A Tool for Creating Healthier Workplaces: The Conducivity Process

Robert A. Karasek
University of Massachusetts–Lowell

The conducivity process, a methodology for creating healthier workplaces by promoting conducive production, is illustrated through the use of the "conducivity game" developed in the NordNet Project in Sweden, which was an action research project to test a job redesign methodology. The project combined the "conducivity" hypotheses about a combination of employees' skills and the Scandanavian "dialogue-based" participatory practice. The goal of the conducivity game is to develop a flexible division of labor that enhances employees' skills and facilitates development of customer-adaptable products. The game develops "local languages" of worker coordination using visual images of a multiworker skill integration based on "skill plates." Usage of the game in the companies activated shop-floor workers and companies to engage in self-managed work reorganization activities.

Keywords: *conductivity game; skill combination; conducive production*

This article describes the development of a job change methodology that is consistent with the conducive production model (Karasek, 2004 [this issue]). The method was developed in the context of the NordNet Action Research Project in Sweden between 1990 and 1991.[1] The job change component of the project attempted to develop new relationships between small subcontracting companies and their larger customers, which could allow workers' skills and participatory decision making to be developed and used to the maximum extent while enhancing company innovative capacity. The method added technical elements, a visual association tool, and a focus on creative future possibilities to the existing Scandinavian democratic dialogue methods of worklife change. Theoretically, the method builds on the "conducivity" concept, a skill-based model of productivity based on producer/user interactions.

In the late 1980s, it was claimed that existing job redesign methods had been failing to promote significant worklife change (Gustavsen, 1990), and new tools needed to be developed. Industrial relations systems that have supported democratic worklife change in the past in Scandinavia were beginning to be outflanked by global economic developments. This implied the need for an alternative economic model as a platform for future change, and new perspectives were on the horizon in the form of network models (Piore & Sable, 1984). The NordNet project used one such alternative—namely, a skill-based model of production and distribution emphasizing worker skill development and well-being (Karasek, 2004). The project attempted to develop practical tools for organizational change in the context of small subcontracting networks in western Sweden.

This methodological attempt was set within the context of the participatory-action research tradition for promoting humane work-environment change that had been furthest developed in the "democratic dialogue" perspectives emerging out of the Swedish Leadership Organization and Management (LOM) program (Gustavsen, 1990, 1992). Under this program, the rejection of both externally imposed "expert" guidance and theory and of technical-economic rationality's dominance have opened possibilities for progress consistent with Habermas's (1984) conception of "communicative rationality." New forms of practice emerged.

The NordNet change process combines elements of the new "communicative" rationality practice above with elements of technical-economic rationality that remain relevant for most organizational roles. This

Bulletin of Science, Technology & Society, Vol. 24, No. 5, October 2004, 471-479
DOI: 10.1177/0270467604269535

joint goal has led to the development of a new type of work redesign simulation game. The "conducivity game" is a group-based, visual communication process that interfaces with verbal dialogue processes. It attempts to integrate democratic dialogue with concrete technical, economic, and customer-relevant information related to a particular production process. The conducivity process involves developing comprehensive images of coworkers' operations and identifying new skill combinations between workers that could satisfy customer demand in new ways (i.e., conducivity simulation). It develops a democratic participatory judgment process for the technical-economic feasibility of such new ideas. It is also an attempt to develop a "rapidly applicable" method to reach shared images of future work structures (what could be instead of what is). Actual job change is the next step.

Defining NordNet: An Action Research Project to Test a Job Redesign Methodology

Methodological Goals of the Conducive Job Redesign Process

The researchers attempted to introduce a new variant of the Scandinavian workplace "dialogue" method. The first goal was to develop an action research methodology that included advantages of both dialogue-based social process understanding and the so-called positivistic technical and rational orientations to insure pragmatic success. These later elements were included via workers' skills being linked, by way of the conducivity model, to production operations and communication channels (Karasek & Theorell, 1990). It was also presumed that the arguments for humanistic worklife change in the companies would be stronger if the change produced benefits for the customers as well as for workers and the company. This producer-customer link was also a central component of the conducive production model.

