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Résumé de l'article

En 1978, Le terminus de silo de céréales Cargill, à Thunder Bay, Ontario, fut l'objet d'un programme de modernisation qui impliqua l'installation d'un système de contrôle par ordinateur. L'introduction de cette technologie met enjeu la division du travail déjà en place dans l'industrie des céréales selon laquelle un représentant de la direction émettait des ordres par téléphone aux travailleurs qui repondaient en transportant le grain d'un endroit à l'autre dans le terminus. Désormais, le déplacement des céréales est contrôlé par deux opérateurs assis devant un ordinateur dans la salle de contrôle. Ce qui soulève la question du contrôle de cette salle.

La direction réclame cette prérogative qu'elle voit comme une extension du rôle de surveillant et, au début du plan d'automatisation, les deux salles de contrôle tombaient sous la responsabilité de surveillant. Le syndicat représentant les travailleurs considérait cet arrangement comme une menace au contrôle de leurs operations. On est arrivé à un compromis selon lequel la direction et le syndicat se partagent les responsabilités de la salle de contrôle. Sur chaque poste, deux opérateurs de contrôle, un de la direction et un membre du syndicat, travaillent côte à côte devant les mêmes ordinateurs. Un mythe, propagé par les deux parties, maintient que le surveillant; en pressant certains boutons, prend des décisions que les travailleurs, en pressant d'autres boutons, exécutent tout simplement.

Il s'agit d'un compromis instable et quatre années de négociations et d'arbitrage n'ont pas réussi à résoudre la question dans ces conflits-test pour l'automatisation de l'industrie céréalière.

Grain Terminal Automation:

A Case Study In The Control Of Control

Joel Novek

FROM THE OUTSIDE, the Cargill grain terminal in Thunder Bay, Ontario, does not look especially impressive. It is old, dating back to 1910, and is only mid-sized by Thunder Bay standards with a capacity of 176,000 tonnes of grain. By comparison the Saskatchewan Wheat Pool terminal number 7 can hold over 350,000 tonnes. On the inside, however, the advanced hydraulic and mechanical transfer equipment along with a sophisticated electronic control system housed in a control room make this terminal one of the most automated in the industry.

The control room serves as command centre of the terminal. Its battery of video display screens, keyboards, and electronic flow charts resembles a scene from *The Empire Strikes Back*. What is unique about the control room though is not the electronic gear itself — some West Coast terminals now have more advanced equipment — but rather the division of labour under which the control apparatus is monitored. Inside the control room a control operator who is a member of the Grain Elevator Workers and a Cargill supervisor sit side-by-side before similar video display units and keyboards and jointly monitor the flow of grain through the terminal. Thus a representative of management and a member of the bargaining unit are carrying out overlapping and often identical responsibilities at the control centre of one of Canada's most automated grain terminals.

The arrangement under which management and labour would jointly perform control room duties is unusual in Canadian industry and makes the Cargill terminal an important test case of alternative social arrangements for the implementation of automation. This essay will present a case study of the implementation of automation at the Cargill terminal with particular emphasis on the situation in the control room. The presentation will include the historical context of automation, the detailed changes in the labour process, and the impact of these changes on labour relations. The union's response to changing circumstances will also be examined. It is hoped that this case study

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can shed some light on current debates concerning the labour process and the broader literature dealing with the role and responsibility of workers under automation.

I

Historical Background

THE ORIGINS OF THIS TEST case go back to 1974 when the Minneapolis-based agribusiness giant Cargill purchased the grain handling assets of the old National Grain Company — including its pre-World War I terminal in Thunder Bay — as part of its ambitious strategy to capture a larger share of the Canadian grain trade. The terminal gave Cargill an export outlet for prairie grain collected in its newly-acquired network of country elevators. The company hoped that it could gain business by injecting a new level of organizational sophistication and marketing skill into the conservative Canadian grain business. In order for this strategy to work, however, Cargill's management determined that the old terminal would have to be modernized substantially. Cargill's entry into Canada's grain handling business was carried out in response to rising grain production and exports during the 1970s and early 1980s. Optimistic projections saw Canadian grain exports rising from 20 million tonnes in 1980 to 36 million tonnes in 1990[1] and analysts were predicting growing pressure on grain handling facilities in Thunder Bay, which have traditionally handled 50 per cent of total grain shipments. Indeed, shipments from Thunder Bay were projected to rise from 14.5 million tonnes in 1981 to 19.5 million tonnes in 1990.[2] Much concern was expressed over whether existing grain handling facilities were adequate to meet rising demand.[3]

The strategy adopted by the industry was not to expand existing terminal elevator facilities. This was considered too costly. Instead the industry sought to improve the efficiency or "throughput" of existing terminal facilities in Thunder Bay, which had a combined capacity of 2 million tonnes.[4] In order to do this, the grain companies believed that they must attack what was seen as the major obstacles to greater efficiency in the grain ports: the labour-intensive nature of grain handling at terminal elevators and the high degree of informal control exercised by unionized grain handlers on the job. The potential for conflict between the industry and the union certainly existed. An estimate in the United Grain Growers' Annual Report for 1983, which can be taken as roughly representative of the industry, suggests that labour

