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Article abstract

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The purpose of this study is to provide data that shed light on the reactions of workers to the introduction of the new technology in three different occupational groups within a segment of the Canadian telephone industry.

Like no other economic sector, the telecommunication sector is experiencing an unprecedented restructuring of its workforce. This is primarily due to the rapid computerization of the technology, the expanding role of telecommunication in the workplace, home, entertainment and commerce, and the movement of the industry toward privatization and deregulation.

Ramifications of this technological change are mostly apparent in the telephone industry, the cornerstone of the telecommunication sector. While there are numerous policy studies and historical accounts of the industry, there is a dearth of empirical literature which examines the deployment of the new technology in the context of the workplace and management-worker relations.

The purpose of this study is to provide data that shed light on the reactions of workers to the introduction of the new technology in three different occupational groups within a segment of the Canadian telephone industry: among traffic (operator and related services), craft (technical, e.g. installation and repair) and white-collar workers (clerical and computer-related). Specifically, the study examines the relationship between occupational placement, the independent variable, a series of intervening variables which include management strategy, union perception, and training, and a list of dependent variables which center on job commitment, monitoring, career prospects, and control over work.

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THEORETICAL CONTEXT

It is accurate to say that Harry Braverman's 1974 book *Labour and Monopoly Capital: The Degradation of Work in the Twentieth Century* set the tone for all subsequent discussion regarding work, new technology, and skill in advanced capitalism. In Francis's words, Braverman's work «gave rise to a sunrise industry of scholars engaged in development and critique of his argument» (1986, p. 65).

It is not our intention to go over the well traversed terrain of the Braverman debate. Suffice it to note that one central shortcoming of Braverman's objectivist work is his neglect of the subjective dimension of the labour process as reflected in the attitudes of workers. While Braverman tended to argue that managerial control over the labour process was not problematic, Edwards (1979), Giddens (1982), Burawoy (1979; 1985), Friedman (1977), and Webster and Robins (1986), among others, argue that the real subordination of labour, which according to Braverman's framework was achieved through the application of scientific management techniques, was far from being as smooth and successful as Braverman describes it. Worker resistance as well as cooperation are important ingredients in understanding the labour process. According to Cressey and McInnes (1980, p. 4), a more adequate theoretical formulation of the labour-capital nexus is to view it as involving contradictory strategies at the point of production whereby management strategy and worker reaction are jointly worked out at the workplace.

MANAGEMENT-WORKER RELATIONS

The social history of the telephone industry is very much the history of the relationship between management and workers. Schacht (1975, 1985) provides the most comprehensive account of labour management relations in the North American telephone industry. According to him, the monopoly structure of AT&T and Bell Canada facilitated the development of paternalistic relations within these firms. The emphasis has been on widely dispersed locations of plants and services, specialized internal organization, the promotion of a «white-collar» image of all employees, extensive reliance on technology which could keep continuous service to customers even during a strike, and the promotion of company unions. Each of these elements strengthened managerial control of the telephone workforce. As he concludes, what «made the Bell system an especially forbidding antagonist, after 1933 as well as before, was the anti-union leverage it derived from the

social and job attributes of the telephone work force, from the structural and technological features of the industry, and from elaborate Bell personnel measures dating back to 1913» (Schacht, 1975, p. 8).

Three separate studies by Sangster (1978) of the 1903 Bell operator strike in Toronto, by Bernard (1985) of telephone workers in British Columbia in the early 1980s, and Howard's (1985) more recent research of telephone workers in the U.S. all confirm the centrality of technology in management-worker relations. The contemporary experience appears to be a deepening and extension of the historical case where the issues of control over work, deskilling, job satisfaction, centralization of facilities, and monitoring loomed large.

The role of technology in management-labour relations is apparent in the numerous reports prepared by unions, management and government. In a recent *Annual Construction Program Review*, Bell offers its perspective on the introduction of technological change in terms of meeting customer requirements, efficiency, and competitiveness. Bell describes its operator services automation program, the Traffic Operator Position System (TOPS), as an effort

to improve the Company's capability to handle the increasing volume of operator-handled long distance traffic, and to reduce the rate of growth of the associated expenses. It also improves the operator working environment. It allows customers to dial directly most of their long distance calls with little assistance from an operator and permits the introduction of customer-dialled overseas calls (*Annual Construction Program Review*, 1985, pp. 16-17).

Our research raises questions about the claim of improved worker environment. Bell makes no positive claims about the impact on workers of its Bell Customer Record and Information System (BCRIS), another computer-based technological innovation. As a result of this technology Bell anticipates that by 1988 the company will realize an annual savings of \$36 million or 800 employees, «which will provide time to reduce staff through attrition, and to transfer others to meet business requirements elsewhere». The company is explicit in asserting that these systems will eliminate skilled maintenance functions and transfer to managers the power of «surveillance, analysis and control of the telecommunications network». In discussing the introduction of the new DMS switches, Bell advances an identical rationale which revolves around skill reduction, increase in the control of work routines, and maintenance requirements (Bell Canada, *Analogue and Digital Network Operations: Planning Guidelines*, 1980, pp. 4-16).

Similar assessments can be found among other telephone companies. In its submission to the provincial Standing Committee on Law Amend-

ments, New Brunswick Telephone, a participant in our survey, made the case for the rapid introduction of new technology «even though new technology may produce higher unemployment in the short term» (New Brunswick Telephone, 1985, p. 1). The company opposed a measure that would institute legal procedures to involve workers in the implementation of technological change claiming that «policy decisions are *solely* the prerogative of management» (New Brunswick Telephone, 1985, p. 7, emphasis in original). The key, in the company's view, to addressing problems in the implementation of technological change is «effective human relations».