Another important difference from previous dialogue models is that this process did not attempt (or promise) to set a full workplace change process in motion immediately but only to develop a first stage where shared ideas about what might be done are developed. The primary focus is on creative future possibilities; past problems come up indirectly as a constraint. Later, other existing participatory methods could be used to complete the redesign process.

A major goal of this process structure was to make certain that the results of social dialogues could not be later undermined by technical arguments that were "omitted" (because technicians did not participate, etc.). Thus, a simulation game process was designed to facilitate the calling forth of all the relevant technical, economic, and customer-need information so that the solutions developed are truly feasible and jointly supported (Ehn, 1988).

The project research group consisted of five members: the author (sociologist/industrial engineer), a sociologist expert in organizational dialogue methods, two engineers in the local university "innovation engineering" program (one with contacts to many local businesses), and a local shop-floor worker/union representative with organization change research competence. Typical "project defining" meetings included three team members (with at least one engineer). The shop-floor participatory dialogue processes were facilitated by the author and the worker/union representative.

The conducivity process is more structured than conventional democratic dialogue processes, yet it is still significantly modifiable by the evolving activities of participants. This structuring, plus the diminished goal of actual changes in the first stage, reduces the social process investment needed by companies, unions, and employees and hopefully shortens the process's first stage. We anticipate that such a form of activity could be adopted by a much wider range of companies than a more open-ended process. At the same time, it is necessary to maintain sufficient social participation to insure valid, democratic solutions and that realistic assessment of future alternatives actually occurs.

Company Selection: Tracing Out the Subcontractor/Client Networks

The project began with the researchers making contact with 8 to 10 small manufacturing firm networks in western Sweden in spring and fall of 1990. Only companies with producer/subcontractor relationships were investigated. The common pattern involved a large producer combined with a small subcontractor in metal manufacturing.

Three company pairs were selected from the eight groups for further discussions on the basis of one or two preliminary meetings. The company criteria were the following: (a) their interest in personal development of employees (all companies were unionized), (b) having a product that could conceivably "grow" in response to a producer/user dialogue, (c) a relatively good labor relations climate, (d) local ownership (not always realized for both producer and subcontractor),

and (e) a democratic, broad participation goal in the Swedish working-life tradition (Eriksson & Holmer, 1991). These starting points meant that some companies would not be interested (about 40% of those selected in Stage 1).[2] Another important criterion was that the companies not be in a state of crisis—a common situation for companies seeking outside assistance. This insured that it was more likely that the companies could successfully complete learning-based organizational change (for crisis companies it is often too late for long-term steps). Unfortunately, this criterion also meant that the companies often did not feel they "needed" change researchers as their top priority (we had to develop their interest by finding important problems).

Two of the three initially selected company groups resulted in multicompany projects: Company A/Client Company A (a large European multinational) and Company B/Client Company B (a large European multinational). The subcontracting companies each had roughly 50 employees and focused on skilled mechanical design and assembly. After selecting one machining company in a network that seemed likely, the researchers and the company jointly discussed a suitable project area (see below). This discussion was then repeated with the subcontractor companies, leading to a joint agreement by both companies to participate. Usually a total of four or five meetings was required to reach this stage for a company group.

The discussion in the companies was also limited to some degree around one broad topic area, which was selected to allow a dual dialogue; both process-related social structure/interaction topics and product-related technical/economic/production topics were encouraged. The starting point for the discussions was the link between employee development and firm innovation based on the "conducivity model" (see Figure 1 in Karasek, 2004), linking employee skill development and participation goals, company product development goals, and customer goals. Typically, the discussions quickly expanded to a very broad range of topics, and many existing company problems surfaced during the process (Stage 2).

The Job Redesign Process in Two Pairs of Swedish Manufacturing Companies

A Timeline of Activities

The time line of work reorganization process in NordNet companies is divided into four stages. Table 1 outlines the sequence of planned process steps and meetings. The actual company experiences are described below.

