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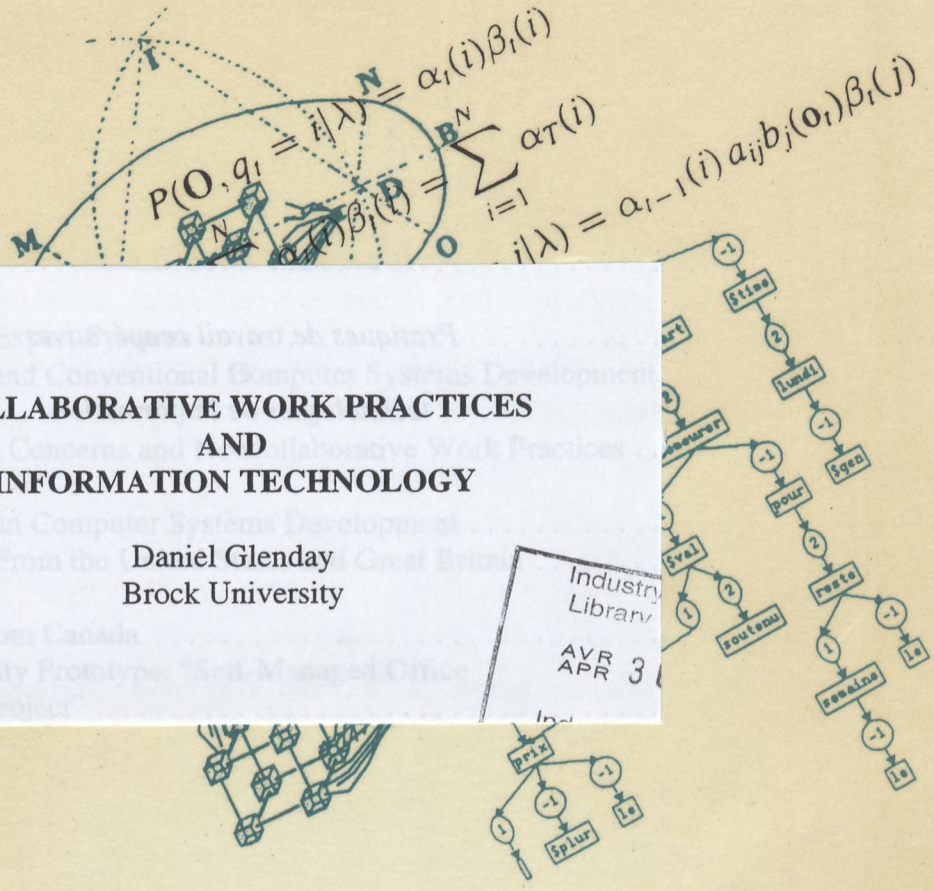

COLLABORATIVE WORK PRACTICES AND INFORMATION TECHNOLOGY

Daniel Glenday
Brock University

CITI

Centre d'innovation
en technologies de l'information

Centre for Information
Technology Innovation

Canada

Centre for Information Technology Innovation (CITI)
Industry Canada

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Daniel Glenday
Brock University

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EXECUTIVE SUMMARY

The primary objective of this report is to provide a model of "collaborative design" that would be of interest to public-sector management (both federal and provincial) and trade unions. Of particular interest is the inclusion of sociologists into teams of system designers, management and unionized employees in the collaborative process. The data is derived from our own empirical research in four organizations in Québec and Ontario, an examination of two Canadian case studies and a review of the relevant research literature on participatory design and performance support systems. Lastly, the juxtaposition of "text" and "context" will serve as appropriate analogues that capture the relationship between training, information technology and collaborative work processes better than the often-used "machine" metaphor.

The four examples discussed in this report, while demonstrating differences among the situations encountered, yielded several common features. The findings can be divided into those dealing with the nature of the information technology (computer hardware and software linked to communications networks) and those dealing with the nature of the reorganization of work (collaborative work processes and training).

Nature of Information Technology (IT)

- The computer is more like a piano than a VCR. Knowing how to play the piano demands more than simply memorizing which buttons to press!

- A more fitting analogy for the complex relationship between IT systems, training and the reorganization of work is the familiar aphorism "text without context is no text".

- The threat of job loss in a period of public sector constraint is viewed by trade unionists as an impediment to the design of collaborative work processes. Economic constraints (cutting budget deficits, for example) facilitate the marginalization of the soft or creative and informal work design aspects of computer system design while legitimating the "concrete" and "technical" practices. The difficulties in operationalizing, for cost

accounting purposes, the medium to long-term benefits of the "soft/creative" side of participatory design contributes to its peripheralization in times of economic constraints on governments.

- Collaborative work processes point to the potential for significant improvement in the use of computer software.

Nature of the Reorganization of Work

- The specific area of collaborative work is office work performed by secretarial and clerical staff (mainly women).

- Just as learning is a continuous activity for job holders, so too should the design process of planning office computer systems be viewed as a sustaining practice.

- Computer systems development increasingly involves communication and information technologies. Organizations employing the latest in Information Technologies (IT) emphasize employees working in groups and depend on the commitment of their employees. Sociology as the academic discipline that studies individuals in groups will take on an enlarged role in the efficient and productive use of IT collaborative work processes.

- The male view of women's ability to manage the many duties and responsibilities of work, home and child care is carried over into the workplace when male managers assume secretarial and clerical staff's capabilities to manage the increasing quantity and complexity of office work without devoting the requisite time and resources to training and creating appropriate collaborative workplace practices.

- A dynamic and interactive relationship exists between training, work-related health concerns, traditional management practices and the organization of work. (See Figure 1).

- Collaborative management practices, collaborative IT work processes and commensurate training practices will lead to increased productivity (value-added products/services) and improved efficiency (better products/services). (See Figure 1).