Trade unions have also been actively involved in policy analysis and proposals to address the challenges of technological change in the workplace. The Communications and Electrical Workers of Canada (CWC) has addressed technological change with a number of reports in areas such as the impact on unemployment (CWC, *Submission to the Task Force on Micro-Electronics and Employment*, 1982), quality of working life (CWC, *Policy Document on Quality of Working Life*, 1982), productivity (CWC, *Submission to the Royal Commission*, 1983) and customer service (CWC, *Telephone Deregulation*, 1984). The union's position on the new technology is well summarized in its submission to the New Brunswick Standing Committee on Law Amendments. The CWC starts with a discussion of the wide range of applications of the new computer technology which include «remote monitoring of office equipment, automatic number identification, computerization of directory assistance records, conference calling», and others (CWC, *Submission to the Standing Committee*, 1985, p. 2). Despite the wide range of applications, the CWC maintains that the impacts are similar:

Whole jobs are either eliminated or changed dramatically. Workers are monitored constantly and the speed at which they work is dictated by the machine. They no longer have control over the work process and they become mere appendages of the equipment. Invariably the skills the worker needed to do a job become obsolete as the skills are built into the machine. The worker's task is usually reduced to extremely boring and repetitive work, rather than freeing the worker from monotony as the advertisements for the new equipment so often claim. The reduction in the variety of skills required to do a job that has been automated leads management to attempt to downgrade the job classification (CWC, *Submission to the Standing Committee*, 1985, pp. 2-3).

In addition to the CWC, the Telecommunications Workers Union, representing telephone workers in British Columbia, has concluded in its study *Technological Change at BC Tel* that the tendency to centralization of telephone systems has downgraded the importance of residential service and reduced personal contact with subscribers. In the area of work it has led to erosion of skills, loss of job variety, reduced scope for initiative, and the

transformation from seeking *careers* (at times even from one generation to another) to clinging to jobs for economic survival (Telecommunications Workers Union, 1983).

Telephone unions outside of Canada have also been active in documenting the impact of technological change. The Communication Workers of America has produced policy relevant research on employment (Kohl, n.d.) and supported research on health implications (Vallas and Callabro, 1985). The former documents the growth of new technologies, particularly in non-unionized sectors. The latter identify significant health impacts and question the value of «Quality of Work Life» programs in addressing these impacts.

Australian trade unions have also been actively involved in the policy debates surrounding the introduction of new technology and deregulation (Reinecke and Schultz, 1983). The Australian Telecommunications Employee Association has produced a comparative study of the changes in telecommunication technology and regulation in Canada, the U.S., and the U.K. (Musumeci and Parkinson, n.d.).

Canadian government agencies have prepared numerous policy reports on the impact of computer technology (Economic Council of Canada, 1987). The Ontario Task Force report revealed fundamental differences between management and labour in the telecommunications industry's approach to worker participation in the implementation of technological change. The Task Force survey reported management's lack of «a formal approach for worker participation in decisions on adopting the new technology», though it did note that the union is interested «in participating in decision making as well as in worker adjustment activities and implementation decisions» (Government of Ontario, 1985, p. 80).

When set against the resources of management and government policies, union ability to influence the introduction of the new technology is limited. This is demonstrated by Annette Davies' *Industrial Relations and the New Technology*, which is a study of union-management relations in the English brewing industry. She concludes that though choice exists in the design and implementation of new technology, the existing political economy of technology makes these «still unquestionably managerial prerogatives». She found that «the disclosure of information» and the «acquisition of knowledge» were «major problems for the trade unionists in dealing with new technology» (1986, p. 204). Moreover, even when unions achieved some disclosure on technological change, there were «major organizational constraints and problems in terms of the time, resources and expertise available to the trade unions» (*ibid.*, p. 204). Unions need not only information but as well the organizational resources to make use of that information to achieve the most beneficial use of new technology.

This problem is exacerbated in the telecommunications industry because technological change is accompanied by major shifts in industry structure and regulation that would destabilize industrial relations even in the absence of technological change. Batstone, Ferner and Terry have studied the relationship of technological change to deregulation and the impact of both on industrial relations in Britain. They point out how deregulation and privatization led management in telecommunications to develop a new strategy of labour relations based on the need for a «flexible labour force and a new basis for worker consent; this in turn implied new criteria of payment and rewards, new work practices, new rules for recruitment and promotion, the development of new functional skills, the reform of collective bargaining, and so on» (1984, p. 285).

TECHNOLOGY AND JOB SATISFACTION

Clearly there have been many different attempts at measuring the relationship between technology and job satisfaction, most of which predate the new technology. Lawler points out that «any definition of a psychologically good working life should include some measurement of the stress and tension level present in the workplace» (1975, p. 125).

While some authors (Breugh, 1985) assert the need for reliable, comparable indicators of satisfaction, such as individual and group autonomy, individual responsibility and interpersonal interdependence, others propose to focus on 'humanizing' work through job security, pay equity (including profit-sharing), individuation (i.e. craftsmanship, autonomy and learning), and workplace democracy (Herrick, 1975, pp. 63-65). In a comprehensive study of work experience, Walton (1975, pp. 93-97) offers several conceptual areas to be used in an empirical context which range from adequate and fair compensation, safety and health issues, development of human and skill capacities, worker participation in designing the work environment, minimum fragmentation of tasks, and job security.

Conceptual areas like those above have been the focus of conflict on the shop floor, and are not limited to academic musing. In Britain, the loss of control over equipment experienced by factory operatives led directly to diminished job commitment (Burden, 1975, pp. 214-215). Another study, concerned with American automobile workers, found that automation was supported by those who have a sense of security, are satisfied with the quality of working conditions, have more challenging jobs, and perceive the management style (organizational climate) as open (U.S. Research Team, 1979).