Table 1. A Timeline of Activities in the Conducivity Process

1. Company project start-up
   a. Start-up meetings with company and worker groups and then customer groups
   b. Interviews with groups and individuals
   c. Feedback data
2. Conducivity game/communication development
   a. Present-situation pictures
   b. New skill combination "gestalts"
   c. Idea review (language development), consensus
3. Cross-company communication linkages
   a. Communication role discussion
   b. New vocabulary elements
   c. Cross-synthesis
4. Self-sustaining job change activity

Results: Actual Process Steps and Resulting Changes

Stage 1: Project start-up. Both projects—Company A/Client Company A and Company B/Client Company B—followed a similar start-up procedure. After finding an area of common interest for a project, the initial group of company and labor participants, along with the researchers, defined the project structure for Stage 2: several (three to four) small teams of 4 to 6 members representing both manager/technician and worker were selected. Researchers then gathered information about existing communication patterns. This involved interviews of about 40 minutes each, with 10 to 20 members from each company. Communication pattern information was fed back to each team to set the stage for the primary "dialogue" tool: the Conducivity Game.

Stage 2: The conducivity game and midprocess changes. The initial start-up activities were used as a basis for developing groups of workers and managers who would be interested in engaging in participatory redesign processes where an image of the existing work process could be made "concrete" (the abstraction of social relations at the workplace becomes concrete and discussable). On this platform, a new set of plans for work organization could be jointly discussed (a detailed discussion of the game results can be found later in this paper). Several unsuccessful attempts to engage workers in a participatory "work organization–focused" dialogues frustrated the shop-floor

participatory team—that is, the author and a local union representative ("imagine you are the owner" scenarios and visual aide development assistance for lectures to machine-side worker's about their jobs produced only silence). This finally led to the development of the conducivity game idea, which was quickly introduced into the process.

Lack of complete acceptance of the informal contract might have been an unstated issue in these groups. However, the general acceptance of the overall project goals and the interest in participation were moderately strong in the final two subcontracting companies, and the projects continued energetically for a full year (typically, with biweekly meetings), although there have been a few midlevel management "resisters" who favored the status quo. There was strong interest in continuation and, of course, a desire to reap the "results" of the investment in time by all parties. The process was also considered as a "concrete" step to constructive dialogues between both pairs of companies (requirement for us to maintain the broad project platform).

Results: Actual Job Changes
Results (Midprocess)

Although "actual job changes" were supposed to be only a topic for the future in our project, it was clear that the mere process of developing shared ideas had gone a significant distance and facilitated significant changes in these companies. For example, the manager of one subcontracting company had stated at the project beginning, "We are participatory already: I tell everyone my door is open for them to come by and problem solve, but—nobody comes." After the conducivity game, however, communication patterns, discussion topics, and so forth, were changed significantly, resulting in a much more active engagement by workers.

It was particularly encouraging that self-sustaining job change process at the shop-floor level, for workers with little of such previous experience, had begun in two of the companies. The following occurred:

- a. Company A workers and managers, after several months of playing the conducivity game in several work groups, suddenly drafted a lengthy application to the local Swedish Worklife Fund (*Arbetslivsfond*) without our outside assistance or knowledge. Before, this joint labor/management project had been an unrealized goal. They successfully gained funding for work reorganization activities. They developed several job design committees: for education, for new building layout, and so on (we had oriented these activities to resolve, first, the work organizational issues). The local committees took responsibility for developing design ideas and for discussing the ideas with other shop-floor workers via their own subgroups. The groups developed their own plans for work organization. For our research team, this was evidence that our process had activated shop-floor workers, the criterion for a successful participatory action research project.
- b. Client Company B (a large multinational) changed the nature of its design feedback meetings with Company B (which had been consistent with Company B's goal to alleviate its "powerlessness" in transactions with this client). Client Company B planned a full-day conference, with the first half devoted to educating shop-floor workers from Company B about Client Company B's production needs. Both sides felt that they got no immediate "payoff" for this extra communication investment. However, the NordNet team thought this communication was an important preparation. In a follow-up of this first meeting, a new design feedback strategy was developed in preparation for a second meeting. Here, fewer members of Client Company B came for a visit to subcontractor Company B's, and all parties were more satisfied with the "payoff" of this meeting.
- c. In Company B, discussion of the job design solutions, which originally began with one group of shop-floor participants, were taken up by other workers in the company (roughly one out of four shop-floor workers and all white-collar workers were originally involved). These discussions were energetic (see below) and raised important work process issues for further discussion.

