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Industrial Relations and Automation

By CHARLES C. KILLINGSWORTH

ABSTRACT: In industrial relations, "automation" is frequently used as a synonym for "displacement." More precisely defined, automation can have various direct and immediate effects on jobs. It may eliminate jobs outright; it may eliminate parts of several jobs; it may require new combinations of skills; and it may affect responsibility, working conditions, and the extent of worker control over rate of output. The impact of these effects has varied greatly in the past decade, depending on the nature of the work rules in the industry or the operation. Automation has been adopted most extensively in industries or operations which impose few barriers to reassignment of job duties—or in operations where collective bargaining is rare. Where automation has encountered rigid job lines and other restrictive work rules, labor-management conflict has at times been intense. As automation becomes more flexible and economical, it may invade such areas to an increasing degree. Labor and management and the government have adopted a variety of measures to prevent or alleviate displacement and to study proposals for future bargaining.

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A WIDELY noted collective-bargaining agreement of 1959 was that between Armour and Company and the two meat-packing unions which represent most Armour employees. The portion of the agreement which attracted attention was a provision for an "Automation Fund" of \$500,000 to be provided by the company and for an Automation Committee to be composed of labor, management, and neutral representatives. The committee was empowered to study employee displacement problems, to experiment with certain remedial measures, and to formulate recommendations for consideration by the parties in collective bargaining. One rather anomalous aspect of this development which has escaped general attention is that automation, in the sense in which this term is used in most of the articles in this symposium, has as yet scarcely made an appearance in the production operations of the meat-packing industry. Armour had a substantial employee displacement problem in 1959, but it resulted from a management program of closing obsolete plants to reduce excess capacity and to centralize production. This program had resulted in the permanent closing of six plants and the termination of about 5,000 employees immediately prior to the negotiation of the 1959 agreement.

The Armour development is illustrative of the fact that, in a great many collective-bargaining situations, "automation" has become a synonym for "any development that may cause employee displacement." However convenient it may be to have a word—or a catchword—for referring to the problems of employee displacement, this usage tends to obscure some of the present and prospective effects of automation, more precisely defined, on collective bargaining.

Any discussion of the effects of auto-

mation on collective bargaining must recognize that one outstanding characteristic of collective bargaining in the United States is diversity. This diversity, broadly speaking, is largely the result of the decentralization of bargaining and the consequent shaping of bargaining systems and working rules to the circumstances of particular industries, particular plants, even particular departments and shops. As the discussion in this symposium demonstrates, automation, too, takes many forms. The diversity both of bargaining systems and of automation limits the possibility of broad generalization.

Sometimes automation completely wipes out particular jobs. More frequently, automation reduces the content of a number of jobs, creating the technical possibility of combining these fractional remainders into new jobs. Automation often changes skill requirements, the degree of responsibility, and the working conditions of particular jobs, and it frequently reduces the extent to which the worker can control the speed of production. These changes obviously affect the relative value of jobs for wage-payment purposes and the appropriate method of payment. Automation sometimes blurs the distinction between production work and supervisory or office work. These are some of the direct and immediate effects of automation, strictly defined. These are effects that have been dealt with in a variety of collective bargaining relationships in the past decade. The main emphasis in this discussion will be on reactions to these direct and immediate effects of automation. Speculation concerning assumed long-run and indirect effects of automation may titillate the imagination more than analysis of this kind. But the understanding gained from a study of actual experience is likely to be more reliable than speculation, however inspired.

JOB COMBINATION

Let us consider first the matter of job combination resulting from automation and the important differences between industries in the collective-bargaining rules on this matter. Two specific examples will illustrate the differences. The rubber industry is in the process of installing highly automatic curing presses for tires. The positioning of green tires in the presses, the timing of the cure, the removal of cured tires, and, in some instances, some post-cure shaping and loading on conveyor belts are all performed automatically. Only one employee is needed to place tires on loading conveyors. Older, less automatic press lines require a number of employees to perform a variety of operations. Hence, the automatic features of the presses, plus the one employee who brings tires to them have in effect replaced a dozen or more employees in perhaps four or five occupational groupings. In a few plants, some questions have arisen concerning rates of pay on the new presses, but I know of no instance in which the union has seriously challenged the elimination of the old occupational groupings or the substantial reduction in force on the new press lines as compared with the older ones.

