews with all the members of the team and their team manager. The data collected were analysed and interpreted by the researchers and later presented and discussed at two different feed-back seminars, the one seminar with the production team and the team manager, and the other seminar with the management group.

During these seminars, and at other meetings during the Spring 1997 the researchers and representatives of the company (primarily members of the management group) had recurrent discussions and evaluations of different aspects of the W 2000 programme as well as the collaborative research process as a whole. A number of new ideas and further co-operation were discussed. Minor alterations in the change programme were discussed and also implemented by the company. As attested to not only by the researchers themselves, but also by members of the production teams and the management group, a general outcome of these discussion was a better understanding of the change process itself, as well as a need for more knowledge about issues of management and leadership in team-based production.

Further Studies and Outcomes of the Collaborative Research Process

In all, a total of 30 teams were planned to be started during the period September 1996 to September 1997. Based on previous discussions, a new substudy was initiated with the aim to follow a new production team from the

start. A new team was jointly chosen and the research process continued with a new "wave" of data collections, analyses and feedback seminars. As a spin-off of these seminars, a number of other potential collaborative projects between CMTO and ABB Stal AB were identified and initiated, including, for example, a project on leadership in team-based organizations.

Although an overall assessment of the results from this (still ongoing) collaborative research process would be outside the scope of this study, it may suffice to make the following brief remarks concerning the outcomes of the research process from a research perspective:

- * The process of collaborative research has given the researchers long-term access to processes of organizational change. This has made it possible to apply a longitudinal perspective, and to obtain data which give a very rich picture of the change process as a basis for theory development and further research.
- * During the years 1997-1998 several master thesis have been produced on the basis of data from this project, and in 1999 a licentiate thesis and a doctoral thesis will be presented.
- * The collaborative research work has resulted in more contacts with ABB Sweden. as a basis for further research. As an important "spin-off" of the co-operation, new research projects have also been initiated.

4. Analysis and Interpretation of the ABB Case

How, then, can the ABB case be interpreted and conceived in more general terms? What, if anything, can we learn from this case study with respect to the planning, organizing, and conduct of collaborative research more generally?

4.1 Some General Characteristics of the Research Approach

As a first step in such an analysis there are certain general characteristics of the research approach that should be underlined. First, in retrospect, the primary focus of the research process became the change programme Workshop 2000, and how this programme had developed and was managed, including the formation and start-up process of new production teams. Other potential research issues that were discussed during the planning phase were only dealt with in a limited way, e.g. through seminars.

Second, new research issues and a number of practical problems emerged during the research process. Some of these emergent issues and problems were dealt with during the research process jointly by the researchers and representatives of the company, others were dealt with through e.g. the initiation of new research projects.

Third, the different activities and steps of the research process as planned during the initial phase (early 1996) were partly re-defined and re-negotiated between the researchers and representatives of the company during the research process. Thus, in retrospect, the actual research process did not totally follow the preplanned, cyclical model that was drawn up during the initial planning phase (see Figure 1). Rather, the research process was to a certain extent characterized by ad hoc decisions due to unexpected events, iterations, shorter or longer delays, and learning by doing. However, the major changes and deviations from the original planning that were made, were negotiated and jointly decided by the researchers and representatives of the company.

Fourth, the researchers were able to establish a long-term relationship and a dialogue with production teams, first line managers, union representatives and the management of the production department based on a considerable degree of mutual trust. An important basis and precondition for the establishment of this relationship and dialogue was a recurrent participation of the researchers in seminars, planning conferences and other internal meetings within the company.

Fifth, the long-term and trusting relationship that was established made it possible for the researchers both to get access to information about significant aspects of the change process, and to support the ongoing change process in different ways. In accordance with the intentions behind the project that were drawn up during the planning phase, this support was mainly based on different kinds "cognitive input" (e.g. interpretations and conceptualizations of different aspects of the change process) into the ongoing discussion in different arenas within the company. In addition, the researchers were acting as discussion partners to different actors within the company (production teams, first line managers, union representatives and the management of the production department).

4.2 An Emerging Model of Knowledge Creation Through Collaborative Research

On the basis of the general characteristics of the research approach mentioned above, the model presented in Figure 2 is proposed as an interpretation of the

research process in the ABB case, and at the same time as an emerging, generalized model of knowledge creation through collaborative research.