The white-collar group at Company B felt a bit pressed by the success of the shop-

floor group but decided to investigate the "bigger picture" of customer linkages instead of opposing worker's suggestions. After several months of the conducivity game in different groups, the shop-floor workers, (with no knowledge at our NordNet project) also contacted the local Swedish Worklife Fund to apply for funds to support job reorganization. Again, we took this as evidence of a self-sustaining development process.

Stage 3: Cross-company communication linkages (future). The project continued for roughly 1 year, but the full set cross-company linkages did not have time to occur. The new-idea teams from both the client and the subcontractor company were soon to be combined in a joint meeting, with preparatory activity almost complete at each company; discussions focused on new patterns of communication, which could allow shop-floor workers to take more responsibility for customer interface. Communication pattern development required assistance by researchers to help build a vocabulary about possible communication structure alternatives. These patterns were quite complex in large companies and the communication data gathered above was also used to assist these discussions. Unfortunately, this step was not completed before the project period expired. Simultaneously, major economic national crisis in the spring of 1992 in Sweden changed company priorities significantly.

Stage 4: Self-sustaining job change activity (future). After these new "images" of possibilities were developed, it was to be up to the companies to decide how to achieve them. In each step of our discussions, we made it clear that we are not "experts" with perfect solutions but only facilitators for processes in which the company members must carry the responsibility. The broad range of participants who participated in the conducivity dialogue above set up a positive model in each company of participation in the process of actual workplace transformation.

The Conducivity Game in Stage 2

The Game's Conception

Overview. The conducivity game develops an overview of the current situation—that is, a picture of how the "production" process works within an organization for a small group of organization members who work together. First, employees, technicians, and managers jointly decide on "a product" to use as a focus of the game. Second, each employee, with the help of the group and the researchers, defines a set of skill areas, individual capabilities, and areas of desired growth as well as skill underutilization. A "picture" of each employee's capabilities—a "skill plate"—is developed (Figure 1). Third, employee's skill plates are linked together to build a combined social and technical image of the production situation, with all communication flows and product flows illuminated. Fourth, on the basis of this current overview, ideas about new work organization can be very easily developed. The easily comprehensible images of linked skill contributions helps to structure new relationships between employees, information flows, and product flows.

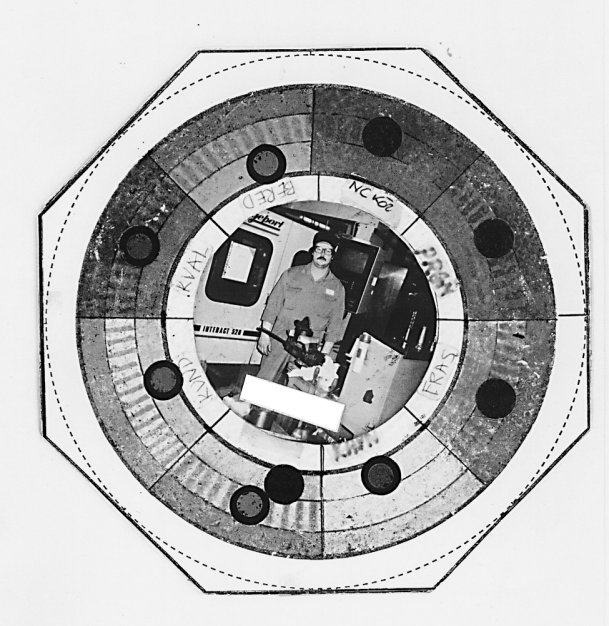

Figure1. A "Skill Plate" Captures a Full Picture of Each Worker's Capabilities

The process. The conducivity game involves developing a "picture" (with real photographs) of each employee's capabilities and then linking all these pictures together to build a combined social and technical image of the production situation (Figure 2). Each employee, with the help of the group and the researchers, defines a set of skill areas, each employee's capabilities, and areas of desired growth as well as underutilization. Producer-user linkages—between each production