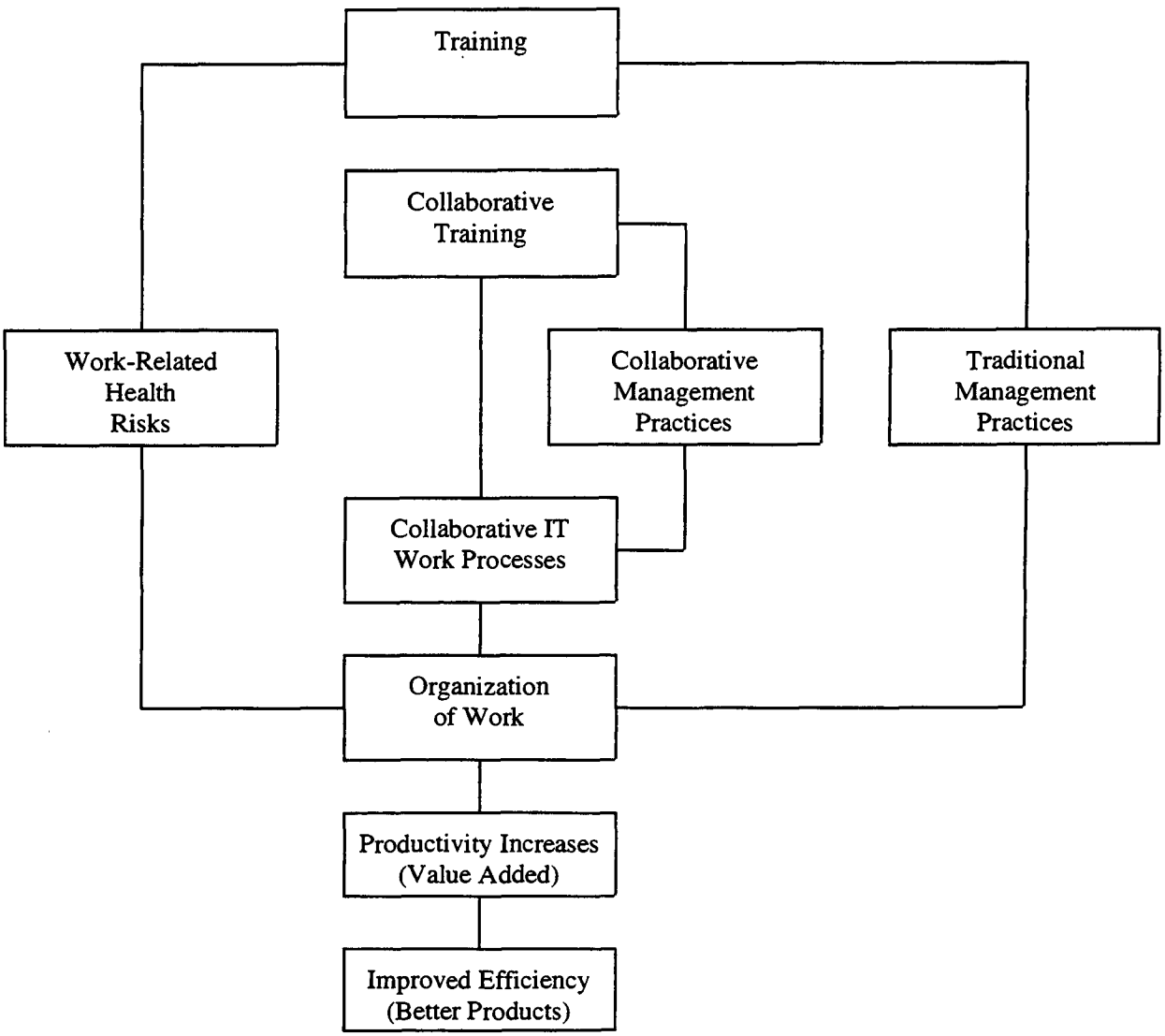

Figure 1
Collaborative vs Noncollaborative
Work Practices

- Training that includes familiarity with the computer system, for example, contributes to the user's ability to experiment with word processing, spreadsheet and other software packages that have become standard tools in the office. Experimentation, however, requires collaborative work practices sanctioned by management.

- The emphasis on training as the development of narrow technical skills not only ignores the broader *problem-solving* and *design skills* users need, it also encourages them to see the fault as lying within themselves and not in the original software design or in the larger organizational context.

- Management underestimates the complexity of the change which office employees must undergo and therefore deprives them from making essential contributions to the process of work redesign.

- Office employees face similar difficulties working in isolation and without the benefit of what others have learned. This is partially overcome by informal learning or self-empowerment.

- Too often, the criteria of ease of usage and ease of learning the software package are considered more important than improving working conditions and upgrading the quality of the product.

- It must be recognized that female office employees are overworked.

- A permanent joint labour-management technology committee should be established to assist in formulating long-range planning policies. This committee should be linked to a resource centre with on going training programmes.

- The final goal should be the more equitable distribution of benefits such as increased productivity derived from collaborative work practices.

INTRODUCTION

This report is divided into five parts. Part 1 examines the text and context of computer systems design and development. Part 2 deals with work-related health risks and their link to how office work has been organized conventionally. Part 3 looks at participatory design as a movement within the orthodox view of computer systems design. Part 4 provides a brief sketch of two Canadian case studies of how office work became reorganized involving several principles laid out by participative design strategists. Part 5 is a summary of the findings in the form of a model of "collaborative design" that will be of interest to public sector management (both federal and provincial) and unions. Of particular concern will be the expansion of the collaborative processes to include sociologists with system designers, management and the unionized mainly female employees.

1 TEXT AND CONTEXT OF EXPERT SYSTEMS

> **"Training, training, training; these are the three top priorities to changing work in the automated office."**
>
> (Strassmann, 1986: 60)

The computer is more like a piano than a VCR. Knowing how to play the piano demands more than simply memorizing which keys to press! It requires a period of time to understand the conceptual and procedural basis behind reading and playing music. Once this has been learned, the individual is not only competent to play but able to *experiment* with different relationships between chords.

If the piano and different sheet music can be compared to the computer and its software packages, then this analogy is similar to the "machine" metaphor often used to describe computer systems design strategies for office work. Computer system design strategies can be situated along a continuum with the purely technical, task-oriented technological ("machine") strategy based on methods of software-engineering at one extreme and an "actional" approach at the other. An "actional" approach embodies an understanding of computer system design that includes the social action of *all* participants. The now familiar socio-technical strategy can be located somewhere in the middle because it combines existing methods of software engineering with developing ergonomic prototypes (Software-Ergonomic Interface Design). These three approaches view the user in different ways. The "machine" strategy sees the computer system built *for* the user, the socio-technical strategy as operating the system *with* the user while the last approach sees computer system design as employed *by* the users (See, Fuchs-Kittowski, 1987). It is in the context of the latter strategy, which is explicitly collaborative, that we have thought about using a new analogy.

If we are serious about collaborative design strategies, the need arises to employ an analogy that better captures the characteristics inherent in the relationship between training, information technology and collaborative work processes. The familiar juxtaposition of text and context will serve as appropriate analogues for Information Technology (IT) hardware, software and collaborative work processes.