Compare the case of the flight engineers in the airline industry. The introduction of pure-jet aircraft substantially changed the nature of the work load in the cockpit. Many of the control functions which the flight engineer performed on certain types of piston-powered airplanes are performed automatically or not at all on the jets. The duties of the pilots on the jets, especially during take-offs and landings, are substantially more demanding than on the piston-powered craft. Furthermore, the much greater speed and carrying capacity of the jets make it possible to fly

many more passenger miles in the same time with the same number of cockpit employees. Since passenger traffic has not increased at the same rate as passenger-mile capacity per airplane, the employment opportunities for cockpit crews have sharply decreased. Hence, the pilots have insisted that the crew member who performs the residual flight-engineer duties should have the full skills of a pilot and take over some pilot duties; this would probably mean that the third seat in the jet cockpits would go to the displaced pilot of a piston-engine craft. The flight engineers have insisted that the third seat should go to a man with intensive mechanical training—which is the basic qualification of the present flight engineers.

The public bodies that have considered this controversy have generally found considerably more merit in the position of the pilots than in that of the flight engineers. However, when the first jets were placed in service, a number of airlines tried to satisfy both the pilots and the flight engineers by adding a fourth man (with pilot qualifications) to the cockpit crew. Neither group was entirely satisfied by this device, however, and the controversy broke out anew in 1961 when a strike by flight engineers shut down most of the major airlines of the country. As this is written (November 1961) a presidential board is attempting to resolve the controversy by mediation.

THE NATURE OF A "JOB"

With some exceptions which will be noted shortly, neither job elimination nor job combination which is related to technological change creates formidable collective-bargaining problems in most large-scale, mass-production industries such as rubber. Why not? Largely because the typical "job" in such indus-

tries has long been an impermanent, shifting bundle of duties. In automobiles, rubber, and many other industries producing durable goods, seasonal and cyclical fluctuations are strong, and, as production expands and contracts, many jobs are necessarily changed by the addition of duties or the assignment of some of the former duties to other jobs. A large proportion of the jobs in such industries do not require very much specialized training; a few hours or days of training is usually sufficient. The seniority agreements in such industries generally provide relatively broad transfer rights to other jobs in the bargaining unit. Typically, one union represents the great bulk of production and maintenance employees, and virtually all agreements contain no-strike clauses which are applicable to all occupational groups.

The cockpit of an airliner exemplifies a setting in which quite different working rules have developed. While the business of the airlines is subject to some seasonal and cyclical fluctuations, the amount of service offered is adjusted by adding or deleting flights. If an airplane flies, it is manned by the standard cockpit crew. The standard duties of each crew member are prescribed in great detail, not only by company rules and in some respects by governmental regulations, but to a considerable degree by the terms of collective bargaining agreements. The pilots belong to one union, the flight engineers to another. On most overseas flights, a navigator has also been necessary, and he has belonged to still another union. The unions have separate agreements with the employers. All of the cockpit jobs require many months or years of training, and the typical pilot cannot perform the flight-engineer job without additional training, and vice versa. In any event, neither has any seniority

rights on the other job.¹ Each union has the right to strike to secure new contract terms without consulting any other union, and such a strike usually grounds the company's planes.