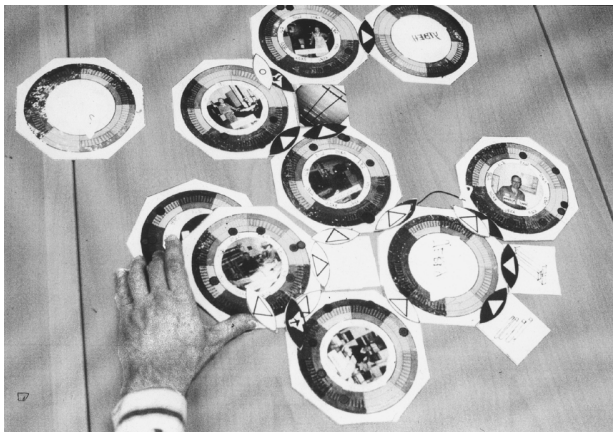

Figure 2. Participative Job Redesign Process Creates an "Image" of the Skill Coordination Patterns in the Company and Then Allows Shifting Them Into New Job Redesign Solutions

Figure 3. Shop Floor and Management Employees Jointly Engage in Many Stages of the Conducive Process

stage according to the conducivity model—helps to structure the relationships between employees, information flows, and product flows (Figure 2).

The game setting is described as a special "protected reality" where dialogue can freely include workers at all levels of the company (Karasek, 1991). The game "contract" involves acceptance by all parties that the process be protected from "hierarchical retaliation," conventional wisdom, and overloads.

The beginning of the game involves building a "current situation" picture of how the production process works at the present time, with all communication flows and product flows illuminated. On this basis, "new solution" pictures are constructed, realizing the project's goal of creating new shared conceptions of future work design alternatives (Figure 3).

Figure 4. "Images" of Capability Coordination Ideas Become a New Vocabulary of Work Redesign Possibilities for Participative Work Design Processes

The multiplicity of game solutions are summarized in terms of an overview picture of each alternative that captures its unique elements along with several key words that recall important elements of the discussion; finally, a "title" to the solution is given, also suggesting its primary theme. It is the work of the researchers to assist this job of "language summary" suggestion. These alternative pictures are then set up on wall discussion sheets beside each other (Figure 4).

Summary Game Process Results

Building a current-situation picture in the conducivity game takes only about 1 hour, and subsequent new-solution pictures take even less time. However, the start-up processes of discussions, which begin the work redesign process and define the "informal contract" for what is to take place, can take several months to discuss and negotiate.

The conducivity game was used to develop shop-floor initiatives for work redesign in six work groups in two small manufacturing companies in western Sweden. As requested, employees, technicians, and managers jointly decided on one product to use for the game. Issues that came up for discussion were recorded, and a visual record of the process was made as a starting point for further game iterations and future discussions.

On the basis of its current-situation picture, each team was asked to imagine how the production process

could change to produce new combinations of employee skills and capabilities. There could be several goals for the changes: to solve existing known problems, to find new solutions that use underutilized skills or generate new skills, to reduce unnecessary supervision, or to develop a new product that solves new aspects of the users' needs. This is the "creative" stage, where the new images of the work process are developed, jointly assessed, and validated. Existing company conflicts clearly surface at this point, as resistance emerged in a very concrete way to new ideas and revelations of needlessly controlling coordination patterns (a long delay in playing the game).

Borrowing from the search conference ideas (Emery & Emery, 1978), the entire group of shop-floor workers was gathered and the second half of a "search conference" in Company B's cafeteria began. Each solution's main points were discussed in terms of both its advantages and disadvantages. After this process was finished, a discussion on criteria followed. What were the most important criteria that the group could use to select between the solutions? The criteria were multiple, but tended to have a strong quality of worklife character. After the criteria were established, the activity of ranking the solutions yielded some important insights. It was clear that some of the solutions were trivial, whereas others were broad and encompassing. Some solutions needed to be jointly adopted in discussion with management. In the Company B discussion, which took two 2-hour sessions for a group of 10 workers, the group felt fairly comfortable with its solutions, recommending two primary solutions and one secondary solution. Several heated discussions emerged about how a group-based solution would work and whether it would lead to a new hierarchy at the shop level. The question of what "developing work" really meant and how it was to be obtained really seriously began in this discussion. Only after this conference had taken place could it really be said that there was a strong spirit building within the company—at least on the shop floor—to pursue significant job change. Clearly, there had been a gradual process of understanding how to communicate on work organization topics that began as very abstract—and undiscussable—concerns for shop-floor machinists.