These and other case studies revive «an old debate over whether participation develops through joint consultations or whether structural changes in organization and jobs will bring about a democratic workplace. The limited studies [...] favour the latter approach» (Davis, 1975, p. 9). Management's response to demands of consultation or structural change typically take the form of modified 'employment policies'. But these are aimed at ameliorating the *effects*, not the process, of most technological change. As has been pointed out repeatedly in the literature, «when asked how employees' needs affected their work, most system designers admitted 'little or none'», while «managers who were questioned about job-design and work satisfaction admitted that they did not really think in these terms so that such factors would hardly be seen as criteria for implementing new technology» (Rothwell, 1984, pp. 122, 123). Consultation must be extensive and meaningful to overcome such barriers. As will be shown in our study, consultation *per se* does not guarantee job commitment unless it is accompanied by a positive feeling with regard to management's method of introducing the new technology. Two other factors mitigate against effective change in the management perspective. First, the effect of new technologies may be difficult to predict accurately outside of a narrow context; according to one study, in «most cases it was not the whole organization [that was affected], although in some cases the 'ripple' effects of [technological] change were very widespread. Thus, even if the number of employees directly affected was usually limited, the indirect repercussions were considerable [...] Almost no activity was unaffected in some instances» (Rothwell, 1984, p. 116). Second, although the evidence regarding the net effect of the new technology on employment is inconclusive, the deskilling assertion is often countered by new employment policies seemingly offering flexibility, variety and growth. Using traditional measures of (de)skilling — task, technology, skill and training — management seems to be right. However, as Rothwell suggests, «it is perhaps helpful to speak in terms of 'horizontal' and 'vertical' dimensions of skill: an engineering maintenance craftsman may acquire more 'vertical' skills by adding 'electrical', yet have a narrower range of 'horizontal' skills if these are only performed within one particular department» (Rothwell, 1984, p. 128). Similarly, telephone operators may experience an increase in 'skill' and training in order to use new technology, but factors of isolation, monitoring and perhaps decrease in tasks — i.e. horizontal skills — may decrease overall satisfaction. The experience of the British newspaper industry is illustrative. There, the effect of new technology (computerized photocomposition and linotype) did not significantly reduce skills required to perform tasks, mainly because, as with telephone operators, the level of skill required *before* was less important than speed (Martin, 1984, pp. 248-249). This is nowhere better illustrated than in the handling and introduction of automation.

In most cases, automation is introduced for economic reasons, with the important corollary of increased control. In Martin's case study of the printing industry, management sought to control labour costs and work allocation, through agreements concerning manpower flexibility, performance evaluation and recruitment, through closer supervision by management of the shop floor, and through gathering information on workers' capabilities by monitoring of retraining (Martin, 1984, pp. 245-247). Indeed, monitoring has become a contentious issue in computer-based work, as the studies by Shaiken (1984), Clement (1984) and Zubboff (1988) demonstrate.

In essence our research on evaluating worker responses to technological change emphasizes a broad definition of work life quality and satisfaction by focusing on the role of management and union in this regard.

SAMPLE

A random sample of 1911 workers was chosen on a stratified, proportional basis to represent the 13 380 workers of the Communications, Electronic, Electrical and Salaried Workers of Canada (CWC) in the provinces of Saskatchewan, Ontario, Québec and New Brunswick. A total of 1 062 questionnaires were returned (56 per cent) from the four participating provinces. The telephone companies in these provinces range in ownership and regulation from the private, federally regulated monopoly of Ontario and Québec (Bell Canada) to the private provincially regulated New Brunswick (New Brunswick Telephone), and to the provincially owned Saskatchewan Telephone Company (Sask Tel). These provinces also reflect a wide range of linguistic, ethnic, and regional differences.

The three major occupational categories are craft, traffic, and white-collar workers. The overwhelming majority of craft workers in the four provinces are males (95,9 per cent), and most of the traffic workers are females (89,9 per cent). In the case of craft and traffic workers, the job department acts as a proxy for gender differences for the purpose of our analysis. Of the four provinces, Saskatchewan is the only province where clerical workers are members of the CWC, and for this reason are included in the survey. 65 per cent of the white-collar workers are males and 35 per cent females. Craft employees are technicians who are responsible for installation, maintenance, repair and central office operations. Traffic comprises chiefly operator services, including directory assistance and service assistance. Clerical workers range from basic data entry and record-keeping to programming, marketing and lower-level accounting, engineering and consulting. While we initially distinguished between highly-skilled and low-

skilled craft workers, and highly-skilled and low-skilled traffic and clerical employees, the classification was most useful in the case of white-collar workers where the skill hierarchy was most pronounced between data entry personnel and programmers. While 97 per cent of the low-skilled workers were women, among the high-skilled white-collar workers women constituted nearly half of the sample, 42 per cent.

We distinguish between those who have been with the company for less than five years, five to ten years (a large category due to extensive hiring in that period), and greater than ten years. The job location was defined on the basis of telephone workers in cities of more than 500 000 (Montréal and Toronto), those in medium-sized cities from 50 000 to 499 999 (for example, St. John, Regina), and those towns of fewer than 50 000 inhabitants.

METHODOLOGY

Altogether the study reports on the relationship among 13 variables which, as indicated in Chart 1, consist of one independent variable, six intervening variables, and a list comprising six dependent variables. In line with the discussion so far, the study aims at unravelling workers' attitudes to the new technology in the context of their occupational location in the telephone industry, their perception of the role and efficacy of the union, the length and quality of training programs, and management and company policies regarding the new technology. The variables we seek to explore in this study and which have a direct bearing upon workers' attitudes to the new technology consist of workers' level of commitment to the job, the surveillance effect of the technology, their sense of control over their work environment, job security, and the effect on promotion and seniority within the company.