The airliner cockpit typifies many segments of industry in which job lines are firmly drawn, with the result that reassignments of work—even those dictated by technological change—are often resisted by the employees and unions involved. This situation is prevalent in such fields as the maritime trades, the construction industry, the railroads (especially train operation), most entertainment fields, many smaller establishments in the metal trades, and the printing trades, among others. Automation, strictly defined, has made little progress as yet in most of these fields.² As noted elsewhere in this volume, until quite recently, the most extensive applications of automation techniques were in the large-scale mass-production industries like automobiles, in process industries like petroleum refining and chemicals, in communications, in electrical utilities, and in data processing in many industries. Here, generally speaking, the employees have been organized in general (or industrial) unions rather than craft (or occupation-based) unions, or else unions have been weak or nonexistent, as in most data-processing operations. Hence, up to now, the kind of conflict that has developed in the air-

¹ The collective-bargaining agreements covering cockpit personnel vary from one airline to another, and their terms are frequently renegotiated. Hence, the generalizations in the text are not equally applicable to all airlines at all times.

² There has been a great deal of discussion of "automation" (very loosely defined) in a great many of these fields. For example, "automation" has been an issue in collective bargaining in East Coast longshoring, but there "automation" means principally the use of large containers which are packed and unpacked away from the waterfront.

liner cockpit has not been a common result of the application of automation techniques. If automation spreads to areas of rigid job lines, then the reassignment of duties within work groups which automation frequently compels may generate the kind of stubborn collective-bargaining problems that we have observed in the airliner cockpit.³ For example, the introduction of tape-controlled machine tools in small metal-working shops may create some difficult problems of work jurisdiction.

SKILLED TRADES JOBS

We must now return to the mass-production industries to note one rather important exception to the generalization that job lines there are impermanent and shifting. Most large factories employ substantial numbers of skilled tradesmen for maintenance, setup, tool and die work, and similar activities which are auxiliary to production. Even where these tradesmen are represented by industrial unions, the job lines are far more stable and change in them is resisted more stubbornly than is the case in direct production work. The United Auto Workers, for example, has repeatedly adopted resolutions pledging to protect "the integrity of the skilled trades," which means, among other things, to resist any reassignment of tasks or any job combinations in the skilled trades. Many, perhaps most, employers in the mass-production industries observe at least to some degree the established jurisdictional lines between the skilled trades in making work assignments. In one of the large automobile companies, for example, a long line of arbitration decisions requires

³ The kind of automation applications represented by space craft have indirectly contributed to some jurisdictional problems at missile-launching sites, partly because some new kinds of work are involved and also because familiar kinds of work are performed in strange contexts and for strange purposes.

that such "lines of demarcation" be observed. In a number of rubber plants, to cite another example, contract provisions give enforceable status to such lines under most circumstances.

The fabrication and installation of many kinds of automation equipment require unusual combinations of skills and some new skills, and such requirements have come into conflict with the established lines of demarcation in some instances. In several of its plants, Ford has attempted to establish a new skilled-trades classification identified as "Automation Equipment Maker and Maintenance," which combines some of the duties of seven different skilled trades. In one new plant, this classification was established before the union organized the plant, and the company succeeded in retaining the classification after union recognition despite efforts of the international representatives of the union to eliminate it. In another new plant in which the company had established the classification, the union succeeded in getting an agreement to eliminate it, but the *quid pro quo* was a concession from the union that the company could assign the tradesmen across traditional lines of demarcation on automation equipment. In still another Ford plant, a long-established one, the company attempted to induce the union to agree to the establishment of the combination classification, but the union refused—with the strong support of the skilled tradesmen of the plant. In a rubber plant, the company attempted to establish a new skilled classification of "Instrument Repair," combining elements of several existing skilled trades, in order to provide for the servicing of the complex instrumentation of many kinds of automatic equipment. The union protested and carried the matter to arbitration, where the ruling was that the plant contract as interpreted by the parties themselves for a number of years

barred the company from unilaterally establishing the proposed new classification under the circumstances of the case.