[1]Canadian International Grains Institute, *Grains and Oilseeds* (Winnipeg 1982), 184.
[2]Westburn Development Consultants, *Lake Carrier Requirements to 1990* (Winnipeg 1981).
[3]*Ibid.* See also the Hall Commission, *Grain and Rail in Western Canada* Volumes 1 and 2, (Ottawa 1977).
[4]*Grains and Oilseeds*, 220-1.

costs account for 70 per cent of a grain terminal's operating cost.[5] By contrast, labour costs represent only 50 per cent of the company's overall operating costs. While terminals contribute around 30 per cent of the company's revenues, the Annual Report goes on to complain that their profit margins have been squeezed by rising labour costs despite increases in productivity.[6]

Another factor is that terminal elevators are easily the most heavily unionized segment of grain company operations. In the case of Cargill, where country elevator and urban clerical workers remain unorganized, it is the only unionized segment. By representing all 1700 workers at the 12 terminals of the six major grain companies with facilities in Thunder Bay, Lodge 650 of the Brotherhood of Railway, Airline and Steamship Clerks, otherwise known as the Grain Elevator Workers, wields considerable influence by its ability to halt shipments at the nation's leading grain port. This worries grain industry executives who see it as a direct threat to their business. The United Grain Growers are explicit on this point: "Labour problems at terminal elevators have caused hundreds of millions of dollars of lost sales to prairie farmers over the years."[7]

Finally, the organization of work in the elevators has given workers a great deal of informal control over grain terminal operations.[8] Although the work is labour intensive the level of management supervision was often low and the companies relied on workers' skill and knowledge to grade and bin the grain efficiently. At the Cargill terminal, for example, no more than five managers were responsible for the up to 73 hourly workers employed. Evening or night shifts were often conducted without a supervisor on duty. Hourly workers could set the pace at which grain flows into a terminal and is cleaned, dried, and loaded onto vessels, and thus set limits on efficiency or "throughput." This is known in the trade as "killing the job."[9] One of the objectives of the terminal modernization program at Cargill, as well as at other grain companies that soon followed Cargill's lead, was to ensure that "killing the job" became a thing of the past in the grain ports.[10]

The potential for conflict between company and union, however, was mitigated by one important factor. The Grain Elevator Workers have a history of cooperating with the grain companies when they view the latter's negotiat-

[5]United Grain Growers, *Annual Report* (Winnipeg 1983), 19.

[6]*Ibid.*

[7]*Ibid.* The significance of labour relations in the grain industry for Canada's reputation as a reliable grain supplier is emphasized in the *Report of the Inquiry Commission on Wider-Based Collective Bargaining* (Ottawa 1979), 28-33.

[8]Interview with Frank Mazur, General Chairman, Grain Elevator Workers, Brotherhood of Railway and Airline Clerks, Thunder Bay, September 1985.

[9]Interview with Sid Kasner, Head, Weighing Division, Canadian Grain Commission, Winnipeg, February 1986.

[10]*Ibid.*

ing position as reasonable. The companies, in turn, have an interest in maintaining the relatively cooperative labour relations' atmosphere in Thunder Bay as compared to the west coast where their relations with the British Columbia-based Grain Workers Union have been far more confrontational. Cargill, as a new player in the grain handling industry with an image as a progressive and well-managed company,[11] did not want its automation experiment marred by poisoned labour relations.

II

The Case Study

CARGILL'S MODERNIZATION PROGRAM started in 1978 with the simple mechanization of physical operations.[12] New motors and controls were installed to replace procedures formerly done by hand. Mechanical controls were replaced by hydraulic controls. These in turn were replaced by electronic controls. Then came automation allowing the remote operation and monitoring of motorized equipment and moving parts through the use of electronic controls. A central "mimic board" was installed showing complete flow paths in the elevator and providing pushbuttons to start, stop, and position all equipment.

The final step was computerization, which provided the electronic logic to tie the whole system together.[13] A central computer stores information on the contents of all storage and shipping bins, which can be called up on a video display terminal. Grain movements are commanded through the computer and the grain moves automatically without human intervention as in continuous process operations in other industries. Until the opening of the all-new Prince Rupert Grain Terminal in May 1985, the Cargill terminal in Thunder Bay was considered the most advanced in the country.

The modernization program radically transformed the division of labour and control system in place at the terminal. Previously the elevator was manually operated. Employees were required to physically operate a lever to start and stop the motors which ran the conveyers and "legs" which moved the grain through the elevator. The various moving parts — the valves, distributors, turnheads, and trippers — were also hand-operated. Sampling and weighing were also done manually, and workers had to be positioned throughout the plant to monitor the grain flow.

Control of operations was carried out by a superintendent in a control room positioned before a blackboard and communicating by telephone with

[11]It is the only grain company to make the *Financial Post's* list of the 100 best managed companies in Canada in 1986.

[12]Interview with Philip Szalich, Manager, Cargill Grain Terminal, Thunder Bay, Ontario, September 1985.