The reporting of the data relies on correlational analysis supplemented by percentage description of the data in the text, so as to convey a more precise picture of the interplay between the variables analyzed in the study. At the correlational level, we examine zero- and first-order correlations, by controlling in the case of the latter for the effect of the independent variable. The ordinal measure Gamma coefficient is utilized, with chi-square applied as a test of significance. Missing cases and 'don't know' responses were excluded from the analysis.

JOB COMMITMENT AND CONTROL OVER WORK

Job commitment was measured in terms of a dichotomized scale which is based on a cumulative response score to three items in the questionnaire. In the first instance, we asked the respondent to indicate whether or not technology has increased, decreased or left unaffected the level of commitment to the job. Second, we sought the respondent's assessment regarding job responsibility as a result of the new technology.

Chart 1

<i>Variable Number</i>	<i>Variable Name</i>	<i>Variable description</i>
	<i>Independent:</i>	
1	Job Department	traffic, craft, skilled and semi-skilled, white-collar workers
	<i>Intervening:</i>	
2	Management strategy	three-item scale*
3	Company willingness	readiness to provide alternative jobs
4	Training period	less than 30 days; 30 days or more
5	Training evaluation	three-item scale
6	Union efficacy	three-item scale
7	Union desired role	four-item scale
	<i>Dependent:</i>	
8	Job commitment	three-item scale
9	Control over work	technology enhances control
10	Monitoring	three-item scale
11	Job security	two-item scale
12	Promotion	technology threatens job promotion
13	Seniority	technology threatens job seniority

*The scales are described in an Appendix available from the authors upon request.

Third, we asked if the respondent felt confident in recommending the job to a young person who was about to enter the labour force. Control over work was based on responses to the question «Some people say that (a) tech change gives workers more control over their work, while others say that (b) tech change decreases workers' control over their work. Do you agree with (a), (b), or don't know?»

As expected the job department showed a clear correlation (0,45) with the level of commitment to the job. In terms of absolute figures, two thirds of traffic workers exhibited low-level job commitment, compared to close to one-half of craft workers.

Table 1
Zero-Order Gamma Coefficients

<i>Dependent Variables</i>	<i>Independent Variables</i>			<i>Intervening Variables</i>			
	<i>Job Department</i> (1)	<i>Management Strategy</i> (2)	<i>Company Willingness</i> (3)	<i>Training Period</i> (4)	<i>Training Satisfac.</i> (5)	<i>Union Efficacy</i> (6)	<i>Union Role</i> (7)
Job Commitment (8)	0,45	0,62	0,54	0,35	0,34	0,15*	-0,46
Control over Work (9)	-0,15	-0,60	-0,47	-0,13*	-0,19	-0,06*	0,55
Job Monitoring (10)	-0,31	-0,48	-0,51	-0,38	-0,43	0,03	0,46
Job Security (11)	0,30	0,41	0,62	0,24	0,32	0,17	-0,54
Promotion Prospects (12)	-0,29	-0,57	-0,68	-0,39	-0,21*	-0,20	0,46
Job Seniority (13)	-0,04*	0,45	0,37	0,06*	0,39*	0,05	-0,42
Job Department (1)	----	0,10	0,33	0,59	-0,21	-0,02	-0,27

Except for those marked by an (), the remaining Gamma correlations are significant at the 0,05 level or higher.

By far, the most satisfied group were clerical workers, with three quarters expressing a high-level of commitment toward the job. However, it should be noted that among skilled white-collar workers such as computer programmers and analysts, the level of commitment is significantly higher than that shown by typists and unskilled white-collar workers. Eighty-five per cent of the former group scored high on the commitment scale, compared to 33 per cent of the traffic and 54 per cent of craft workers.

With regard to control over work, while the correlation with the job department of -0,15 is significant there were hardly any differences between craft, traffic workers, and to some extent low-clerical workers in feeling

that the technology lessened their control over work. The exception were the highly qualified white-collar workers who tended to feel in ratios of 1:3 compared to the rest of the sample that the technology gave them a greater sense of control. Yet a sizeable proportion of this group (one-third) was unable to assess the impact of technology on control.

Training was dealt with in the context of two objective indicators and a scale comprised of three additional evaluative items. The length of training period showed a clear correlation (0,35) with commitment to the job, although it should be born in mind that since training is a function of the job department, we expect this correlation to decline appreciably when we control for the influence of the job department (see Table 2). There was no discernible relationship between the presence or absence of training programs as such and commitment to the job. The sample was split in the middle along this variable in terms of job commitment. Similarly, control over work did not correlate significantly with length of training period (-0,13). However, when an evaluative dichotomous scale which linked training to the extent of familiarity with the technology, to the availability of opportunities to ask questions about the technology, and to the effectiveness of the training program, lower satisfaction level correlated significantly with low job commitment (0,34). The same relationship holds, though to a lesser extent, with control over work (-0,19).

Respondents were asked two sets of three items each about their perception of the union: first, there were three interrelated questions which focussed upon union efficacy, i.e., whether the union is doing enough to protect workers' jobs in the face of technological change, if the union is doing better or worse than other unions outside the telephone industry in protecting jobs, and whether or not the union has had an impact on the pace of technological change. In the second set, the respondents were asked to express normative responses as to whether or not the union should bargain more forcefully for technological change, even if this involved sacrificing wages, that the union should do more in the area of educating its membership regarding technological change, and that the union should have more say in introducing technological change.