Text is analogous to the "machine" approach to system design which includes, of course, the hardware and software. From this perspective, office work, for example, is viewed as basically a technical problem. The computer system is viewed as a machine in that the designer, in the process of "informating" (see Zuboff, 1988) a work process, must determine its technical possibilities. Interestingly, as more and more tasks are incorporated into the technology and some displacement of personnel occurs, the elimination of all information workers is not possible, nor desirable. The user comes in when the computer *cannot* carry out a particular task or set of tasks. To some designers, these are limitations to be tackled and overcome. In the words of Thoresen:

> Methods and techniques are biased towards what the computer can do, not what the people using the computer can do... it is the construction [of the computer system] which is fascinating. In addition, the designers are often severely restricted by economical, organizational and technological limitations.
>
> (Thoresen, 1989: 124)

1.1 Office Work and Conventional Computer Systems Development

Attention has been focused on tackling issues related to office-system design, electronic mail, data base systems, and so on. Conventional computer system developers, who see the office work process linearly in terms of information and other flows, will produce specific products that are perceived to contribute to the organization's goals. They accept the likelihood of a reduction in routine and repetitive tasks while expanding the variety, responsibility and challenge of new work duties. However, they neglect to inform us of the processes through which information workers (e.g. secretaries) may gain access to decision-making and planning procedures. Moreover, they have a limited understanding of information workers aspirations and how they can be achieved. These authors concentrate on job design but tend to ignore career management and education and training. For example, if freedom from routine tasks is taken as a real outcome of information technology applications, there are few substantive answers as to what replaces the routine and how information workers are prepared for it or how to prepare them for it.

> We now ask secretaries to work for more than one person, so it changes the whole social environment... [the secretary is] now interacting with two people who are her bosses, so to speak, and a bunch of other people who are her peers or perhaps her subordinates.
>
> (Cohen, 1987: 80)

While office work includes a necessary and complex set of tasks, duties and responsibilities, many aspects of the job are invariably not defined. There are constantly people coming in to ask questions, and telephones are ringing; the demands of office work include interruptions. Moreover, office workers in the four organizational settings in Ontario and Québec we studied were doing more than specified in their official job descriptions. Some female office employees did more supportive work (helping superiors), while others had greater responsibility and autonomy. Information flow methods are useful to those in the latter category, but are not beneficial for those in the former group. Different forms of analysis are required if we are to truly understand the complexity of office work.

Predetermined concepts of tasks make office work look clear and understandable. However, *in the wrong context*, they only hide the fact that parts of the work and the skills used have been lost in the analysis. Since it is women's work that tends to include "invisible" tasks, that is, those requirements that are not official but regarded as part of normal female aptitudes (see, for example, Machung, 1983) it is women's work that gets easily lost during fixed, objectifying procedures of work analysis.

Advances in word processing packages for clerical and secretarial office work illustrates not only the limitations of the "machine" approach to computer systems design and development, but also the need for well-trained and intelligent users. As the first quote below illustrates, word processing packages, even with automatic spell checks, pose difficulties for their users. Moreover, an automatic spell check is only as good as its dictionary, and even an automatic spell checker includes a custom dictionary to accommodate the specific requirements of the office, whether legal, academic or business terminology are involved, personal or business names, authors, and so on.

> You still have to have good English skills even though the machine might have the spelling error detector on it; you still have to know how to spell words because it often spits words out which are not in the dictionary... so unless you know how to spell the word in the first place, it doesn't help.
>
> (Cohen, 1987: 78)

More important for the word processing requirements of the office is the need for good grammatical skills. These skills cannot be taught in a seminar lasting a day or two, nor can they be incorporated into a performance support system. While these skills are often assumed as requirements for the job of secretary or office clerk (mostly women), it is amazing to see the lack of grammatical skills of their bosses, who are mostly men.

> And it [word processing package] doesn't pick up bad grammar, it doesn't make sense of what you've put down there; you have to do it. You can produce a beautifully formatted document, but it can be a load of rubbish. And the author doesn't care about beautiful formatting; the author cares whether it makes sense.
>
> (Interviews with Clerical Workers)

Further recognition of the complexity of office work is captured by the work of two Italian computer systems researchers, DeCindio and Simone (1989). They offer an innovative approach to the analysis of office work that incorporates the nature of interpreting changes in office tasks brought about by IT systems with the role played by academic disciplines.

When asked to reply to the question: "What are you doing?" They observe five possible responses from female office workers:

- "I am tapping on my keyboard, looking at the screen: my eyes ache."
- "I am using a wordprocessor that does not have the 'undo' command and some mistakes become a disaster."
- "I am working on the monthly budget report; some data are wrong and I have to finish it for tomorrow morning."
- "Mr. Jones asked me to prepare this report. But I probably need the help of Mrs. Smith to be able to describe the marketing aspects too."

- "I'm angry because I agreed to do this job for a colleague of mine. It will never happen again."

Each of these responses is meaningful but contains different types of information about office work. The authors point out the need for a reference system that would be capable of accurately and commensurably comparing the different responses. Table I classifies their "five universes of discourse" into measurable variables and the corresponding academic disciplines responsible for their analysis and evaluation.

TABLE I
FIVE UNIVERSES OF DISCOURSE

Type	Operator Response	Support Systems	People's Skills	The Problems	Academic Disciplines
Physical	"I am tapping on the keyboard, looking at the screen: my eyes ache."	Office equipment (desks, lamps, cabinets, etc.) and computer technologies (mouse, voice, scanner, etc.).	Manual precision, dexterity, resistance to physical fatigue.	Office layout, lighting, etc. leading to fatigue, eye strain, etc.	Ergonomics, work environment architecture.
Operational	"I am using a word processor that does not have an 'undo' command and some mistakes become a disaster."	Software (word processing, spreadsheets, graphics, personal agendas, DSS*, etc.).	Competence, autonomy, experience, familiarity with the number of applications and their complexities.	Stress related to ease of learning and use of software, use of application with a slow answer time, etc.	Cognitive Psychology (AI*), Computer Science (AI*).
Procedural	"I am working on the monthly budget report; some data are wrong and I have to finish it for tomorrow morning."	EDP* integrated with MIS*, some data banks, forms/documents handling, etc.	Ability to find the best Scheduling and resource allocation, isolate a current problem, etc.	Difficulty in finding the best Balance between competing parameters since high complexity=high number of mistakes.	Cognitive Psychology, Computer Science (AI*).
Commitment	"Mr. Jones asked me to prepare this report. But I probably need the assistance of Mrs. Smith to be able to describe the marketing aspects too."	Telephone, fax, E-mail, "groupware" that is software devoted to supporting communication.	Autonomy, ability to live in complex human networks, intuition, collaboration.	Role definition is crucial, degree of visibility of the over-all process, etc.	Sociology.
Individual	"I am angry because I agreed to do this job for a colleague of mine. It will never happen again."	none	Individual reactions to the organizational, technological, and the social setting result from the specific combination of the previous four discourses.		Sociology.