The next step was to develop an equally creative process for the office section. This was expected to be more difficult because several midlevel managers had been resistant to change.

Discussion: The Conducivity Game as a Language Generator

The conducivity process adapted part of the search conference ideas from classical Scandinavian action research (Emery & Emery, 1978) and linked it to conducivity theory and emerging communications theory ideas from the Swedish Leadership Organization and Management worklife (LOM) program. The important new change process technique developed was the conducivity game, played in companies as a participatory activation tool (see Penny, 1995, for a description of the conducivity game played as a class exercise with work-experienced students who are not from the same company).

The game images appeared to have some meaning to participants. With the help of photographs taken of the conducivity game patterns, it has been possible for us to return to a detailed discussion as much as 3 months after the game, with people remembering what moving of the skill elements symbolized (it takes 15 minutes to reassemble the images if the game is to be continued). A limitation of this approach is that with several groups and several sessions, there are many different game patterns to deal with, and the detailed visual method described above can become unwieldy.

How does one build an effective vocabulary of new work redesign alternatives? We have found that it is of vital importance to be able to link the symbolic representations of the game elements to the actual discussion themes that transpired when the game was being played. The game is only one symbolic description of what is happening in the communication. The "practical" discussion is triggered by the game elements, but it deals much more specifically with the problems that are normally discussed in the workplace—that is, in the language of the local workplace itself. Of course, this is the most accessible format for ideas to the participants, and it is important for us to keep a record of these topics and their linkage to game elements for future discussions.

It should be noted, however, that the existing workplace discussion language was often not sufficient to capture the essence of a work organization problem or to facilitate the solutions. The extra assistance of the conducivity game comes from attaching the existing language elements to the more general work organization concepts of the conducivity game by putting problems in a broader perspective, making nonlinear associations between issues, and creating a "gestalt."

(Kohler, 1946), or a right brain activity. This perspective also allows one problem to be compared to another, often revealing unexpected similarities or differences or problems that keep reoccurring without solution.

We can summarize our observation in terms of the "communicative rationality" ideas of Swedish democratic dialogue research. We would say that the visual tools have played an important role at an early stage in the job design discussions when there are only vague understandings by participants of how their organization really works and no available language elements for conceptualizing work organization changes. The game helps develop these understandings (in discussions, there are references to game elements). The game generates primitive language elements (Karasek, 1992).

After the groups have developed their own "local vocabulary" via the conducivity game, a new phase of communication seems to begin. The game elements are forgotten—at least temporarily—and the discussion begins in an animated verbal stage (left brain) (even for previously nonverbal participants). Discussions about ranking the best alternatives to choices, advantages, and disadvantages of already created solutions occur which do not require a visual language.

The use of the game could go further in relation to this first experiment to help build conceptual elements of a large-scale work-design solution between groups, further linking the company and its customers. Finally, when it comes to the detailed questions of how each individual would really perform in a new role, we again expect that the game elements would provide some preliminary answers, which would then provide the basis for verbal discussions of new daily practice.

Human beings are verbal animals, and verbal communication is a very efficient way to manage discourse on already-developed ideas. However, for discourse about the complex future alternatives, existing words may be inadequate to create the combinations needed to build the necessary overview. Many combinations must be quickly tried and compared in a nonlinear fashion, where one combination of elements can be the springboard to other combinations. The nonlinearity of the visual method is an advantage; it allows many disparate elements to be brought into juxtaposition (quasi-near relationship) so that the eye can compare many combinations at once. Once these combinations are further developed, they become maps and give concrete representations to otherwise vague relationships. Elden (1983) has spoken of the development of "local models" in work redesign activity. Certainly, the images coming out of the conducivity process are a form of a local model and are jointly validated in the game process.