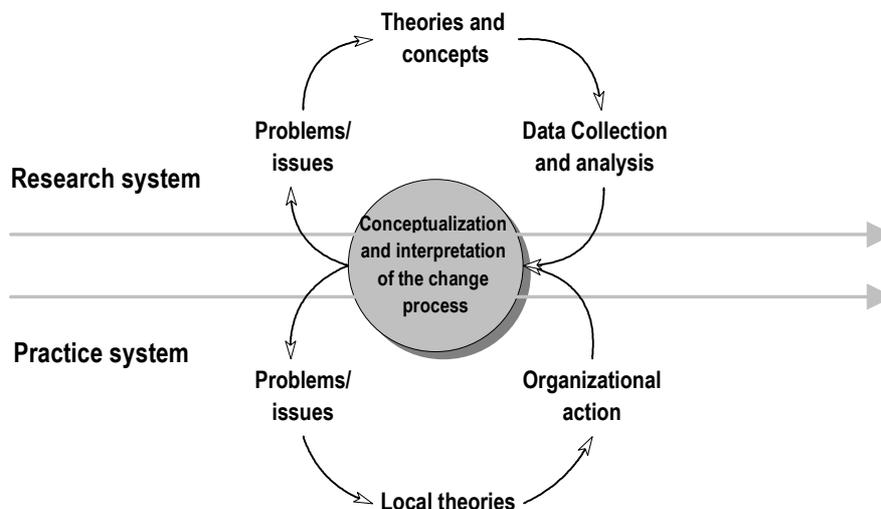


Figure 2: An emerging model of knowledge creation through collaborative research.

Interlocked, Collective Learning Cycles

The model shown in Figure 2 depicts two interacting activity systems, called the research system and the practice system, respectively. In this specific case the two activity systems refer to ideal typical representations of the research activities of the CMTO researchers and the activities within the change programme at ABB Stal AB, respectively. In this model both activity systems are depicted as cyclical in character and driven by problems/issues originating in research or practice. The basic activities in both systems, i.e. research activities (e.g. data collection and analyses) and different kind of organizational actions within the change programme, are assumed to be informed by explicit or implicit theories based on previous research and/or practical experiences.

Furthermore, a basic point in this model, as indicated by the shaded circle in the intersection between the two systems, is that the process of collaborative research is assumed to produce *common conceptualizations and interpretations of the ongoing change process* that becomes "cognitive input" into the next cycle of the change process, but also into the next cycle of the research process. Considering this cyclical process of knowledge creation and use, these two

activity systems may be seen as two *interlocked, collective learning cycles* that produce successive versions of common conceptualizations of the ongoing change process.

A Two-Way Flow of Problems and Knowledge

In relation to the discussion of collaborative research that was initiated in section 2, the model outlined above claims to represent an alternative both to conventional more linear models of research (cf. Brulin, 1998; Sörlin, 1996) and to traditional models of action-research (cf. Clark, 1976). What, then, do these claims mean more specifically? First, the model presented here is *interactive* in the sense of attempting to build a two-way flow of problems and knowledge between research and practice. This in contrast to the common assumption made by traditional models of research, that there are predefined practical problems that are waiting to be solved by theories, results, and methods derived from research, and disseminated to the potential users. This may certainly be true in a few cases, but usually you can not expect to find workable solutions to predefined practical problems. Rather, the problems typically have to be analysed and redefined through an interactive process between researchers and practitioners. In fact, in many situations an interactive process of problem-finding and diagnosis is required before possible solutions could be considered and applied.

In line with this, the model presented above starts with a joint process of diagnosis and problem-finding, where the researchers and practitioners together try to conceptualise and define the problems and issues that should be addressed. As was the case in this study (cf. section 3.4), this problem-finding process may even require an empirical study of the problem area in order to be able to define the problems. Thus, according to this line of reasoning, productive utilization of research is not primarily a question of finding the right solution to a predefined problem, but rather to engage in a joint problem-finding process.

An Integrative Research Task

In what ways, then, do the model outlined above differ from traditional forms of action research? Could not in fact much of what has been said so far equally well be said about many kinds of action research? One main difference between this model and many traditional models of action research concerns what we in section 2 called the threefold task of collaborative research and how this task is

handled. As discussed in section 2, a common way of handling the threefold task is to subordinate the research task to that of practical problem solving and change, i.e. to reduce collaborative research to a strategy for research-based developmental work.