The point is that even the industrial unions tend to behave like craft unions with regard to jurisdictional lines in the skilled trades. This fact suggests that the basic source of resistance to this kind of change is not merely union policy but also the nature of the jobs involved and the attitudes engendered in the occupants. The skilled tradesman in the industrial plant, like the pilot or the flight engineer in the cockpit, has invested years of his life in training for his occupation, and his capability and contractual right to transfer to another occupation of comparable pay and status are usually severely limited. Hence, management's efforts to realign job duties to conform to the new requirements established by automation usually encounter stiff and sometimes bitter resistance. But the collective-bargaining problems are generally less difficult in the mass-production industries than in the industries where separate unions represent each skilled group. The industrial union rarely attempts to get detailed statements of job duties written into contracts (and thereby frozen at least for the life of the contract), and the factors of inter-union rivalry and independent strike power in the hands of several different groups are rarely present in industrial-union bargaining.

Thus far, the discussion has been concerned mainly with job combination or other realignment of those duties that survive automation. The collective-bargaining problems are often less difficult where specific jobs are completely eliminated by automation and no residual duties remain to be allocated. This has happened to a great many production-line jobs in manufacturing industry. Occasionally it happens to a skilled

group represented by its own union. We find another example in the cockpits of certain airlines. Until recently, navigators have been required on most overseas airline flights. Small electronic computers have been installed in some cockpits, and, with the aid of certain other electronic gear, the computers are able to perform all of the functions formerly assigned to the navigators. The navigators' union threatened to strike when its contract with the airline involved expired, but the obvious and the only real issue was the amount of severance pay, if any, that the navigators should be granted. The settlement was generous, and there was no strike.

BORDER DISPUTES

The application of automation techniques often changes basically the nature of the human contribution to the production process. Engineering, designing, programming, and similar work gain in relative importance as manual machine operation by workers diminishes. Much of the engineering, designing, and programming work indisputably falls outside the conventional production and maintenance bargaining unit. But the increase in office and supervisory forces in most industries, accompanied by decline in the number of bargaining-unit employees, has stimulated a number of "border disputes"—cases where the union claims that new work related to the use of automation equipment should be assigned to bargaining-unit employees rather than to employees who are excluded from it. Most present-day collective-bargaining agreements in large-scale industry define the border lines between these two groups only in quite general language, and this fact has helped to make the resolution of some of these disputes difficult.

The nature of the problems involved can be illustrated by two of the many relevant arbitration cases. A rubber plant

converted a mixing machine (known as a Banbury) to completely automatic operation. Formerly, an operator, and sometimes one or more helpers, had been required to weigh and add materials, to operate control levers, and to push start and stop buttons throughout the production cycle. The installation of automatic controls made it possible for the machine to operate for hours without human assistance after a punched card had been inserted in the control equipment, dials had been set, and a button had been pushed. The only attention that the operation required was periodic monitoring of the control panel for signals of unexpected trouble. The company assigned the monitoring function, the card handling, the dial setting, and the button pushing to a supervisor, who performed them in a control booth several hundred feet away from the automatic machine. He spent virtually all of his time on unquestionably supervisory duties such as the preparation of reports. The union claimed that the monitoring and button-pushing functions should be assigned to a bargaining-unit employee rather than to a supervisor.

The arbitrator ruled that the protested assignment was proper. He based his decision primarily on the fact that closely similar monitoring and button-pushing duties on semiautomatic systems had long been assigned to supervisors in the plant involved without protest from the union and no comparable work had ever been assigned to production employees. This plant assignment practice helped to establish the borders of the bargaining unit, he held. In the 1961 contract negotiations in the rubber industry, the Rubber Workers Union obtained from two of the major companies a contract provision to the effect that automation would not be used as a basis for removing jobs from the bargaining unit.