[13]*Ibid.* See also "Grain Storage — A Global Viewpoint," in *Grain and Oilseeds*, 287-325.

workers in various parts of the plant. The blackboard displayed the various storage and shipping bins within the elevator and their contents. The superintendent telephoned instructions on grain movements to workers in the workhouse or other sections of the elevator who then operated the controls or manually positioned the grain spouts. Verification of proper grain movements was then carried out by visual inspection. However, one exception to this pattern was the fact that the superintendent was responsible for manually positioning the grain spouts when vessels were being loaded. Management's operational responsibility for transferring the grain to ships, but not for grain intake, storage, or cleaning, was to prove a major point of contention between labour and management as automation proceeded.

The work has now been complete reorganized. The changes are most evident in the control room, which is responsible for all grain movements from rail car off-loading to ship on-loading.[14] Gone is the old blackboard, replaced by an electronic mimic board. The telephones have been replaced by a central computer system designed to be operated by two individuals. Electronic boards and video display units monitor the movement of grain into the terminal, through weigh scales, storage, and shipping bins, and then along conveyors into ships. Control is exercised through three keyboards representing grain receiving, cleaning/storage, and shipping, respectively. Directives are given electronically by the two operators, replacing the telephone commands and manual operations of an earlier era.

One significant implication of the new control room setup is the fact that the intellectual process of issuing voice commands — generally considered a management responsibility — and the manual process of responding to those commands by physically moving the grain — considered the domain of hourly workers — are merged into a single computer system run by two operators. The operators are simultaneously making "managerial" decisions about which grain should move where — assisted by computer data on logical flow paths — and controlling the actual physical movement of grain.

In the case of the control room the transition to "computer-mediated work"[15] has been so abrupt that the line which formerly divided the responsibilities of management and hourly workers has ceased to exist. "This is because," writes William Peterson about automation in general, "technology is so sophisticated production personnel must have staff skills and staff jobs are more intimately involved with the daily problems of production."[16] What Peterson and other theorists who see automation as reducing the division of labour do not ask, however, is whether control of operations is to be carried

[14]As confirmed in a plant tour undertaken by this author in September 1986 and hosted by Philip Szalich and other mangers at the Cargill Grain Terminal.

[15]Shoshana Zuboff, "Computer Mediated Work: The Emerging Managerial Challenge," *Office Technology and People* (September 1982).

[16]Richard Peterson, *The Industrial Order and Social Policy* (Englewood Cliffs 1973), 54.

out by production personnel trained in staff skills or by staff supervisors who assume a direct operating role.

The significance of this question is underscored by an examination of the theoretical literature on the social impact of automation in the workplace. Some writers, taking the above point of view, regard automation as reversing the fragmentation of tasks and authoritarian management characteristic of mass production technology. Workers would no longer merely perform simple tasks; they would be responsible for the operation of entire plants. Influential here has been the earlier work of Blauner who saw automation as ushering in a new era of "responsible workers" who would enjoy "consultation" rather than confrontation with management.[17] More recent studies by Gallie[18] and Hirschorn[19] have also emphasized the need for knowledgeable and responsible workers in automated environments.

Not everyone saw automation as ushering in a new era of responsible workers. Managerial control theorists explored the implications of automated plants in which control of basic processes was built into the machinery and workers were removed from any direct role in production. The later work of Joan Woodward, concerned with the development of managerial control and the sharp separation between the programming and execution of automated systems, is a case in point: "When the control processes become mechanized ... the operators increasingly cease to be responsible for making the product."[20] The result would be a diminution rather than an enhancement of workers' job skills and responsibility, a point emphasized in parallel studies by Dubin[21] and Bright.[22]

Labour process theorists have also been divided on the implications of automation. One point of view, emphasized by Braverman[23] and Reinhart,[24] gives backhanded support to managerial control theory by linking automation with managerial intentions to gain increased control over the workplace. Automation thus represents the extension of managerial efforts to gain a monopoly of knowledge over the labour process and to replace human effort with mechanical devices. However, this point of view has been criticized for equating managerial intentions with workplace reality.[25] Worker resistance

[17]Robert Blauner, *Alienation and Freedom* (Chicago 1964), 147.
[18]Duncan Gallie, *In Search of the New Working Class* (Cambridge 1978).
[19]Larry Hirschorn, *Beyond Mechanization* (Cambridge 1986).
[20]Tom Reeves and Joan Woodward, "The Study of Managerial Control," in Joan Woodward, ed., *Industrial Organization: Behaviour and Control* (London 1965), 46.
[21]Robert Dubin, *Leadership and Productivity in Industry* (San Francisco 1965).
[22]James Bright, *Automation and Management* (Boston 1958).
[23]Harry Braverman, *Labour and Monopoly Capital* (New York 1974).
[24]James Reinhart, *The Tyranny of Work* (Toronto 1987).
[25]The various debates on the labour process have been summarized in Paul Thompson, *The Nature of Work* (London 1983).