Contrary to this way of handling the threefold task, we have in this study tried another strategy based on the idea of identifying and negotiating a common, and potentially *integrative task* between the research system and the practice system, i.e. to identify a kind of common denominator. This integrative task was to attempt to produce a common understanding of the ongoing change process that could be viewed as significant both from the perspective of practice and from the perspective of research. (cf. Figure 2 above).

Of course, it is difficult to know to what extent the research model as applied in this case succeeded in creating such a common understanding of the change process. However, at least it seems to have created a new interest in reaching such an understanding within the company. One indication of this was the conclusion drawn by one manager from ABB Stal AB concerning the company's experiences of the collaborative research process:

“...before we believed that there were two kinds of companies; companies that make things happen and companies that watch things happen. Our goal was to be a company of the first kind. Now we understand that there is a third type of company. Our goal is now to become the company that makes things happen and try to understand why they happen”.

Although this strategy of defining an integrative task in certain respects have proved to be able to handle the tensions created by the so called threefold task of collaborative research, it did not prove to be sufficient for reconciling the different sides of this task. Thus, in practice it has also proved necessary to use the strategy of creating an interplay between research-oriented and practice-oriented activities over time. Thus, while practice-oriented activities were allowed to predominate during certain periods of time, more purely research-oriented activities (e.g. analyses of data, writing research reports) were allowed to predominate during others.

A Clear Division of Labour

Another important difference of the model proposed here in relation to many traditional models of action-research, concerns the character of the co-operation between researchers and practitioners. From the first contacts with the company, a clear division of labour between the researchers and the

practitioners was agreed on. The role of the researchers was clearly separated from the role of being a consultant or change agent in the sense of an advisor or expert that prescribes certain solutions to "given" problems. Rather, as researchers we defined our primary task as the task to contribute to a common conceptualization and interpretation of the change process (cf. Figure 2), and to participate in joint arrangements (e.g. seminars) in order to discuss and explore different conceptions of the ongoing change process. Decisions concerning possible implications for practical action, and the management of the change programme (W 2000) were the task of the managers of the company. Of course, this does not mean that the researchers avoided practical issues. On the contrary, as indicated above, the researchers supported in different ways (e.g. as discussion partners) the management of the change programme.

5. Discussion

In this final part of the paper, we will discuss the implications of this study for how to conceive and organize collaborative research. More specifically, we will focus on some factors that appear to have been in some respect significant or critical for the possibility to realize the model of collaborative research that was used in this study. These factors we believe, may also have a more general significance for attempts to create knowledge through interactions between researchers and practitioners within a framework of collaborative research.

5.1 A Negotiated Agreement Concerning Research Problems and General Research Design

The model described was based on an important early phase of project definition. For this purpose, a project steering group was created, with management and employee representatives. Here, issues and problems were analysed in a process of diagnosis and problem-finding in interaction between the researchers and practitioners. Areas of interest could be raised both from researchers as well as from the practitioners in the company. This phase was important in several ways:

- * it involved researchers and practitioners in a mutual effort to express different expectations on the co-operative research;
- * this phase also provided researchers and practitioners with opportunities to discuss what roles initially, and over time the parties should have in the research process; i.e. it represented a process of interpretation and sense-making regarding roles and expectations in relation to the research process;
- * it created a mutual understanding of questions and issues at stake;
- * it could be regarded as a supportive recurrent activity if the project definition, problems, strategies etc. needed to be refined and/or redefined.

This early definition phase resulted in a written document. The problems and issues of importance for the company are normally multi-disciplinary. As the model was based on a multi-disciplinary approach, several different issues relevant to the company can be discussed and may be studied in later phases of the research process.

5.2 The Combination of a Top-Down and a Bottom-Up Approach

It is almost impossible to overestimate the importance of management support both for successful implementation of change programmes, but also for the formation of collaborative research projects. However, equally important is to engage and encourage participation from the employees and their representatives within the company. This is one of the major arguments that strongly supports the involvement of management and employees in a collaborative research process. As researchers we build on the assumption that both the quality of the research results, as well as the process of change, will benefit from a broad participation from different groups within the company. This is also an important point of clarifying our role as researchers, both in the eyes of management and in respect to other parts of the organization.