An automobile-industry case involved the programming of a newly installed, tape-controlled machine tool. The company had assigned the preparation of tapes for this machine to a production engineer, an employee not in the bargaining unit. The union claimed that this work should have been assigned to toolmakers, who are bargaining-unit members. The arbitrator held that the programming of such a machine is essentially the determination of its operational sequence and involves the computation of distances, locations, and angles; this type of work had always been part of the toolmaker's job, he said, and he concluded that it was a violation of the union-recognition clause of the contract to exclude the toolmaker entirely from the programming work.⁴

The increase in the number of these border disputes and the vagueness of most collective-bargaining agreements concerning the precise boundaries of the bargaining unit may prompt efforts in some contract negotiations to lay down additional guidelines, as in certain rubber-industry contracts in 1961. If the guidelines are to be really helpful in disposing of particular cases, they will necessarily be rather detailed and they will not be easily negotiated. Most companies and unions, therefore, may prefer to take their chances with their present indefinite language and to leave to arbitrators the task of deciding the difficult borderline cases.

WAGE DETERMINATION

Labor economists generally agree that one result of collective bargaining over

⁴ A union official later commented that this decision would probably affect 100,000 jobs within the jurisdiction of the union in the country as a whole. To my mind, there is some question whether the decision will be as universally accepted and whether the ultimate number of programmers for machine tools will be as large as this comment seems to assume.

the past several decades has been the development of a far more systematic approach to wage structures and wage-payment systems than was common in an earlier era. By considerably altering job content and by changing man-machine relationships in many industrial operations, automation is creating a need for reconsideration of some of the wage determination and wage-payment systems now in use.

When output per man is sharply increased, as frequently happens in automation applications, the employees and their union may insist that this higher productivity justifies a higher wage rate even though the automated job may require far less physical effort and less skill than the predecessor job. In companies where wage-rate determination is not on a systematic basis, the productivity argument has sometimes been accepted. The fact that unit labor cost may be greatly reduced by automation and the desire to "buy" employee and union acceptance of the new technology have also been persuasive factors in the decision to grant higher wage rates. A series of such decisions, taken without regard to the emerging pattern, may result in an illogical wage structure and, perhaps ultimately, a crisis in bargaining.

A great many larger companies set wages on the basis of job-evaluation plans which assign rates on the basis of varying degrees of factors such as training, skill, responsibility, and working conditions. Such plans vary considerably in the relative weights which they assign to different factors. The prevalent plan in the steel industry, for example, gives much greater emphasis to responsibility factors than to skill factors; the most widely used plan in the metalworking trades and electrical manufacturing gives greater emphasis to skill than to responsibility factors. In the steel industry, changes in operat-

ing jobs resulting from automation have frequently been interpreted to increase the responsibility factors sufficiently to offset decreases in other factors such as working conditions and skill, so that wage rates have often remained unchanged or have increased. In some maintenance fields in steel, however, the companies and the union have found it necessary to negotiate what might be regarded as a modification of the usual application of the plan; an example is the new job of "electronics repairman."

Little information is available concerning the application of the evaluation plans emphasizing skill to jobs affected by automation. It seems reasonable to deduce, from the nature of automation, that skill requirements on production jobs would generally tend to decrease as higher levels of automation are achieved, and there are some case-study findings which lend support to this deductive conclusion. Hence, straightforward application of skill-oriented evaluation plans to production jobs affected by automation might be expected to reduce wage rates in a number of cases. Such a result could hardly be expected to create enthusiasm for the new technology or for the job evaluation plan. In one aircraft company which uses a large number of tape-controlled machine tools, the job evaluation plan has simply been ignored. Skilled tradesmen are assigned to monitor the operation of the machines and they are paid their established rates although many executives are positive that the skill of the tradesman is not needed for the work. Such a policy may lead ultimately to a substantial revision of the job evaluation plan rather than outright abandonment of it. Since job evaluation is usually a rather technical matter, it seems reasonable to anticipate that bargaining over the revision of a job-evaluation plan will frequently prove to be difficult.