In examining attitudes to job commitment and control over work as a function of the workers' appraisal of union efficacy, the relationship in both cases is insignificant (0,15 and -0,06). As we will argue later on, the low level of correlations between the efficacy scale and other items in the questionnaire could be accounted for in terms of the variability of union activity at the local level.

The other set of prescriptive questions sought workers' attitudes on the need for the union to expand its role and be more aggressive in terms of responding to management's plans to introduce technological change. Workers who sought to limit the union's role in the bargaining process, a minority to begin with of around 15 per cent of the sample, tended to express a higher level of job commitment (-0,46) and to feel that they have greater control over the work environment (0,55). Workers who preferred an expanded role for the union tended to be primarily traffic and craft workers, and less so from white-collar workers.

As an intervening variable, management strategy was assessed in terms of four items in the questionnaire. As a prelude, workers were asked to indicate if management had consulted with them prior to introducing the technology. It is interesting to note that consultation *per se* did not correlate with any of the dependent variables in the study. What we have discovered is that the quality of management-worker interaction and the method of introducing the technology is what counted most in the minds of our respondents. Three such items reflected this sentiment, and they formed the basis of the management strategy scale in this study: (a) satisfaction with management's methods of introducing technological change; (b) management's recognition of workers' performance, and (c) the extent to which technological change has affected the relationship between management and workers. An additional question which dealt with the company's response to a possible job loss by workers was treated separately, and found to correlate significantly with the dependent variables.

It is clear from Table 1 that job commitment and control over work are highly contingent upon management's strategy in dealing with technological change. The more satisfied a worker is with management's methods of introducing the new technology, with the positive impact of technological change on management-worker relations, and with management's recognition of workers' accomplishment, the higher the level of job commitment (0,62), and sense of control over the work environment (-0,60). Similarly, the willingness of the company to consider alternative jobs for workers who are threatened by technological displacement enhances job commitment (0,54) and feeling of control (-0,47).

MONITORING

A job monitoring scale was developed on the basis of three items in the questionnaire: workers' perception of management's efforts at increasing its supervision practices with the aid of the new technology, that such practices pose a problem for the affected workers, and that monitoring increases stress on the job.

Here again traffic workers tend to view monitoring as a job-related problem more often than the other two groups in the sample, with clerical workers emerging as the least likely group to associate the new technology with monitoring-caused stress on the job (-0,31).

While there is no association between the presence of training programs as such and monitoring, a finding noted in the previous section with regard to job commitment, monitoring is correlated with the length of training programs (-0,38) and the quality of such programs (-0,43). While the former is an artifact of job location (which explains why traffic workers perceive the monitoring effects of the technology as more problematic than any other group in the sample), the latter shows that 36 per cent of those scoring low on the job training satisfaction scale describe the technology as posing a major problem at work. This compares to 20 per cent of those scoring high on the satisfaction scale.

Workers who believe that the union should expand its role in educating its membership about technological change, that it should have more say in implementing technological change, and that it should bargain more forcefully in the area of technological change, even if this means paying less attention to wage issues, tend to view monitoring as a problem in the workplace (0,46). Union efficacy failed to correlate significantly with the monitoring scale (0,03).

The more satisfied the worker is with management strategy regarding the new technology, and the impact of technology on management-worker relations, the less likely that monitoring is perceived as a problem (-0,48). Similarly, reservation about monitoring is high among those who feel insecure about the company's willingness to provide them with alternative jobs should the new technology threatens their current jobs (-0,51). Close to 40 per cent of those who felt that the company is unwilling to provide alternative jobs expressed great reservation about the monitoring effects of the technology, and 36 per cent of those who disapproved of management strategy felt that the technology posed serious monitoring problems for them.

PROMOTION, SENIORITY AND JOB SECURITY

Three interrelated aspects of the worklife experience were assessed in this section: the impact of technology on promotion prospects, on the seniority system, and on job security. While the first two components were operationalized in terms of a single item each in the questionnaire, job

security was measured on the basis of a two-item scale which dealt with the impact of the new technology on possible job loss and forced early retirement.

When asked to indicate if the new technology has enhanced or retarded their promotion prospects, the majority believed that, at best, the new technology has not improved their career profile (-0,29). It is only among the highly-skilled clerical workers that we find close to 30 per cent of this group attaching positive career outcome as a result of the new technology. Among craft and traffic workers around 70 per cent felt that the technology did not improve their promotion prospects. Sixty-four per cent among low-clerical workers believed likewise. On the issue of seniority, white-collar workers, irrespective of their skill level, resemble the rest of the workers in the sample by perceiving (close to 50 per cent) the new technology as posing a threat to the seniority system. It turned out that this is the only variable in the study which was hardly affected by job location. Job security correlated significantly with the job department (0,30), with close to 47 per cent of the traffic workers fearing for their jobs as a result of computer-based automation, followed by unskilled white collar workers (44 per cent), craft (29 per cent) and skilled white-collar workers (10 per cent). It is significant to note that close to three-quarters of the skilled white-collar workers were confident that the technology will not endanger their future jobs.

Promotion prospects failed to correlate significantly with training evaluation (-0,21), although it appeared to be related to the length of training (-0,39). Threat to seniority failed to relate significantly (0,06) to the length of training (again, expected in the light of the insignificant correlation with the job department), while it did correlate significantly with training evaluation (0,34). The longer the training program is and the more positively it is evaluated by the workers, the more inclined they would be to feel that their job is secured (0,24 and 0,32). Of those who were satisfied with their training program, 76 per cent expressed a positive attitude toward their job security, compared to 28 per cent who indicated dissatisfaction with their training programs.