to technological change has been underestimated.[26] As well, the vulnerability of current automated systems to malfunction and breakdown and the continuing need for alert and experienced workers to maintain and operate them have not been adequately taken into consideration.[27]

The gap between managerial intentions and workplace reality can be better understood through a discussion of the technical problems involved in subjecting grain terminal operations to logical analysis and computer control. The physical characteristics of grain handling differ significantly from those found in continuous process industries such as chemicals or oil refining, which were among the first to undergo automation. These industries are characterized by a continuous flow of a single homogeneous raw material — usually liquid or gaseous — being transformed into a variety of finished products. Uncertainty in the manufacturing process is greatly reduced, allowing for full programming of automated operations and little need for operator intervention in normal procedures. In large grain terminals, on the other hand, the raw material arrives in discrete forms — as wheat, oats, barley, or canola — in various grades, and in varied conditions of cleanliness.[28] There is no continuous flow, only a large batch of grain cars to be unloaded quickly and efficiently. Afterwards a number of discrete operations — weighing, cleaning, drying, screening, or blending — may have to be performed if the grain is to meet export standards. Transferring the grain within the elevator and unloading it to ships is a similarly exacting procedure.

As a result, there are limits on how fully grain terminal operations can be programmed in advance and the discretionary judgment removed from control room operators. Their work can neither be completely programmed nor monitored. The control room in the Cargill terminal is equipped with manual overrides allowing operators to react to contingencies by bypassing automated procedures.[29] Operators are far from passive machine monitors with little influence over the cost and efficiency of industrial processes. They are responsible for binning grain in storage, and for cleaning and blending prior to shipping. They decide on the optimum speed and routing of grain flows through the terminal. Furthermore, these calculations differ with each grain handled.[30]

In sum, the control operators must be familiar with elevator operations and be able to make decisions. As Larry Hirshschorn has written, "In cybernetic settings workers must control the controls. To do so they cannot merely

[26]Stephen Hill, *Competition and Control at Work* (London 1981), 112-3.

[27]C.S.E. Microelectronics Group, *Capitalist Technology and the Working Class* (London 1980), 76-8.

[28]Interview with Sid Kasner.

[29]*Ibid.*

[30]Interview with Jack Riel, Weighing Division, Canadian Grain Commission, (Winnipeg, January 1986).

become competent at a fixed and predictable set of tasks .... Instead they must be able to survey and understand the entire production process."[31] Clearly, whoever predominates in the control room — who controls control — will decisively affect the economic success of the terminal operation.[32] This remains a point of contention. Management, recognizing the strategic significance of the control room, has claimed it as its prerogative, with supervisors taking a direct operating role. However, the Grain Elevator Workers have resisted and have demanded a say in how the control room is organized.

As a result, the automation of the Cargill terminal has been marked by an ongoing conflict between the company and the union representing all hourly employees over who should control the control room. The dispute first became evident in 1980 when Cargill informed the union of its plans to automate operations and restructure employment at the Thunder Bay terminal. According to Frank Mazur, the chairman of the Grain Elevator Workers, the company was prompt and fair-minded about informing the union of its modernization plans.[33] The original plan was to run the elevator with 26 people. This was less than half the complement of 60 hourly employees previously required to operate it. However, there was no loss of jobs among permanent members of the bargaining unit.[34] For one thing, the number required to run a day shift at the elevator was 31, not the proposed 26. Automation, at Cargill as in other places, meant a greater need for maintenance workers and electronics technicians to repair the new equipment. Their numbers have gone up from six to seventeen.[35] As well, automatic cleaning machines did not wholly obviate the need for manual sweepers.

The major reason for the employment stability, however, was the fact that Cargill was able to use the new equipment to increase the output of its elevator from one to three shifts per day, seven days a week. The elevator was formerly designed to operate with about 60 people in one shift. Today, 31 are required for a single shift, 51 for a two shift operation and, in busy times, the full 60 for a three shift operation.[36] Counting vacation, sickness, and injury time, full time employment levels have been maintained while annual throughput has increased 45 per cent from 875,000 to 1.3 million tonnes. This situation of employment stability and "jobless growth" is now

[31]Larry Hirschorn, *Beyond Mechanization*, 2.

[32]In particular, grain company officials fear that union members in control would result in a slowdown in the pace of work which is known in the industry as "killing the job." Interview with Sid Kasner.

[33]Interview with Frank Mazur.

[34]The employment numbers were confirmed in an interview with Yvon Chabot, Vice President of Terminal Operations, Cargill Grain Co., Winnipeg, January 1986.

[35]*Ibid.*

[36]*Ibid.*

threatened by the current slump in the grain trade which prevents the company from maintaining employment levels by raising output.

There were job losses in the grain unloading area. Two dozen temporary workers who used to perform the backbreaking and unhealthy chore of unloading grain from boxcars by hand have been replaced by five men operating a hydraulic screwdriver and boxcar dumper. Neither management nor union mourns their loss. A union official stated: "Unloading boxcars is hard lousy work, breathing in grain dust. I know, I started off doing that. Nobody wants to do it anymore."[37] The union was willing to sacrifice these ancillary positions in order to maintain employment among the core of operating and maintenance workers.