INCENTIVE SYSTEMS

Various kinds of incentive-payment systems are widely used in American industry. In general, these systems provide for extra pay for extra production above a prescribed minimum. The general assumption, of course, is that extra effort results in extra production which justifies the extra pay. Broadly speaking, automation tends to transfer control over the rate of production from the worker to the machine; hence, it tends to undermine the basic rationale of incentive payment. This is a factor which has contributed to the increasing difficulties with incentive-payment plans experienced in many plants. Some time ago, the large automobile companies and the United Auto Workers recognized that incentive plans were poorly suited to most operations in the industry, largely because of the high degree of machine (or assembly line) control of the pace of work. Hence, incentive plans are rare in the larger automobile companies, and automation has not created for them the kind of problem under consideration here.

Some other companies in other industries have also moved away from incentive types of wage payment, sometimes with union assent and sometimes despite strong union resistance, sometimes in part because of the automation of operations and sometimes because of other considerations. Under some agreements, management has the right to make the decision whether an entirely new operation—for example, one performed on equipment that is substantially different from that used on the predecessor operation—is to be placed on incentive. It seems likely that some attrition of incentive plans will occur under such agreements as automation spreads.

A widespread practice under many incentive payment plans is limitation of

output by the workers.⁵ The degree of limitation varies quite markedly from one plant to another and even from one operation to another in the same plant. Some automation applications reduce the possibility of such limitation. It is not easy to eliminate completely all employee control over output, however; in some cases, such control is achieved simply by limiting the number of hours that the employees actually work during the scheduled shift. Automation commonly increases the amount of capital investment per employee and tends to make underutilization of equipment a more serious problem for management than under older types of technology. To meet this problem, some companies have fundamentally revised their incentive plans to provide for payment on the basis of the percentage of time that the employee (or the group) actually utilizes the equipment rather than on the basis of output. Another approach has been to make the production quota under the incentive system a matter of explicit bargaining between union and management representatives instead of leaving the matter to *sub rosa* unilateral determination by the employees involved.

GENERAL EFFECTS

The discussion to this point has considered primarily the direct and immediate effects of automation, carefully defined, on collective bargaining. This emphasis is not intended to imply that there are no indirect, long-run effects. They are much harder to assess, however. One reason is that, as one moves away from immediate and direct effects,

⁵ The reasons for such limitation are diverse. Probably the most common are the fear of rate-cutting, the desire to spread the available work among as many employees as possible, and the desire to protect the average or below-average workman from unfavorable comparisons with high producers.

it becomes increasingly difficult to determine the extent to which the observed developments are the result of automation (carefully defined) rather than other forces which are also at work. Moreover, since automation and collective bargaining are both relative newcomers in most industries in which both are found, most discussion of long-run effects rests far more on speculation than on experience. Some points of a general nature deserve attention, however.

In a few situations, automation appears to be the principal factor in a substantial decline in the effectiveness of strikes. In the telephone and gas and electric utilities industries, which are the most notable examples, most operations have now been made so automatic that the little direct labor that is required to maintain essential services can be provided by supervisory employees in case of a strike. Most production employees are normally assigned to repair, installation, and maintenance work, much of which is simply postponed for the duration of a strike. It does not seem justifiable, however, to conclude that most unionized industries will soon reach the same level of automation and, therefore, that the strike will wither away.

In manufacturing as a whole, automation is one important factor in the decline over the past decade in the number of blue-collar workers and the rise in the number of white-collar workers. As has often been pointed out, this trend will result in declining union membership and perhaps declining union influence unless white-collar workers are organized in far greater numbers than at present.

AUTOMATION AND JOB SECURITY

As was pointed out at the beginning of this discussion, automation has become a subject of debate in an increasing number of collective bargaining ne-

gotiations during the past decade, but the term has been given an extremely broad definition. "Automation" has frequently been used to mean any development that causes displacement or unemployment in an industry or even in the economy generally. Obviously, many factors in addition to automation (carefully defined) cause displacement and unemployment. Among these additional factors are the decentralization of certain industries, the elimination of excess capacity in others, the growth of substitute materials, products, and services in many fields, the massive shift in emphasis in defense expenditures, and the lagging growth rate of the economy as a whole.