While union efficacy showed no clear relationship with promotion (-0,19) or seniority (0,05), the desire to see the union play a larger role in the introduction of the new technology was significantly correlated with both of these dependent variables (0,46 and -0,42). Of those who favoured increased union role in implementing technological change, 27 per cent saw no threat to the seniority system, in contrast to 47 per cent of the workers who advocated greater union involvement. 74 per cent of those who favoured expanding the union's role felt that promotion was threatened. This compares to 60 per cent of those who opted for a limited role for the union. Similarly,

62 per cent of those who espoused limiting the union's role expressed a high level of job security, compared to 30 per cent of those favouring increased union involvement.

As expected, management strategy and company policies regarding technological displacement correlated significantly with prospects for promotion ($-0,57$ and $-0,68$), seniority ($0,45$ and $0,37$) and job security ($0,41$ and $0,62$). A negative perception of management strategy in introducing the new technology contributed overwhelmingly to a belief that promotion prospects are in danger (82 per cent), that there is a threat to seniority (61 per cent) and that the very existence of their jobs is at stake (44 per cent). By the same token, a belief that the company will not provide them with alternative jobs in the face of technological displacement, contributed to a feeling of career insecurity in terms of promotion ($-0,68$), seniority ($0,37$), and job security ($0,62$).

CONTROLLING FOR THE JOB DEPARTMENT

Recall from Table 1 that, except for job seniority, the job department correlated significantly with each of the remaining variables in the study. We have therefore set out in Table 2 to assess the nature of the association between the intervening variables and the dependent variables, once we isolate the influence of the job department. A weakening of the initial association indicates the important influence of occupational experience, while a strengthening of the association reinforces the independent contribution of the intervening variables.

After controlling for the job department, commitment to the job remains significantly associated with management strategy. As a matter of fact, next to the job department, management strategy remains highly correlated with each of the dependent variables, except in two cases: the first concerns the impact of technological change on promotion prospects of traffic workers, and the other the effect of technological change on the seniority system among white-collar workers. In both of these instances management strategy is not perceived to affect workers' perceptions one way or the other. It is worth noting that controlling for the job department has in several cases increased the magnitude of the association between management strategy and the dependent variables.

Company willingness to provide alternative jobs in the face of technological displacement remains crucial for craft and traffic workers in terms of job commitment and monitoring, but less so for white-collar workers. Control over work and job security are positively correlated with

company willingness for the three occupational groups under discussion. Except for craft workers, the level of association between company willingness to provide alternative jobs, on the one hand, and seniority and promotion prospects, on the other, are insignificant.

With regard to length of training for the new technology, it is clear from Table 2 that except for two instances involving white-collar workers, there is hardly any association between this variable and any of the dependent variables in the study. This is further proof that the length of the training program is basically a function of the job department, i.e. the occupation of the respondent. This explains the rather high zero-order correlation (0.59) between job department and length of training period. However, the quality of training is somewhat more significant in terms of shaping the workers' attitudes to the new technology than the length of the training period. Here again white-collar workers attach more importance to training than the other two groups in the sample. This is true with regard to job commitment, control over work, monitoring and job security. In all of these cases the magnitude of the association for the white-collar groups rose sharply. Job security emerges as the only dimension which is perceived by the three groups as being highly contingent upon the quality of training in the use of the new technology. Promotion prospects do not seem to be influenced by the quality of training for the sample as whole, as well as for each separate occupational group.

Of the seven intervening variables in the study, union efficacy emerges as the weakest factor in the series of associations. Bearing in mind that for the sample as a whole the zero-order correlations between this variable and the dependent variables are insignificant, this finding is not surprising. What this indicates is that union efficacy is a function, not so much of the job department, but of union activity at the local level. Altogether there were 15 locals in our study, and they differed significantly in terms of size, organizational structure and the relationship between local leaders and rank-and-file members. Yet, willingness to see the union as a whole expand its role and become more involved in technological issues has greater significance in explaining the dependent variables than union efficacy. This is particularly true with regard to traffic and craft workers, who tended to advocate greater involvement on the part of their union in the implementation of the technology. In three of the instances under discussion, white-collar workers do not seem to attach as much importance to expanding the union's role as the other two groups in the sample.

Table 2
Zero- and First-Order Gamma Coefficients Controlling for Job Department

<i>Dependent Variables</i>	<i>Intervening Variables</i>					
	<i>Management Strategy</i>	<i>Company Willingness</i>	<i>Training Period</i>	<i>Training Satisfac.</i>	<i>Union Efficacy</i>	<i>Union Role</i>
	(2)	(3)	(4)	(5)	(6)	(7)
Job Commitment (8)	(a) 0,64	0,48	0,38*	0,22*	0,04*	-0,50
	(b) 0,60	0,54	0,16*	0,46	0,22	-0,39
	(c) 0,76	0,20*	0,46*	0,61	0,12*	-0,65*
	(d) (0,62)	(0,54)	(0,35)	(0,34)	(0,15)	(-0,46)
Control over Work (9)	-0,60	-0,51	-0,44*	-0,21*	-0,07*	0,60
	-0,54	-0,40	0,12*	-0,18*	-0,02*	0,49
	-0,91	-0,69*	-0,70	-0,66	-0,59*	0,74
	(-0,60)	(-0,47)	(-0,13)	(-0,19)	(-0,06)	(0,55)
Job Monitoring (10)	-0,39	-0,39	-0,19*	-0,49	0,02*	0,41
	-0,51	-0,53	-0,27	-0,52	-0,05*	0,37
	-0,58	-0,36*	0,29*	-0,61	-0,14	0,77
	(-0,48)	(-0,51)	(-0,38)	(-0,43)	(0,03)	(0,46)
Job Security (11)	0,35	0,57	0,24*	0,45	0,21	-0,52
	0,42	0,54	0,00*	0,33	0,19*	-0,46
	0,51	0,79	0,64	0,56	0,24	-0,82
	(0,41)	(0,62)	(0,24)	(0,32)	(0,17)	(-0,54)
Promotion Prospects (12)	-0,42*	-0,56*	1,00*	-0,02*	-0,31*	-0,27*
	-0,57	-0,71	-0,22*	-0,23*	-0,01*	0,50
	-0,60	-0,78*	0,64	-0,43*	-1,00	0,50*
	(-0,57)	(-0,68)	(-0,39)	(-0,21)	(-0,20)	(0,46)
Job Seniority (13)	0,43	0,36*	0,65*	-0,21*	0,18*	0,69
	0,51	0,54	0,08*	0,41	0,02*	-0,39
	0,22*	-0,38*	0,06*	0,46*	-0,34*	-0,35*
	(0,45)	(0,37)	(0,06)	(0,39)	(0,05)	(-0,42)