* DSS: Decision Support Systems
* MIS: Management Information Systems
* EDP: Elementary Data Processing
* AI: Artificial Intelligence
Source: DECINDIO, F. and C. SIMONE. "A Framework for Understanding (Women's) Work and Its Computerization", K. Tijdens, et al., (eds.), *Women, Work and Computerization: Forming New Alliances*, New York: North-Holland, 1989, p. 137-139.

As we can see from an examination of the academic disciplines column, the narrow technical view that includes Computer Science and Cognitive Psychology gradually broadens to include Sociology. Moreover, it is clear from their vantage point that the recent developments in IT systems can put women who have been relegated to the margins in non-technical fields, more towards the centre of system development and design. For women, the advantages are clear. To make this normal practice, however, we need interdisciplinary teams that include sociologists.

In addition to the above typology, the authors point out that the penetration and complexity of information technologies in the workplace have passed from an early stage of elementary data processing (EDP) into a period of *personal computing* and *individual productivity tools*. This development represents a shift from the computerization of routine tasks to include the use of information technologies in the communicative aspects of work. They see this change as a move from the "procedural" and "operative" into the "commitment" universe of discourse.

Theirs is an important contribution to our understanding of women's work in the office as it becomes integrated into ever more complex IT collaborative work practices. Academic research and business periodicals are constantly reminding us that the organization, be it in the public or private sector of the economy, is undergoing an evolution that is accentuating the conversational, communicative aspects of work. The organization is evolving from a bureaucratic, rational enterprise into a more decentralized structure where the work environment is coming to value such personal (women's) characteristics as intuition and collaboration. As Herbert and Stuart Dreyfus note:

> Intuition is the product of deep situational involvement and recognition of similarity. ... Intuition or know-how, as we understand it, is neither wild guessing nor supernatural inspiration, but the sort of ability we all use all the time as we go about our everyday tasks, an ability that our tradition has acknowledged only in women, usually in interpersonal situations, and has adjudicated inferior to masculine rationality.

To continue with my analogy, any text requires writing tools (pen, pencil, paper and so on) and a clear understanding of the grammatical and spelling skills needed to communicate ideas, thoughts and so on. However, text without context leads to misunderstanding, confusion, and even

undue stress, frustration and anger. Context combines IT systems with communication skills and commitment to work practices in the new Information Technology collaborative workplace. Context refers to the interaction between information workers and information-technology systems. As new systems come on line, some tasks are taken over by the technology, and new tasks are created while still others are expanded. Training, or competence-based learning, is an essential, critical and costly issue.

Too often, the computer and software packages are pushed as appliances, like a toaster, on the office employees (mostly female). The computer system is viewed by managers as a tool with little or no intrinsic value other than the specific purpose it is to be used for, even though it is technically designed to do far more. Therefore, training is frequently restricted to a few hours of instruction on "the basics". The assumption that is repeatedly made but seldom stated is, whatever else that needs to be learned can be picked up quickly and easily by the user on her/his own time. As a result, the organization forfeits lost potential for increased productivity and improved efficiency when the user's lack of conceptual knowledge of the IT system fails to interface with the embedded knowledge of the computer system. Training that includes a familiarity with the computer system, for example, contributes to the user's ability to *experiment* with word processing, spreadsheet and other software packages that have become standard tools in the office. Experimentation, however, requires collaborative work practices sanctioned by management.

If these analogies of text and context accurately capture the essence of IT systems (text) and the reorganization of work along collaborative lines (context), training, for example, that has been almost entirely competence-based must include a deeper conceptual understanding of computer systems design than is presently taught. Increasingly, information workers are being called upon to adapt IT systems to meet new, creative but not unexpected particularities. More and more, compatibility between the resources characterizing an organization's social system such as readiness, competence, qualification, interests, abilities, needs and motives with the goals of the technical system are needed for the efficient use of the technology.

2 WORK-RELATED HEALTH CONCERNS AND NONCOLLABORATIVE WORK PRACTICES

Little has been written about the continued relationship between work-related health concerns such as stress and clinical depression and the nature of non collaborative work practices (Exceptions include Clark, Decuman and Snider, 1988; Cohen and White, 1986; and Stephenson and Debo, 1989). Clearly, the dominant mode of computer systems design and development (the "machine" approach) accepts traditional management practice. Lost productivity and efficiency have been explained by the lack of appropriate training and computer systems developers are moving rapidly to overcome this "deficiency" by developing performance support systems (PSS). These innovative training tools are meant to be user-friendly. The expectation is that lost productivity and efficiency can be quickly recouped by the systematic use of these technical innovations (See, for example, Carr, 1988, 1992; Geber, 1990; Gery, 1989; and Hedberg, 1993).

Can training for redefined or new office tasks be delegated solely to performance support systems? We have neither the time nor the inclination to debate the merits or shortcomings of these systems. However, in addition to competence training, we know a great deal of learning occurs at an informal level. Marsick (1987, 1988), for example, points to the importance of "reflective learning" in the workplace, while DeCindio and Simone above suggest "five lexicons" (physical, operational, procedural, commitment and individual) or "five linguistic dimensions" for analyzing office work, skills, technology and specific characteristics of women's work attitudes and practices. How women learn while using IT systems is a complex process not susceptible (not yet, at least) to technical acumen (that is, Performance Support Systems or PSS). It would seem reasonable to conclude that learning while on the job comes into play when performance support systems cannot adapt to special situations. In any event, they may still prove beneficial if used properly – that is, if they become part of a broader, more encompassing strategy of collaborative work practices. The danger, as we see it, is that these systems may exacerbate an already intolerable health problem in the IT office.

A short time ago, the precursor to CITI, CWARC, demonstrated an interest in the role played by white-collar unions in the execution and the progressive penetration of information and communications technologies in the office. The Social Sciences and Humanities Research Council

of Canada (SSHRC) provided the funds to execute a study of the relationship between trade unions, administrators/managers, information technology and the office. What we will report on below is the relationship expressed by the mostly female staff in four organizations located in Ontario and Québec between work-related health concerns, training, computer skills and the organization of work in the office.