Other articles in this symposium discuss from various viewpoints the difficult question of how much of the recent increase in general unemployment is attributable to automation rather than to other factors. I will not go into that question, important though it is. The pertinent point for this discussion is that there is a widespread belief that automation is a new force in the economy which is decreasing job security and that collective bargaining in recent years has increasingly involved job-security measures. Thus, whatever its real economic impact, the psychological impact of automation has been an important factor in producing this new emphasis—or change in emphasis—in collective bargaining.

The result of this interest in job security has been an extensive repertoire of agreement provisions intended to prevent unemployment or to alleviate its effects.⁶ Some companies and unions have tried to minimize unemployment by providing a number of aids to worker

⁶ I do not intend to imply that all collective-bargaining agreements now include all of the measures discussed in this section. However, provisions of the kinds described are becoming increasingly common.

mobility—provisions for advance notice of major changes to permit joint planning, provisions for transfer to other operations or plants and broadening of seniority units, provisions for payment of moving expenses under certain circumstances, and provisions for training or retraining programs to be provided by the employer. For those whose employment is interrupted either temporarily or permanently, cushions have been provided—supplementary unemployment benefits, short work-week benefits, and severance pay. Early retirement benefits have been provided to encourage some voluntary withdrawals from the labor force. Some unions have demanded, with increasing urgency, reductions in the work week or the work year in order to spread the available work among larger numbers of people; and, in a few instances, unions have proposed job “freezes” to avert unemployment. Thus far, neither the hours-reduction nor the job-freezing proposals have made much progress in collective bargaining.

Another approach to the quest for job security has been for labor and management or the government to set up study committees to formulate recommendations for consideration in collective bargaining. Kaiser Steel and the Steelworkers have set up a tripartite committee, and the union and the largest companies in basic steel have a joint committee at work. One assignment of both committees is to consider ways of adjusting to technological change. The tripartite Automation Committee established in 1959 by Armour and two meat-packing unions is continuing its work. Several public boards have been appointed to study job-security matters (among other subjects) on the airlines. A tripartite Presidential Railroad Commission was at work, as 1961 ended, on recommendations for handling displacement and other problems of train-oper-

ating employees. Other less formalized studies were also under way in some other industries. By the end of 1962, we should know a great deal more about the efficacy of these varied approaches to a solution of the job-security problem under collective bargaining than we do at present. Even now, however, it seems safe to predict a considerable measure of agreement with the conclusion stated by the Armour Automation Committee in a progress report:

Only through a coordinated approach in which public policy and private action mutually reinforce one another can the employment problems of technological change be met. Collective bargaining by itself cannot fully solve these problems.

CONCLUSION

Let us return briefly to the principal subject of this discussion, the direct and immediate impact of automation on industrial-relations systems. A superficial examination of the experience of the past decade might readily induce an optimistic view of the future. The spread of automation has created controversy and conflict over job rights, assignment of job duties, bases and methods of pay, and related matters. But with only a few exceptions, the controversy and conflict have been contained and resolved within the established institutions for negotiation and arbitration. We should not conclude too quickly, however, that the further spread of automation in the future will be accomplished with as little disruption of industrial-relations systems as in the past decade.

Up to now, the technical characteristics of automation have made it most adaptable to certain operations in mass-production industries.⁷ The environment

⁷ Or to data-processing operations in which collective bargaining is rather rare.

in which most of these industries operate has compelled them to develop ways of adapting to rapid change. Most of them have also developed fairly efficient arbitration machinery. As automation becomes more versatile and more economical, it may have greater impact on collective-bargaining systems that have developed impediments to adjustment to change—rigid job lines, restrictive working rules, wage-payment systems that are hard to adjust—and that lack effective arbitration machinery. The limited experience of the past decade suggests that conflict over automation in these bargaining situations is not likely to be as effectively contained as it has been in the generally different environment of the mass-production industries.