The combination of a top-down and bottom-up approach is also vital in other respects: it supports a broadening of activities in the organization, and it makes it possible to create and/or capture interests from other groups within the company regarding ongoing change processes. This seems to be a prerequisite necessary for the access of researchers to change processes, as well as an important condition for successful realization of changes on the whole. In this way, the model assumes a certain extent of mutual trust and co-operation between management and other actors (e.g. unions) in the company. Without

this mutual trust it is doubtful if an application of the model, or the change process as a whole, will be successful, or even possible.

5.3 Access to Significant Information and Processes in the Organization

The joint agreement concerning research problems and general design of the research process, together with the combination of a top-down and bottom-up research approach, provided the researchers with access to relevant and significant information and events within the organization. One enabling factor for this was the reasonably high effort put into building this foundation for the co-operative research. As CMTO is a multi-disciplinary research unit, it has the potential to cover several areas of research, as agreed upon in the joint definition phase. Therefore, the model provided the researchers with opportunities to conduct research on a multi-disciplinary base, as well as carrying out more focused studies. The model made it possible to conduct longitudinal/process oriented as well as cross-sectional studies. The actual focus/width/type of study draws back to the first phase of the model, the joint definition phase where questions of this kind can be handled.

5.4 Clearly Defined Roles Between Researchers and Practitioners

The aim was to minimize role ambiguity regarding the researchers and practitioners by defining these roles during the joint definition phase. One important aspect of this was consequently to clarify the expectations towards the collaborative research model and the roles of researchers and practitioners. This was to a certain extent facilitated by the fact that the researchers were funded through public research funds, and not paid by the company. From this point of view it was logical for the parties to agree on a division of labour according to which the researchers should primarily be responsible for the research process. The primary task of the practitioners was to manage, carry out and take the responsibility for the process of action and change within the company. The common primary task of both researchers and practitioners was to engage in a mutual effort to conceptualize, reflect on and learn from the ongoing change processes. The joint definition phase can in this perspective also be seen as a role definition phase, where questions of responsibility and division of labour in the co-operative process were important ingredients.

5.5 Usable Knowledge and Fast Feed-Back

A common critique towards action-oriented research, generally put forward by practitioners, is that it is usually too slow and too focused on so called "soft issues", unable/unwilling to deal with issues such as productivity, efficiency, quality etc. (see e.g. Nashhold et al., 1993). In this case, the selection and formulation of issues were of mutual interest among researchers and practitioners and took place in the early stages of the research process as earlier pointed out. The issues were also partly redefined later on. An interesting observation is, however, that more soft issues were raised by the company after a while in the research project. Fast feedback may be difficult as researchers tend to secure the pace and sequence of their "own" research process according to expectations from the scientific community.

Concerning these issues, the model proposed here may, however, have certain advantages compared to traditional models of research due to the following factors:

- * the research process was built on a joint definition of research issues, and a relatively fast and broad collection of data focusing on different actors, including operators, union representatives, and managers;
- * it was possible to jointly redefine problems/issues, strategies and methods based on the data collected and feedback seminars;
- * the research process included several researchers from different disciplines and subject areas in data collection, analysis and feedback;
- * an overview analysis of data was relatively soon after the data collection fed back to different actors within the organization.

Of course, a higher pace in data collection and in feedback activities demands more resources in comparison with traditional research models. However, the advantages seem obvious: a description of present conditions in sanctioned areas, based on scientific data, upon which a mutually constructed arena for further collaboration may be created.

5.6 Concluding Remarks

The model presented in this paper should be viewed, not as fixed, but rather as an emerging model of knowledge creation through collaborative research that is continually undergoing changes and improvements. The model has so far been applied in some five cases, and seems so far to be promising. Among the difficulties in the application of the model to be mentioned is the resource demanding, broadly focused methods of data collecting and analysis, and the

following feedback seminars and workshops involving different groups within the company.

One final aspect of the model raised here, deals with opportunities to learn and benefit from collaborative research in a longer perspective. The successful implementation of change and improvement activities are to a high extent depending on the quality of the models, perspectives, and the methods used. Several practitioners have expressed that the collaborative research process has created an arena for reflection and conceptualization, which did not previously exist within their organization. It is also an opportunity to get an outside perspective and update with current research. In the same spirit, several companies have expressed a consultant-fatigue, on the basis of consultants giving "too many good models and answers", but "too few good questions to connect these answers to".

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