Clearly Cargill had demonstrated its intention to maintain good relations with the union during its modernization drive by being open about its plans and by guaranteeing employment stability while minimizing job losses. On the other hand, the company's desire to gain increased operating control of the terminal was made equally evident. The control room, centerpiece of the entire automation project, was to be staffed solely by management personnel — two per shift. Nor was this all: salaried managerial staff has increased from five under the old system to thirteen under the new.

The plant manager is now assisted by three engineer-superintendents responsible for plant operations and maintaining grain flows. There are five control room supervisors in charge of the control room. The rest of the managerial staff is involved in accounting, programming and analysis activities. The jump in salaried employees from five to thirteen, while full time hourly employees have remained stable at sixty, raises a number of important questions. Certainly it challenges the conventional wisdom that automation leads to a decline in middle management and supervisory personnel. A fuller discussion is indicated.

Cargill's vice president for terminal operations argued that the increase in managerial staff is due to the greater number of shifts worked.[38] Since supervisors must be on duty on each shift, an increase in daily shifts from one to three leads to a need for more managers. The union, however, worried that there may have been a decline in trust between workers and management. They argue that terminal operations in Thunder Bay were characterized by a strong consensus between management and a labour force viewed as highly competent and loyal.[39] Hence companies could run large elevators with a tiny managerial component. Often night shifts would run without any supervisors

[37]Joe Dziergo, President, Lodge 650, Grain Elevator Workers, Thunder Bay, September 1985.

[38]Interview with Yvon Chabot.

[39]Frank Mazur and follow up interview in February 1986. The general competence of terminal employees was emphasized by Cargill officials including Mr. Chabot and Mr. Szalich.

at all. In the union view, the expanded supervisory staff signifies a decline in trust and subjects hourly employees to more intense monitoring of their work performance.

Another perspective is possible. Managerial theorists, following the pioneering work of Joan Woodward, have generally concluded that increasing technological sophistication correlates with a growing managerial presence as management seeks to assume control of complex technological systems.[40] In Dubin's concise formulation, the focus shifts from the indirect management of personnel to the more direct managerial control of the complex and expensive hardware at the point of production: "Thus with high speed and continuous process technologies the direct control of technology itself is transferred from operatives to management."[41] To follow the logic of managerial theory, the new management staff at the grain terminal are there not so much to monitor the 60 hourly employees as to assume a direct operating role. Indeed, this issue is at the core of contested terrain in the control room.

III

The Control of Control

AS ORIGINALLY ENVISIONED by the company, the control room would only be staffed by management personnel. They saw it as an extension of the old superintendent's function of telephoning instructions to the workers. Information, instead of being carried by voice, was now entered into the computer. In part, this interpretation was valid. However, the computer also took over the hourly workers' task of physically routing the grain through the terminal. Not surprisingly, the union feared that if management was supreme in the control room, they would eventually be able to operate the plant without the aid of members of the bargaining unit.[42]

This concern was strong enough to be an issue in a two week strike on the Thunder Bay docks in September 1981, the first strike there since 1969. Although the major issues in the strike were hours of work and overtime, concern over automation was never far below the surface. The automation issue, coupled with a personality conflict between Frank Mazur and the manager of the Cargill terminal — who was subsequently replaced — helps explain why Cargill was chosen as the strike target.[43] After the strike the two

[40]Woodward, *Industrial Organization*.

[41]Robert Dubin, *Leadership and Productivity*, 62.

[42]Not only the union but officials of the Canadian Grain Commission were convinced that management hoped to "strike proof" the terminal by operating it directly. Interview with Jack Riel.

[43]As is the custom in Thunder Bay labour disputes, the other grain companies, members of the Lakehead Terminal Elevators Association, immediately locked out in sympathy. See *Strikes and Lockouts in Canada* (Ottawa 1984).

parties continued to negotiate and an agreement that allowed the automation experiment to proceed was reached in August 1982.[44] The company acceded to the union demand that it be given a stake in the control room. A new job classification of control room operator was created with rank and pay equivalent to the highest level within the bargaining unit. The position of control room operator represented a substantial upgrading in the range of skills and level of knowledge expected of hourly workers. In the words of the agreement:

> In view of the complexity of operations and the increased responsibilities given to bargaining unit people, the employee will be required to possess a minimum of high school education or an educational experience equivalent. He must be prepared to study and learn the functions of micro processors and computerized controls, as well as the elevator equipment and the flow of grain through the elevator.[45]

The company agreed to select members of the bargaining unit on a competitive basis and put them through a six month training program until they qualified as control room operators. Only those workers with an aptitude for computers and an understanding of grain flows were selected. The union conceded that the usual privileges of seniority need not apply in this case, as many of the most senior members of the bargaining unit had neither the aptitude nor the desire to become control operators. It took two years for the full complement of five unionized control room operators to be in place.