TABLE II

RELATIONSHIP BETWEEN WORK-RELATED HEALTH RISKS AND REORGANIZATION OF WORK

	Health			Tech. Support			Training		Organization of Work								
	7G	7H	7I	7A	7B	7F	7C	7D	7E	7I	7J	7K	7L	7M	7N	7O	7P
Niagara College (1,2)	76%	68%	90%	63%	82%	66%	55%	44%	29%	90%	50%	40%	61%	55%	58%	47%	59%
York (1,2)	88%	79%	94%	85%	86%	67%	60%	51%	39%	94%	62%	68%	70%	71%	68%	n/a	46%
Brock (1,2)	92%	88%	95%	86%	73%	60%	62%	37%	36%	95%	57%	54%	62%	51%	53%	45%	38%
UQAM (1,2)	73%	67%	92%	62%	83%	59%	53%	28%	42%	92%	39%	46%	72%	55%	80%	51%	55%

Highest Questions (Over 80%):		
	Niagara College	Physical Layout and Health Needs [7I]
		Technical Staff [7B]
	York	Physical Layout and Health Needs [7I]
		Technical Staff [7B]
		Learn New Computer Skills [7A]
		Informed about Health Risks [7G]
	Brock	Physical Layout and Health Needs [7I]
		Learn New Computer Skills [7A]
		Informed about Health Risks [7G]
		Improve Protection [7H]
	UQAM	Physical Layout and Health Needs [7I]
		Technical Staff [7B]
		Better Equipment and Software [7N]

Table II categorizes the sixteen items asked of mostly female clerical and secretarial staff at three Ontario and Québec universities and one Ontario community college. These items deal with the most important issues facing their computerized working environment. The respondents were asked to indicate the level of importance from 1 to 7 (1 representing "very important" and 7 "not important") for each of the sixteen questions. Regardless of the size of the organization (large or small), cultural context (Québec and Ontario) or degree of unionization (unionized or not), the

items that stood out were those dealing with work-related health concerns, ergonomics, better training related to computer skills and quicker technical support. Each of these issues will be explored in more depth in some of the case studies to follow. However, before proceeding, recent developments in collaborative computer system design will be briefly introduced.

3 PARTICIPATORY DESIGN IN COMPUTER SYSTEMS DEVELOPMENT

Participatory (or collaborative) design (PD) refers to an approach to computer system design used by a group of computer system developers who view their work as building computer systems that are better suited to the actual skills and working practices of the people using the system (that is, much like the "actional" approach discussed earlier in this report). They accept the view that work is a social activity involving the interaction of many people, and that barriers between technical specialists and other working people need to be broken down in order to build effective communication between those using the products of design and those who develop and maintain them. There have been several conferences devoted to collaborative design practices held in North America, such as the 1990 Participatory Design Conference in Seattle and the 1990 Computer Supported Cooperative Work Conference in Los Angeles. In addition, a plenary session at the 1991 ACM Computer-Human Interaction Conference in New Orleans was dedicated to small group collaborative methods. In Europe, the Fifth International Federation of Information Processing (IFIP) Conference entitled "Women, Work and Computerization: Breaking Old Boundaries; Building New Forms" was held in Manchester, England from July 2-5, 1994. This latest conference, like the four previous ones, brought together computer systems specialists from across Europe and North America to share ideas and experiences of collaborative or participatory design of office computer systems. The IFIP has been holding these meetings since 1983.

The assumption is made that female office workers have gained experience and confidence in using computers. For PD designers, the question is, How can their knowledge and experience be put to good use? For some, strategies like *group workshops* and *activity groups* are applied to workplace issues and become an integral part of participatory design (Green et al., 1991; Kensing and Madsen, 1991). What follows are two case studies of how participatory design strategies have contributed to not only making the IT workplace a better place to work but increasing the productivity and improving the efficiency of the organization.

3.1 Case Studies From the United States and Great Britain

Joan Greenbaum (1991) describes her involvement in participatory design as a consultant to a large non-profit organization in New York City. Her team used group workshops to "foster an environment where staff members from different departments could begin to express their ideas about the types of software and hardware they wanted when a new desktop office system was installed" (Greenbaum, 1991: 35). Heads of departments were asked to assist by involving staff members in the first stage of the project. Twelve people either volunteered or were recommended for participation in the workshops. Their numbers included data-entry clerks, secretaries, editorial assistants and area coordinators. All were excused from their normal work schedules while attending the workshops.

Half-day sessions were held over a two-month period. The workshops involved two major stages: "Storytelling" and "Future Workshop". The latter was divided into critique, fantasy and implementation workshops. During the Storytelling session, employees were asked to prepare two short oral stories about their worst and most successful use of computers in their daily work. All the worst stories were descriptions of wasted time and lost productivity. A major problem identified during this phase was the embarrassment and lack of confidence expressed by both men and women about their ability to handle technical problems. Lack of proper training facilitated these feelings of inadequacy and discomfort.

The next stage, Future Workshops, used group strategies to help employees talk about problems (critique workshops), suggest alternative ways of doing the work (fantasy workshops) and lastly planning for how to bring their problems and ideas to management's attention (implementation workshop). According to Greenbaum, management was "pleased with the outline of specifications that grew out of the workshops, but extremely enthusiastic about the group process" (Greenbaum, 1991: 36). It would seem that management perceived the workshops or process as more important than the recommendations that resulted from them.

The focus of the second example is on the changed requirements to meet organizational goals due to new demands in the external environment. Green et al. (1991) describe how both

management and the 400 staff members at a northern British city library shared the view that the piecemeal approach to technology-led computerization over the previous ten-year period (the study began in 1986) had been "a disaster". Moreover, the role of the library had moved away from the "traditional, 'custodial' view towards a more outward-looking, active and community-oriented model" (Green et al., 1991: 222). Library assistants were being asked to respond to more complex public inquiries in addition to their "normal" duties of issuing, shelving and repairing books. Interestingly, management agreed with a trade-union proposal to "expand the pay and career opportunities for library assistants on clerical grades" (Green et al., 1991: 222).

As research consultants, the library assistants were asked to assist in the planning for a new library computer system. After discussions with management and the local trade-union representatives, they agreed to a collaboration based on three principles: the computer library system would enhance jobs and services, not displace staff; it would embrace both technical and organizational needs; and it would explore new forms of collaboration that would include the library's clerical employees.

They began with "workplace study circles". Unlike "management-inspired quality circles", study circles were run by the participants, who worked with an agenda they largely defined themselves. According to Green et al. (1991), management did not think it likely that the staff would respond enthusiastically to study circles because of their prior "bad experience with computerization". The study circles were convened through open advertisement. There were enough volunteers to staff five groups made up of six to eight members each and facilitated jointly by a researcher and a library assistant. They met during work time for an average of seven half-day meetings each. They started with group exercises that would enable the members to share views and concerns about IT. By the end of the seventh session, each study circle had constructed its own set of activities that included a day trip to a large public library of their choice to examine an on-line, up-to-date integrated system.

Among the positive outcomes of this exercise in workplace study circles was the emergence of a significant minority who showed an active interest in working on computerization issues and contributed to the creation of a proposal for a design-team structure that included the

library's clerical staff. The links between technological and nontechnological aspects of computer systems development had been made at this stage and were to continue into the design-team stage.