(a) = First-order Gamma coefficients controlling for traffic workers.

(b) = First-order Gamma coefficients controlling for craft workers.

(c) = First-order Gamma coefficients controlling for combined white-collar sample.

(d) = Zero-order coefficients between the dependent and intervening variables.

Except for those correlations marked by an (), the remaining Gamma correlations are significant at the 0,05 level or higher.

CONCLUDING DISCUSSION

Discussion about the new technology has been governed by what Hill (1988) calls the Technological Imperative, according to which technology is portrayed as a determining factor external to the social organization of production. Thus diffusion of the new technology has been considered in the context of type of industry, size of firm, market demands, and managerial attitudes. To the extent that the social dimension of the technology is relevant, it has been assessed through its impact on employment, regulatory policies, and competitive standing. Attitudes of individual workers in general and unions in particular toward technology implementation have been left largely unexamined (Betcherman, 1987, p. 701).

Betcherman's work for the Economic Council of Canada, which surveyed 1 000 Canadian establishments, concluded that there was «little support for the contention that unions commonly block technological change through restrictive work practices» (*ibid.*, p. 713). If anything, it was the attitudes of management which dictated opposition to the involvement of workers in the introduction of the new technology, as was reaffirmed in another Canadian study of high technology, the *Ontario Task Force on New Technology* (1985). When comparing unionized to non-unionized establishments, Betcherman discovered that the two differed in terms of the motivations behind introducing computer-based automation. Respondents from unionized companies mentioned labour-saving, increase in production control, and general cost reductions as the reasons for automation. Unionized respondents were more likely than non-unionized respondents to cite layoffs, early retirement, reduced hours and part-time work as the outcome of implementing the new technology. In certain types of manufacturing industries, such as those which use CAD/CAM, the creation of new jobs was more prevalent in non-unionized than unionized establishments.

Although the literature on the management of technology is replete with lip service about the need to involve workers in the introduction of new technology, our findings, as reflected in the attitudes of workers, confirm the technological imperative perspective. Our interviews with a small number of key management personnel in the telephone industry confirm the view that executives believe decisions about technological change are the prerogative of the company. Interestingly enough, the workers in our study assigned to management a primary role in the introduction of the new technology. When asked to rank management, union, telephone workers, customers and government, in terms of who *should* have a say in determining the pace of the new technology, the modal response (43 per cent) placed management first. The percentage ranking workers first was 21 per cent,

while the union was placed first by 14 per cent of the sample. This does not mean, however, that the respondents preferred a peripheral role for the union, as we have seen in the study. Indeed, in responding to the same question, a total of 56 per cent ranked the union as first and second in importance.

When asked to evaluate the impact of technology on the job security of telephone workers in general and management in particular, responses for the sample as a whole showed a remarkable consensus. Seventy-two per cent of the more than 1 000 respondents in our sample thought that its greatest effect was on operators, and 60 per cent evaluated this impact negatively. For craft workers, 42 per cent of the total sample said that it had a substantial impact upon them, with 48 per cent judging the impact negatively. Clerical workers were perceived to be the least affected by the technology (34 per cent), although 40 per cent saw the impact in negative terms. There was a perception among a minority of our respondents that the technology will impact lower management negatively (28 per cent), but less so for upper management (15 per cent). Men and women workers were evaluated similarly in terms of negative impact (around 40 per cent), although a slightly larger percentage thought that the technology's impact in general would be felt more widely among women than men (38 vs. 30 per cent). Finally, older workers, city workers and those with primary education were seen as most susceptible to technology's negative impacts on job security. Workers who were judged to be most protected from technological change were those with post-secondary education.

We found no evidence in our study that workers opposed technological change as such. Indeed, the majority felt that not much could be done about the march of technology. We have found that greater say on the part of workers and union in the introduction of the technology, when accompanied with a positive management strategy, is likely to alleviate some of the problems faced by workers in terms of their job commitment, control, monitoring and job prospects generally.

There are signs that, while management continues to retain exclusive say regarding the type of technology to be introduced and the timing of its introduction, it is nevertheless willing to seriously consider input from labour concerning the effects of the new technology. For example, in the latest collective agreement signed between Bell Canada and the CWC, after a bitter strike which lasted for four months and ended in October, 1988, management consented to extend long-term protection to workers affected by technological change and compensate those transferred to lesser paying jobs as a result of the new technology. However, the most significant change yet to be implemented in future collective agreements was outlined

in a letter of agreement between the union and Bell Canada. According to this letter, the company will undertake «to commence a trial to study the effects of eliminating the use of Average Work Time (AWT) statistic on an individual basis». It should be recalled from the finding of this study that this form of surveillance by management was cited by telephone operators as a frequent cause of work dissatisfaction (*Collective Agreement between Bell Canada and Electrical Workers of Canada*, 1988).