This method of working becomes a continuous activity in the company, helping to realize the conducivity model's goals. The process of finding new division-of-labor combinations must occur again and again at reasonable time intervals. Tomorrow's model will not necessary be the same as today's. Each language (and type of language) must be learned. Becoming familiar with a combination language's operations can make it easier to make subsequent changes in the work organization. The conducivity game has the purpose of making possible continual and participative modifications in the division of labor. Workers in a development-oriented work setting are able, in a continuous way, to fulfill the evolving needs of customers who are also developing.

Notes

1. This project was undertaken by Robert Karasek (project director), Kjell Eriksson, Nils Ragnarsson, Gunnar Weber, Uno Uudelepp—A Hogskolan i Halmstad Arbetslivscentrum project (see Eriksson et al., 1993).

2. One of the three company groups refused to go further when the democratic participation issues were stressed, leaving the two remaining groups discussed above.

References

Ehn, P. (1988). *Work-oriented design of computer artifacts*. Stockholm: Almqvist and Wiksell International.

Elden, M. (1983). Democratization and participative research in developing local theory. *Journal of Occupational Behavior*, *4*, 21-33.

Emery, M., & Emery, F. (1978). Searching: For new directions, in new ways, for new times. In J. W. Sutherland (Ed.), *Management handbook for public administration* (pp. 257-301). New York: Van Nostrand Reinhold.

Eriksson, K., and Holmer, J. (1991). *Studiecirklar som stod for forandring av arbetslivet* [Study circles as a support for change in working life] (Report 1991:09). Goteborg, Sweden: Institution for Pedagogik Goteborgs Universititet.

Eriksson, K., Karasek, R., Uudelepp, U., & Weber, G. (1991, November). *Produktfornyelse och kreativt koordinerad produktion* (CAU Report). Halmstad, Sweden: Center for Work Life Development (CAU), University in Halmstad.

Gustavsen, B. (1990). *Vägen till bättre arbetsliv: Strategier och arbetsformer i ett lokalt utvecklingarbete* [Road to a better working life: strategies for reform and local development work]. Stockholm: Arbetslivscentrum.

Gustavsen, B. (1992). *Dialogue and development: Theory of communicative action research and restrucrtureing of working life*.

Stockholm: van Gorcum, Assen, Masstrict, and the Swedish Center for Working Life.

Habermas, J. (1984). *The theory of communicative action: Reason and the rationalization of society.* Cambridge, UK: Polity Press.

Karasek, R. A. (1991). *Conducivity game theoretical background*. Halmstad, Sweden: Center for Work Life Development, University in Halmstad.

Karasek, R. A. (1992). "Conducive" production via creative coordination. In *NordNet project documentation*. Lowell: Department of Work Environment, University of Massachusetts.

Karasek, R. A. (1992). The "conducivity game": Developing "worker coordination" vocabularies. In *NordNet project documentation*. Lowell: Department of Work Environment, University of Massachusetts.

Karasek, R. A. (2004). An alternative economic vision for healthy work: Conducive economy. *Bulletin of Science, Technology & Society*, *24*, 397-429.

Karasek R. A., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books.

Kohler, W. (1946). *Gestauilt psychology: An introduction to new concepts in modern psychology.* New York: Liveright.

Penny. J. (1995). *The conducivity game: 1995 version*. Lowell: Department of Work Environment, University of Massachusetts.

Piore, M., & Sable, C. (1984). *The second industrial divide, Possibiities for prosperity.* New York: Basic Books.

Robert Karasek, first educated in liberal arts, physics, and architecture and with a Ph.D. in sociology, has been professor of industrial engineering at Columbia University and University of Southern California and is now professor of work environment at University of Massachusetts–Lowell. He researches in the area of job stress, psychosocial factors, work organization, and the political economic implications of work organization. His demand-control model has been successfully tested in hundreds of chronic disease studies. His conducive economy theory attempts to provide a humane pathway for new work organization in the global economy. He is now working on a new physiological theory of low control and chronic disease development: the stress-disequilibrium theory.