Despite giving members of the bargaining unit an important stake in the "control of control," the agreement set the stage for future conflict by attempting to divide the responsibilities in the control room between management and labour. It was stipulated that "the Union [is granted] jurisdiction of the functions performed by the CRT as it pertains to the movement of grain." At the same time, "Management reserves the use of the CRT for the purposes of obtaining the necessary information to make management decisions and supervise the operations."[46] Students of labour process theory will have little difficulty recognizing the attempt to divide the functions of hand and head — Braverman's "conception and execution" — within the context of a computerized control room. Some computer operations would pertain to the physical movement of grain and thus be within the purview of the bargaining unit; others would involve "management decisions" and thus belong to management. In practice, how was this division of labour to be maintained?

The problem was compounded by the complexity of the control room design with its three input keyboards, nine video display terminals, and

[44]Memorandum of Understanding between Cargill Grain Co., Ltd., and Lodge 650, Brotherhood of Railway Airline and Steamship Clerks, August 1982.
[45]*Ibid.*, 2.
[46]*Ibid.*, 1.

numerous flow charts and manual controls requiring at least two operators per shift. The union had won the right to supply one control operator per shift. Management, however, insisted that the other operator be a supervisor. The agreement simply left any future resolution of this deadlock in the control room open for negotiation: "In the eventuality that the Union maintains that two Control Room [operators] per shift are required, the parties agree to meet and review the Union's contention in this regard ...."[47] However, in the absence of any agreement on this latter point, what followed was a creative shop floor artifice which allowed each side to claim that it was performing its traditional role. The result: two individuals, one a unionized control room operator, the other a management supervisor, sat side by side and jointly performed "the control of control."

The control room operator occupied a work station with two keyboards and attendant video display terminals designed to handle the receiving, cleaning, and storage of grain. His job was to program the computer to move the grain from receiving pits through cleaning and ultimately into storage bins. He also monitored the grain flows to ensure that the grain was sent to the right destination, that it was not damaged, and that the mechanical equipment within the terminal was used properly. In sum, his job was designed to carry out the accepted bargaining unit role of physically moving the grain into and through the terminal. Significantly, the control of grain movements from the terminal into ships was reserved for the management supervisor.[48]

The control room supervisor, a member of management whose status was equivalent to a foreman, sat at a work station consisting of a console and video display terminal and a telephone. To differentiate it from the control operators' work station it was dubbed "the decision maker."[49] In practice, it was often unclear who actually decided what. The supervisor had overall responsibility for the operation of the grain terminal during a shift. He could supervise but could not physically control the flow of grain into and within the terminal. The operator had to push the buttons. He could, however, access on his video display screen all information available to the control operator and, if necessary, override or reverse the latter's decisions. In fact he rarely did so. It was generally agreed that operators had considerable leeway to control the unloading and transfer of grain and that informal discussions on operations between operators and supervisors were the norm.[50]

The supervisor, however, had sole responsibility to control the shipping of grain, as opposed to its receiving or storage. He instructed the operator to

[47]*Ibid.*, 2.

[48]An Arbitration Between Cargill, Ltd. and Lodge 650, Brotherhood of Railway, Airline and Steamship Clerks, Winnipeg, 31 January 1986, 7-8.

[49]Interview with Yvon Chabot.

[50]*An Arbitration*, 11.

transfer grain in preparation for shipping. More important, only his console could control the flow of grain from the elevator into ships and only his display screen could receive shipping related information. Such information was not available to the operator. What was less clear was why the control of shipping flows but not receiving or storage involved making "management decisions."

The division of labour between supervisors and operators in the control room can be described as a social artifice, a truce reflecting shop floor bargaining power as well as the limits of available technology. Although legitimated in the familiar language of industrial relations — management is to "supervise" while workers are to be concerned with the "physical movement of grain" — the actual situation is one of flux with overlapping and contradictory roles. Neither the technology nor the social relations are consistent with a clear and hierarchical division of labour.

This is evident in the case of access to information. Both the control room operator and supervisor had access to the same electronic flow charts and video displays which illustrate grain received or in storage bins. Indeed, the operator must interpret this information accurately in order to route the grain through the terminal. The same overlapping can be found in communications between operators and supervisors. Theoretically, the direction of information should be from the latter to the former as the supervisors have final authority over the operation of the control room. In reality, a significant amount of communications between the two was mutual and advisory, as operational information was shared and discussed. A consultative relationship between labour and management was evident in this control room. In the words of the operator: "Things were operated on a mutual basis."[51] However, this stemmed more from the operational realities of the control room than from any commitment on the part of management to consultation with labour.

Furthermore, the decision-making capabilities of the hourly operators were well recognized. The corporate vice president of terminal operations stated that he was impressed with their "knowledge and competence."[52] The considerable degree of responsibility for safe and efficient operations exercised by the operators is much more consistent with the findings of Blauner[53] and Gallie[54] than with the managerial view of an essentially passive role for labour in an automated environment. In fact, the job definition of control operators in the collective agreement of 1983-4 contains such phrases as "to supervise" and "primary responsibility."[55] This is not surprising considering

[51] *Ibid.*
[52] Interview with Yvon Chabot.
[53] *Ibid.*
[54] *Ibid.*
[55] The job definition of a Control Operator 1 reads as follows:
"To supervise applicable work area and participate in all aspects of Terminal operations as

that the control system is by no means self-regulating and requires human intervention to decide the most efficient means of moving and storing grain. Equally important, the control room operator was originally a management position which the union won for itself at the bargaining table.