> The group felt that it wasn't just a question of getting the technology right, but also about staffing, communication, training and so forth.
>
> (Group Report, Study Circle 3, as quoted in Green et al., 1991: 224)

Selecting a system and a supplier was the principle task of the design team. The team knew that all the available computer systems were designed to operate according to local requirements. However, the differences between the systems had to compared and evaluated. The design team planned demonstration events that included all library employees and devised a questionnaire method of recording and analyzing staff assessments of the available systems. The authors compared the different questionnaire sections produced by the design team to illustrate the positive impact of staff involvement. Only one-eighth of the total was jargon-laden; the remainder was phrased to "directly reflect staff and library borrower needs". Without the active collaboration of the female staff, they conclude "we would have expected these proportions to have been reversed" (Green at al., 1991: 227). In common with the study circle process, this mechanism opened up system selection and development issues to the women staff.

These case studies illustrate the need to recognize that new office technology requires major investments in learning and adjustments by the staff directly affected. In addition, as reflected in much of the recent management literature, these case studies draw out the group basis for sound organizational learning that pays off in improved efficiency and increased productivity. Finally, collaborative work practices require the direct involvement of those doing the work. An IT collaborative workplace should be viewed as a *sustaining practice* and must not be relegated to only improving the technical support systems.

4 TWO CASE STUDIES FROM CANADA

After an extensive examination of the area of participative design strategies in Canada that included interviewing key informants working for the largest trade unions such as CUPE and PSAC, only two case studies could be uncovered. Only one, the M-Power Project at Manitoba Telephone System, came close to employing a PD design strategy. Clearly, the need exists for implementing PD design strategies in several different office environments in this country.

4.1 York University Prototype: "Self-Managed Office Automation Project"

The principal aim of the introduction of microcomputers for clerical and secretarial staff from 1984 to 1986 at York University was linked to the unlikely prospects of employment growth in clerical and secretarial staff to meet the expanded demands brought about by expected increases in student enrollments during the 1980s. Therefore, the use of computers was meant to serve as an administrative instrument that would increase output by reducing much of the repetitive typing and data management without increases in support staff.

The initial project team responsible for introducing computers consisted of two members: a financial and budgetary officer and a newly appointed manager of Computer Projects. After consultation with department faculty and a few secretaries, the project team decided to *ignore* the departmental requests because, in their view, they knew best what could be done with computers. They decided to provide the more than 100 secretaries and department chairs with a stand-alone microcomputer. The principle applications were word processing with spreadsheet capabilities. The team then sent a questionnaire to all staff to find out about the nature of office work. The findings revealed 75 different layouts for letters across 22 academic units. However, the initial project team determined the findings to be unusable.

The purchase of the hardware and software was left to the two team members. Equipment was compared on price, keyboard layout, screen, memory capacity, disk speed and compatibility with popular makes. Suppliers were evaluated on the basis of stability, reputation, and service competence. Zenith computers were chosen and MS-DOS and WordPerfect were picked as the operating system and word processing software.

Training was to be done by the project manager over a two-day session for a cadre of secretaries. The first day was spent unpacking and setting up the machines and studying MS-DOS. The second day was devoted to WordPerfect. The rest of the staff were to learn on their own with the help of the local "expert" from the cadre who had received the initial two days of training. No additional staff was hired to fill in for secretaries while they studied or practiced on the new equipment. It was assumed that people would find the time to fulfill these requirements. The Project team assumed this process would make all academic departments self-sufficient because when a secretary encountered a problem, she could always consult her local "expert".

Things did not go according to plan. Secretaries were not consulted, and were they informed about the arrival of new equipment. Training was too technical and complex for the employees to understand. The staff took much longer to learn than anticipated and the technical specialist was "swamped" with the quality and variety of questions. Typewriters were removed despite the objections of staff members. Other complaints included the poor quality of the monitors, the lack of ergonomic considerations, and insufficient time provided during the working day to learn how to use the new computers.

A research project was designed to assess how the support staff reacted to the new computer system and what difficulties they had encountered. A questionnaire and interviews with staff, administrative personnel and department chairs was conducted in late 1986 and early 1987. The questionnaire dealt with issues such as training, consultation, health and safety, performance improvements and job satisfaction. Among the significant findings from the York questionnaire were the following:

- Word processing was used heavily in preparing letters and correspondence, form letters, course outlines and faculty CVs.

- Computers increased work performance in the total amount of work performed, overall quality of service, capacity to take on new tasks, desire to take on new tasks and the speed with which to respond to requests.

- Learning on one's own and with the help of others in their department was considered more useful than attending courses or getting help from an outside specialist.

- Physical discomfort was widespread with headaches, muscle and eye strain reported by two thirds of the respondents.

- Computers were viewed by half as posing health risks.

- Learning to use computers was seen as contributing to the advancement of their careers.

These findings were aptly captured in the words of one staff member who said,

> "I feel strongly that training has been inadequate in the extreme and that computers ***are not*** being used as they should be. With proper training there is ***so much more*** that could be done. The staff have neither the time nor the facilities to expand their knowledge ".:
>
> (Emphasis ours)

Issues related to the lack of meaningful consultation, inadequate training and technical support and work-related health problems led to the need to demonstrate an alternative approach to office computerization. It was soon accepted that a stronger role for office staff in determining training needs, for example, would result in a greater willingness by staff to explore new applications from existing software, thereby enhancing the effective use of their equipment. The result would be greater confidence in their technical and organizational skills and a corresponding improvement in office productivity.

The second project began with a steering committee of seven members representing the Deans of Arts and Fine Arts, Personnel Services, the president of the Union, a department chair from each of the two Faculties and the support staff. They were responsible for obtaining the necessary resources, selecting participating departments and dealing with major problems as they emerged from the operation of the project.

One of the "obstacles" was the management view that when general-purpose information technologies are introduced into the workplace, the female staff is conventionally not expected to decide on how work is to be reorganized, what training schedules should be implemented, nor how training should be accomplished. One way of overcoming this "obstacle" was the setting up of a resource centre where staff from different departments could go to obtain assistance in learning to apply computer software and, more importantly, to discuss the problems they faced and how to tackle them. Among the support resources were (1) a hotline for getting help quickly; (2) a computer so that staff could study and experiment away from the interruptions of their busy office; (3) ad hoc workshops for individuals and groups; (4) access to outside consultants with expertise in word processing and job design; and (5) a library of materials related to office computers-particularly popular software packages.