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Les réactions du personnel des entreprises de téléphonie face aux nouvelles technologies

Le personnel du secteur des télécommunications fait présentement l'expérience d'une restructuration sans précédent. Les forces principales qui poussent ce développement tiennent à l'utilisation de plus en plus accélérée de la technologie des ordinateurs, au rôle croissant des télécommunications au travail et au foyer ainsi qu'aux tendances à la déréglementation et à la privatisation de l'industrie. Ce changement technologique est davantage apparent dans les entreprises de téléphonie, pierres d'angle du secteur des télécommunications.

Le présent article cherche à combler le vide existant dans les études relatives à ce secteur où prolifèrent les analyses politiques et les exposés historiques, mais qui est dépourvu de recherches concrètes sur le déferlement de la nouvelle technologie dans les lieux du travail et dans les relations professionnelles. Le but précis de cet exposé est d'examiner les données touchant les réactions de trois catégories différentes d'employés des services de téléphonie à la suite de la mise en place de technologies qui reposent sur l'utilisation des ordinateurs: soit les communications (opératrices et services qui leur sont rattachés), les métiers (techniciens préposés aux installations et aux réparations), les cols blancs (employés de bureau et préposés aux ordinateurs). L'étude porte sur la relation entre le poste, qui constitue la variable indépendante, et une série de variables intervenantes comprenant la stratégie de la direction, les points de vue des syndicats, la formation du personnel et un certain nombre de variables dépendantes, principalement la motivation au travail, la surveillance par moniteur, les possibilités d'avancement et l'initiative. Une des constatations principales de cette enquête est que la stratégie de la direction lors de l'implantation des changements technologiques, influence considérablement l'intérêt au travail des employés, leur acceptation de la surveillance sur les lieux du travail, la perception qu'ils ont de leurs possibilités d'avancement ainsi que l'initiative dans l'exécution du travail. Plus un travailleur est satisfait de la façon dont la direction a établi la nouvelle technologie, de l'influence positive des changements technologiques dans les relations professionnelles, de la reconnaissance par l'employeur des réalisations des employés et de l'aide qu'il apporte aux personnes déplacées, plus le travailleur se sent intéressé à sa tâche, découvre qu'il maîtrise son milieu de travail et estime qu'il a des possibilités éventuelles de promotion dans l'entreprise.

L'étude empirique s'ouvre par un débat sur ce qui s'est publié sur les relations du travail, traite ensuite de l'histoire sociale des relations professionnelles dans le secteur des télécommunications et de l'état de la recherche sur le rapport entre les innovations technologiques et la satisfaction au travail. La pierre de touche de la discussion théorique porte sur la controverse engendrée par les recherches de Braverman sur la manière de considérer le facteur travail, en particulier sur la conception des rapports dynamiques entre les méthodes patronales et les réactions des employés. La recherche en matière d'histoire sociale des télécommunications fait surtout état d'études portant sur les efforts de syndicalisation et les tentatives effectuées en vue d'élargir le champ des relations du travail de façon à y incorporer la question des changements technologiques. L'appréciation de la littérature traitant des changements technologiques et de la satisfaction au travail en ont conduit certains à mettre l'accent sur une définition au sens large de la qualité de vie au travail en insistant sur l'influence primordiale des employeurs et des syndicats dans la conception de la satisfaction au travail.

La recherche empirique se fonde sur une enquête d'échantillonnage faite au hasard auprès de 1 911 travailleurs choisis d'une façon équilibrée, lesquels représentaient les 13 380 membres du Syndicat des travailleurs en communication, électronique, électricité, techniciens et salariés du Canada en Saskatchewan, en Ontario, au Québec et au Nouveau-Brunswick. Ces provinces comprennent des types différents de propriété et de réglementation ainsi qu'un vaste éventail de diversité de langues,

de races et autres particularités. On a retourné aux enquêteurs, au total, 1 062 exemplaires d'un questionnaire comportant 83 points provenant des quatre provinces participantes.

On a pondéré l'échantillon selon les catégories d'occupations, de niveau de compétence, d'ancienneté et de lieu du travail. Puisque presque toutes les personnes assignées aux échanges téléphoniques étaient des femmes et que les gens de métier étaient de sexe masculin, l'occupation permet d'identifier les différences entre hommes et femmes. Dans l'ensemble, l'étude porte sur les relations entre une variable indépendante, six variables intervenantes et six variables dépendantes. Le compte rendu des données obtenues repose sur une analyse corrélative à laquelle s'ajoute parfois une description des pourcentages.

L'enquête indique que la variable indépendante, soit le service où travaille l'employé, est en corrélation d'une façon significative avec chacune des autres variables, sauf en ce qui a trait aux attitudes des employés touchant l'ancienneté de poste. En second lieu, la stratégie patronale reste aussi très fortement en corrélation avec chacune des variables dépendantes, sauf en ce qui concerne le comportement des préposés aux échanges téléphoniques au sujet des promotions et l'influence des changements technologiques sur les possibilités d'avancement selon l'ancienneté pour les cols blancs.

On peut conclure de cette enquête que plus la participation des travailleurs et des syndicats est forte dans l'instauration de la technologie, lorsqu'elle s'accompagne de programmes positifs de la part des employeurs, plus il sera possible d'atténuer quelques-uns des problèmes que les travailleurs doivent affronter, en particulier la motivation au travail, le contrôle, la surveillance et les possibilités de promotion.

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