On the other hand, the system was designed so that supervisors would perform what was traditionally thought of as union members' work. The position of control room supervisor is a residue of management's initial contention that management alone should operate all control room functions. If the control room operator represents the ideal of the responsible and autonomous worker under automation then the control room supervisor represents the opposite: a managerial vision of an automated system under its direct control with labour's role removed to the margins of ancillary and maintenance work. The ambiguity is evident in the supervisor's dual role as both supervisor of grain flows within the terminal and as direct controller of shipping flows. In fact the supervisor's role bears a striking resemblance to that of the "lead operator" — usually a member of the bargaining unit — found in automated oil or chemical plants. The overlap with the hourly operators was significant enough to move one of the latter to remark that the supervisor performs "as much as 90 per cent of the same work I do."[56] The question remained: who was really doing whose work?

The truce in the control room proved to be unstable. Each side held to its own conception of what ought to be while resisting any encroachment by the other side onto its own sphere of influence. Management continued to view the control room as an extension of its supervisory and decision-making role. Access to vital economic data displayed on the shipping terminal was seen as a management right. While acknowledging the competence and responsibility of union operators, management worried that that very capability threatened its ascendancy in the control room. Accepting an additional control room operator per shift, as demanded by the union, would be tantamount to relinquishing any direct role in the "control of control."

For its part, the union continued to see the control room in terms of the bargaining unit's responsibility for physically moving the grain. No claim was made that decision-making in the control room ought to be shared, although this was what the operator and supervisor in fact frequently did. The union remained concerned about the supervisor's direct operating role; it was said that "he pushed too many buttons."[57] A second control operator per shift seemed the obvious solution. Behind this request was concern that manage-

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assigned. Primary responsibility to be the organization of Grain movement through use of a computer-assisted weighing system. Will be expected to train and direct other in accomplishing his responsibilities." Agreement Between Cargill, Ltd. and Lodge 650, Brotherhood of Railway, Airline and Steamship Clerks, 1983-84, 70.

[56]An Arbitration, 10.

[57]Interview with Frank Mazur.

ment might be able to "strike proof" the terminal by assuming direct operating control. The union wanted supervisors to restrict themselves to verbal commands and leave the keyboards to the operators.

Three years of intermittent negotiations failed to resolve the issue. In 1985 the union grieved the matter and it went to arbitration. The union alleged "that a substantial portion of the work being performed by the Control Room Production Supervisor is work of the Bargaining Unit."[58] The hearings were held in Thunder Bay, Ontario, in July 1985. In January 1986 the arbitration board ruled in favor of the company. Noting that the supervisor has wider jurisdiction than simply supervising the control room and that since the inception of the control room bargaining unit members have not performed the shipping function, the board concluded that "the work done by a Control Room Supervisor with respect to the shipment of grain is not a job function falling within the exclusive jurisdiction of the bargaining unit."[59]

The union nominee to the board dissented from this opinion, however, and upheld the union's original claim to all operational work performed in the control room.[60] Indeed, if the supervisor's job was not "within the exclusive jurisdiction of the bargaining unit" — and by inference not within management's exclusive jurisdiction either — then was there not room for further negotiations on the issue? The board suggested that there was: "It may well be that the parties should discuss this matter but any changes should be done at the bargaining table."[61] There the matter rests for the present.

IV

Conclusion

IT HAS BEEN CONTENDED that new technology can place an existing division of labour in jeopardy. In the case of the Cargill grain terminal, automation has blurred the formerly distinct roles of management and hourly workers in the control process. The reversal of the division of labour implicit in this case does not, however, eliminate the conflict between labour and management. Indeed, the scope of conflict may widen as both sides claim control of new processes in the workplace. Technology becomes contested terrain until a new division of labour is created. As John G. Brooks observed in 1903: "In the conflict between the employer and employed, the 'storm centre' is largely at this point where science and invention are applied to industry."[62]

[58]An Arbitration, 2.
[59]*Ibid.*, 29.
[60]In the Matter of an Arbitration Between Lodge 650, Brotherhood of Railway, Airline and Steamship Clerks and Cargill, Ltd., Thunder Bay, February 1986.
[61]An Arbitration, 29.
[62]Quoted in David Noble, "Social Choice in Machine Design," in Andrew Zimbalest, ed., *Case Studies on the Labour Process* (New York 1979), 38.