Next came the Staff Analysis Group (SAG), consisting of secretaries and administrative assistants from four departments – two from Arts and two from Fine Arts. Once a week, four representatives from the four participating departments met for three hours at the resource centre. Staff relief was provided so that work would not accumulate. Rotation of staff was expected. Minutes of each meeting were to be taken and distributed to all participating department chairs. "Tip Sheets" containing suggestions derived from these meetings on specific topics were to be circulated. These instruments were intended to stimulate discussion and communication among staff members.

The initial project lasted approximately seven months. When compared with a control group that had no contact with the project, the participants showed they had achieved more than simply learning about their word processing packages. They had begun to see their computers as more than tools that led to their *experimenting* with them. Some had set up new databases for their own use. Others reorganized their filing systems. In all, this progress could not have been achieved without some way for staff to discuss and learn together – something the project facilitated.

What were the benefits of this project for staff members (and by extension, the university administration)? One staff member said "It has made me think less about *my job* and more about

our jobs collectively" (emphasis in the original). Another had this to say: "[it's a] relief to know that there is a place – on campus – to find out the how, what, where and when – you can deal with problems arising from understaffing and computerization".

4.2 Manitoba Telephone System (MTS) and M-Power Evaluation Program

The joint labour/management work redesign initiative of the Manitoba Telephone System (MTS) and the Communications and Electrical Workers of Canada, or CEWC (now the Communications, Energy and Paperworkers Union, or, CEP) began as a response to a workplace health and safety "crisis" which began in January 1986. After a hydroelectric power surge, MTS telephone operators reported experiencing shock-like sensations from their computerized work terminals. Over the course of the next two years, the electrical "shocks" continued, and even worsened, until the operators decided to exercise their right to refuse unsafe working conditions. The work site was temporarily closed by the Manitoba Workplace Safety and Health Division of the Manitoba Department of Labour. These actions resulted in the interruption of customer service and required an investigation of the technical, ergonomic and environmental aspects of the work setting.

The final report (November 1987) summarizing the findings linked the "shock-like" incidents to a "breakdown in the ability of employees to cope with the stress inherent in highly automated, repetitive, routine, closely-measured and supervised, high productivity tasks" (Manitoba, 1987: 2). The employees response was identified as a "collective stress response" to their adverse working conditions. Not only the employees, but also managers and supervisors at MTS Operator Services as early as March 1987 identified problems such as lack of communication, inadequate training and preparedness for managing in the 90s, lack of autonomy and decision-making power which they felt warranted senior management's attention.

As a result of these developments, MTS management and CEWC Local 5 developed the following "model" to tackle these issues.

A joint ***Trustee Committee*** (or steering committee) made up of three MTS vice-Presidents, the two presidents from both CEWC locals and CEWC's national representative were responsible for overseeing and sanctioning the activities of the Trail Change Project.

A joint ***Start-Up Committee*** with equal representation from management and the union selected external consultants to assist in the project.

A joint ***Design Team*** with equal representation from management and the union was mandated to research, educate, design and evaluate the new workplace that was completed approximately a year later.

A ***Trial Office*** (or pilot site) was established and staffed with 40 volunteer telephone operators and a front-line management supervisor. Their duties were to provide both long distance and directory-assistance services while experimenting with different organizational/job designs. Redesign was to occur with an employee-collaborative environment.

During the period from early 1988 until July 1989, the Trial Change goals were to maintain and improve customer service, improve the working environment by reorganizing work, improving communications and empowering employees and managers. At the end of its term, the design team submitted 22 proposals for reorganizing work that were to be taken into consideration by the Trustee Committee. The design team, through the Trial Change Office, contributed to making the office a safer workplace for the mostly female employees. In addition, it helped foster a collaborative working environment that recognized the contributions made by the female staff members. Furthermore, it encouraged an atmosphere of trust between management and the unionized staff.

The organization has benefited from the experience of the Trial Change Project, which led to the M-Power Program, by improvements in customer satisfaction, a drop in absenteeism, significant decreases in the number of grievances, as well as the resolution of grievances at the discussion step of the grievance process. This change represents a saving, which is by no means insubstantial, to both the union and management. This saving could only have been made possible by the positive collaborative atmosphere fostered by the Trial Change Project and the M-Power Program.

4.3 Summary

What can be learned from the four cases described above? Specifically, how can managers achieve higher added value from their office staff? One thing is certain and is recognized by virtually every stakeholder examined in the four case studies: the nature of the training experience is crucial. However, what type of knowledge is needed by users to increase the productivity of office work? First, two types of knowledge are required. First, if geared to the existing level of knowledge of office employees, conventional training and support methods possibly including PSS that help users learn some of the underlying principles and the mechanics of using the hardware and software can be profitable. Second, most offices, as argued above, include varying degrees of non-procedurally-oriented tasks. Only the users themselves can analyze their work in its organizational setting and provide customized methods for adjusting work practices. Moreover, we would anticipate that they could provide this information to the employer at a substantially lower cost than if he/she were to employ outside consultants. Lastly, the four cases discussed in this report have been incorporated into Figure 1. It depicts the manner in which a focus on merely technical solutions to complex problems in the office can have serious, negative effects on personnel, productivity and efficiency. It also shows how collaborative IT work processes sanctioned by management can lead to productivity increases and improvements in efficiency.