Since technological change is usually introduced by management, it tends to make the first move. The managerial vision encompasses an automated system which can substantially reduce errors and uncertainty, which is self-regulating and which can be programmed to function with a minimum of operator intervention. The system is conceived as a management right and its operation as a management tool. Workers are to be removed to the margins of ancillary and maintenance work. Robert Boguslaw has labelled this managerial vision utopian: "Impatience with 'human error' has become a unifying imperative among the new utopians. The theoretical and practical solutions they seek call increasingly for decreases in the number and in the scope of responsibility of human being within the operating structures of their new machined systems."[63]

Such managerial intentions do not necessarily translate into reality. Two barriers stand in the way. One is the fact that current automated systems are rarely either self-regulating or error-free. In Boguslaw's terminology they are "emergent" rather than "established" systems.[64] The separation of programming and execution remains more of a theoretical construct than a real world phenomenon. Instead, what is required is extensive operator intervention, usually by workers with a great deal of "tacit knowledge" about the processes they are controlling. In this particular case it means that control operators should have a background of prior experience working with grain flows in a terminal elevator. Automation has failed to eliminate the need for a skilled and experienced labour force.

The second barrier is that labour can resist managerially-directed technological change. Management's hope for an automated system under its direct control can be countered by labour's aspirations for greater autonomy and responsibility in the workplace. If computers can integrate decision-making and operational functions into a single system, thereby making a shambles of textbook divisions of labour, then workers can demand that their own jobs be redesigned to allow them to make maximum use of the new technology. Writers such as Mike Cooley[65] and David Noble[66] have argued that automated systems can just as easily be designed to extend workers' responsibility and decision making powers as to limit them. The choice is social, not technological. Computer networks can run "bottom up" as well as "top down" and thus challenge management's exclusive control over information vital to decision-making.

Unions are becoming increasingly aware of this possibility. After conducting a series of case studies on new work environments on behalf of the British Columbia Federation of Labour, Hansen and Bernard have concluded,

[63]Robert Boguslaw, *The New Utopians* (Englewood Cliffs 1965), 2.
[64]*Ibid.*, 7.
[65]*Architect or Bee?* (London 1981).
[66]Noble, "Social Choice," 45-9.

> The image which emerges is one of a highly skilled autonomous worker overseeing a broad system using diverse methods to ensure successful achievement of fundamental goals. But in what way does this differ from traditional 'management' work? These technical developments are implicitly questioning the existence of dysfunctional supervisory systems which are a throwback to Taylorist production.[67]

What Hansen and Bernard advocate is a "proactive" approach in which unions embrace new technology and demand that it be utilized in ways which enhance workers' knowledge and responsibility. This approach is exemplified by the Energy and Chemical Workers who argue that automated plants will be most productive if employees are allowed maximum scope to make the system work. The membership of this union is largely derived from industries which are already highly automated, such as petrochemicals, and its confidence in new technology is based on considerable experience in its implementation.

In industries where automation has been slow to proceed, on the other hand, union members may have little knowledge of or training in new technology. Technical change may be experienced as something imposed by management for reasons which are not in their interest. In these circumstances the union's reaction is likely to be defensive — to defend traditional rights and privileges against managerial encroachment — at least until there is greater familiarity with new technology and more positive strategies can be devised.

The latter is clearly the case in the grain handling industry. When Cargill first brought forward its automation plan, neither the membership of the Grain Elevator Workers, nor its leadership, had any experience with an automated environment. In fact, many senior members of the bargaining unit doubted their own ability to master computerized equipment. At the same time, new technology threatened labour's direct operating role. The union reacted defensively by reaffirming its traditional operating role and insisting that the company train a specially selected group of its members to operate the new technology. In effect, it bought time to allow its membership to adapt to new circumstances. The emergence of more positive or proactive strategies in the grain handling industry must await a transformed skill base of union members competent to understand and operate an automated terminal.

Should this occur, it is more likely to occur on the West Coast where an increasing share of Canadian grain is being shipped and where terminal automation is proceeding rapidly and the union tradition is highly militant. At the recently completed Prince Rupert Grain Terminal, now the most technologically advanced in Canada, the conflict which first surfaced at the

[67]Ken Hansen and Elaine Bernard, *Summary: Case Studies on New Technologies in Five British Columbia Industries* (Burnaby 1986), 30.

Cargill terminal in Thunder Bay appears to have repeated itself. There, management has claimed the control room, and thus the control of control, as its exclusive jurisdiction.[68] The west coast Grain Workers Union have disputed this claim and a conciliation commissioner appointed by the Minister of Labour has recently ruled in their favour.[69] Joint labour-management manning of the control room, which appeared so odd when it was first instituted in Thunder Bay, may soon become the norm throughout the grain industry and can be expected to form the basis of future labour-management conflict.

Perhaps an analogy can be drawn with the introduction of numerically controlled machine tools in the 1960s which challenged the division of labour traditionally found in machine shops. Who would program them? Managerial hopes for centrally programmed and remotely controlled machine shops were countered by labour's aspirations for an upgraded labour force of machinist-programmers. The issue remains unresolved. The dispute in the grain industry over who controls the control room might also prove significant for highly automated industries.

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[68]B.C. Federation of Labour, *Technological Change and Work Organization in Process Industries* (Burnaby 1986), 7-8.
[69]Conciliation Commissioner's Recommendation to the Parties, 6.