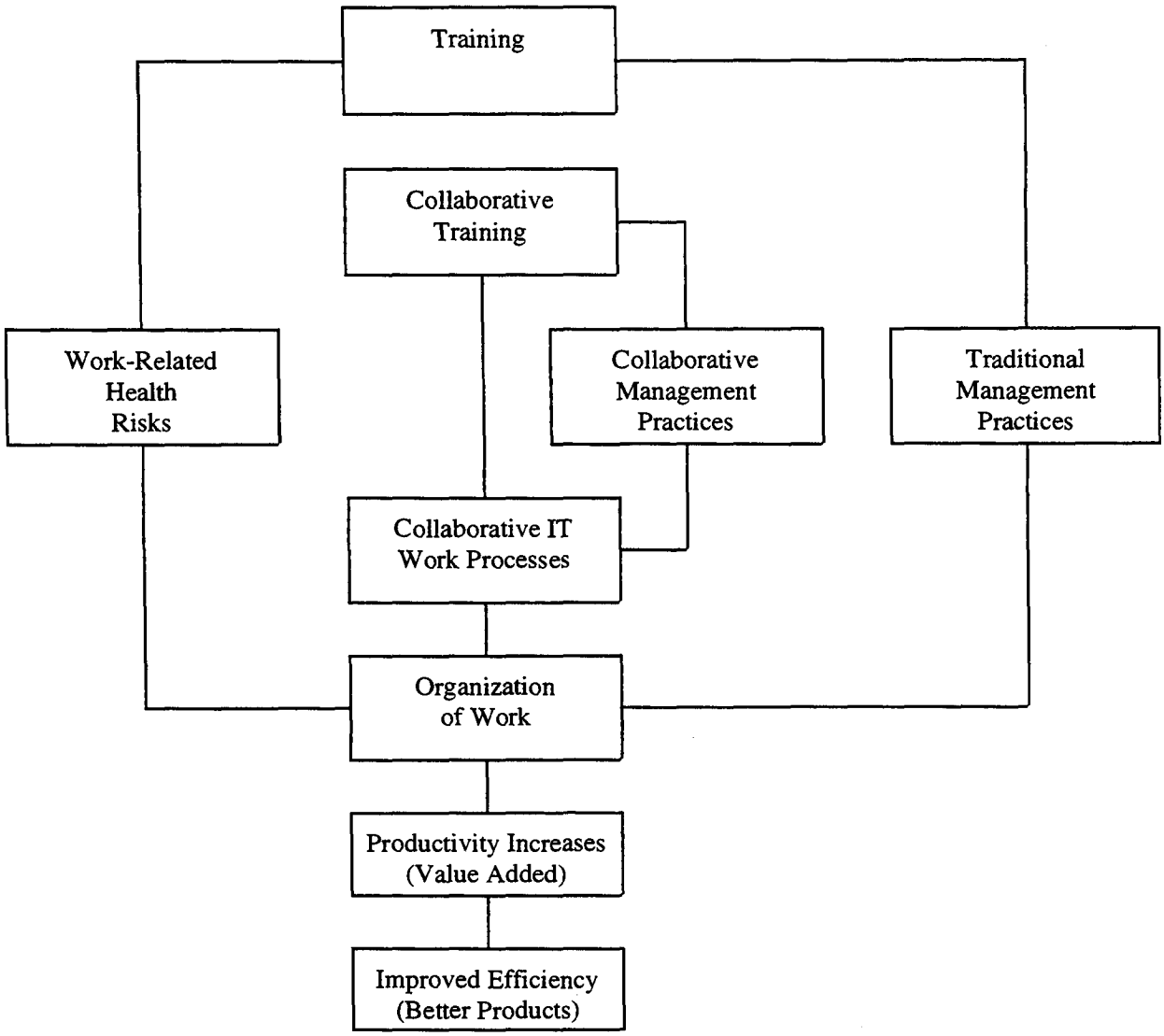

Figure 1
Collaborative vs Noncollaborative
Work Practices

5 COLLABORATIVE DESIGN: THE DEMOCRATIC REORGANIZATION OF WORK

Below is a model for implementing a collaborative design strategy for office work that has been developed from a close examination of the four case studies briefly described above.

5.1 Model for the Collaborative Design of Office Work

Start-Up Committee: (Equal representation from management and the union)

➢ Duties: To select external system design consultants including sociologists.

Design Team: (Equal representation from management and the union)

➢ Duties: To communicate, research, educate, evaluate and design the new workplace of the future.

Trial Office: (Pilot Site: All office workers including staff and management supervisor)

➢ Duties: To experiment with different collaborative (employee-participative) organizational/job designs.

Joint Trustee Committee: (Steering Committee made of equal representation from management and the union)

➢ Duties: To oversee the change project and sanction its activities.

(Adapted from MTS and CEWC model)

APPENDICES

APPENDIX 1

Towards an Organizational Statement on Collaborative Work

The nature of organizations in the information age, whether they are operating in the public or the private sector of the economy, is such that delays in recognizing (1) mistakes in computer system designs or (2) the need for operational changes and taking the appropriate actions are likely to result in substantial costs. Bringing about change is an extremely difficult task which must be approached realistically and patiently because of deeply rooted attitudes and practices. The most promising opportunities lie in "grass roots" circumstances. However, fostering the growth of collaborative work practices in IT settings should reflect the belief that:

1) Experimentation and the generation of new ideas must be encouraged. Situations that are newly expected or unexpected should encourage or promote "learning" and not punishment/discipline.

2) Groups can work together effectively as members of a team with minimal supervision, collaborating on such matters as problem solving (operational and personal), training, "hands-on" operations, and so on.

3) Status differentials should be minimized.

4) Communications should be open and meaningful. Direct communications across departmental boundaries between specific individuals concerned, without passing through intermediaries, is most effective.

5) New work tasks in IT settings should be designed so that individuals are involved from the start (premises, conception, economic context, and so on) and should include the evaluation of results.

An essential ingredient for the success of any organization is a high level of employee commitment. Such commitment begins with satisfactory terms and conditions of employment. However, other needs that should be met include:

1) The need for "continuous learning".

2) The need for the individual to know that he/she can rely on others in a time of need and that if others rely on him/her, their contribution will be recognized.

3) The need to feel that the job leads to some sort of desirable future.

4) The need for some discretion in doing tasks.

(Adapted from various joint labour-management initiatives)

APPENDIX 2

Evaluation Process and Methodology

In the four cases under review changes in work and organizational culture were implemented as a result of circumstances that had made the "old way of doing things" redundant. Each case began with a collaborative design team made up of all organizational stakeholders: staff, trade-union representatives, managers/supervisors, and outside consultants, including computer system designers. In every case, a pilot office became the focus for experimentation based on collaborative work practices. The results of these efforts led to changes in how the organization conducted its business. Once implemented, these changes should be evaluated. Below is *one* way such an evaluation could take place. The findings from the evaluation would be compared with those from a control group based on the "old way of doing things". The evaluation process would proceed in two phases which are outlined below:

Phase 1

Activities required:

1) Development, review and modification of a job diagnostic survey (JDS).
2) Implementation, scoring and interpretation of the results of the JDS.
3) Compilation of any archival data.

Phase 2

Activities required:

1) Designing an interview script for the key stakeholders.
2) Conducting the stakeholder interviews and collating the data.
3) Completing the collection and interpretation of the archival data.
4) Developing recommendations from the data on realignment for the future.
5) Developing the necessary materials and communication process for feeding the information back to the stakeholders.
6) Implementing the process of providing stakeholders with feedback.

Variables of Interest:

* Absenteeism.
* Turnover including resignations, dismissals, transfers out of office/department.
* Productivity including no. per hour, per message or some relevant common indicator.
* Grievances/disciplinary action.
* Client/customer complaints.
* Client/customer satisfaction.
* Education/training including added value through experimentation (product/service).
* Communication.
* Job satisfaction.
* Health risks monitored.

(Adapted from MTS and CWC model)

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1575, boulevard Chomedey, Laval (Québec), H7V 2X2 Téléphone: (514) 973-5700 Télécopieur: (514) 973-5757

1575, Chomedey Boulevard, Laval, Quebec, H7V 2X2 Telephone: (514) 973-5700 Facsimile: (514) 973-5757