

CHAPTER 9

AUTOMATION AND JOB EVALUATION TECHNIQUES

S. HERBERT UNTERBERGER*

The central problem which we are here to consider was clearly set forth at least five years ago by James W. Bright, Professor of Business Administration at the Harvard Graduate School, in his, by now, classic volume, *Automation and Management*.

There he answered the question, "Will job evaluation work?" for automated jobs, as follows:

Suppose, we say, "Let us be as fair as possible on compensation. Let us apply the best of job evaluation techniques to equate the worth of the automated job." Will job evaluation eliminate the difficulties?

In many cases, the job evaluation analysis will indicate, "This automated job is worth less than the former job." Then the "fair" answer is likely to yield a difficult administrative situation. Shall the job evaluation answer be applied or ignored? If the purpose of job evaluation is considered to be to rate jobs relative to each other and not against some concept of absolute contribution, then it would seem that job evaluation is still feasible although we may have to weight factors differently or add new ones.

What will happen in a plant that has a mixture of "automated" and traditional jobs? Here the original job evaluation system may show much downgrading of jobs that, to the worker, appear to be more important, responsible and complex. The old weighting of factors may create obvious inequities. For instance, an electrical firm evaluates jobs on the basis of four major factors, giving the following weights:

Skill	3
Demands on worker	1

* Economist and Arbitrator, Philadelphia, Pa.

Responsibility	1
Job conditions	1

In some of the jobs that have been automated skill is of little value for there is no opportunity to exercise it. Now, use of this evaluation scale for the automated job, while using it for literally hundreds of traditional jobs which exist in this plant, produces several indefensible positions:

If skill cannot be exerted, is it now worth three times more than any other contribution? Is responsibility properly weighted? Are new education and training requirements, where present, adequately weighted in "Demands on worker"?

What should a plant facing this mixture of jobs do? Abandon job evaluation entirely? Develop a new rating scale? Use two rating jobs? Or continue to use the old scale and let the chips fall where they may?

This catalogue of alternative horrors which is faced not only by a plant but, of course, by an arbitrator who is called upon to settle a dispute over proper evaluation of an automated job after a plant and its union have tried and failed, is followed by the anti-climactic conclusion that "Any of these courses of action has potential inequities and administrative headaches" and the exhortation that "management should start thinking about a proper basis for compensation, now." The need for arbitrators to be thinking about these problems is, of course, no less urgent.

Bright goes on to regret that, "Unfortunately, time did not permit full exploration of job evaluation versus automation (e.g., what things should be evaluated in automated jobs?)." More unfortunate is the fact that a recent review of the literature fails to reveal anyone who, in the subsequent five years, has engaged in this exploration—at least, not in print.

Charles C. Killingsworth, Professor of Labor and Industrial Relations at Michigan State University, and one of our discussants today, sums up the situation succinctly in an early observation, in his December 1958 paper to the Annual Meeting of the Industrial Relations Research Association, that "Basic changes in job content may require fundamental revisions of some job evaluation systems (which tend to be rationalizations of the pre-existing wage and job structure)." This is followed by a recent report in his May 1962 article, in the Annals of the American Academy of Political and Social Sciences, that "Little information is available

concerning the application of the evaluation plans emphasizing skill to jobs affected by automation.”

Nor will this discussion attempt to fill more than a very small part of this very large void, not only for the conventional reasons of lack of time or paucity of source materials, but also because the author has been broken to the rack by the representatives of many parties who have warned him of the direst consequences which would flow from any effort to extend his authority beyond the immediate issue submitted to him. In this case as well, he interprets his responsibility narrowly, as requiring a rather full analysis of the problems of an arbitrator who is called upon to use job evaluation techniques in a situation affected by automation—but precious little in the way of solutions.

Definition

It is approximately at this point in most discussions involving the subject of automation that the author finds it necessary to make clear precisely which of the multifarious definitions of the term he subscribes to or, at least, is going to use for the remainder of the paper. If he limits his choices to only those which have been used by respected authorities in the field, his range still extends from any improvement which transfers any physical or mental activity previously performed by the operator to its performance by a machine. This could be the addition of a simple magazine feed which now feeds pieces into a machine one-by-one, a duty involving a physical activity which was performed formerly by the operator, or a simple relay device which signals for the set-up or maintenance man by a bell or light when the machine jams, a duty involving a mental activity which was performed formerly by the operator. At the other extreme of the range, his choice includes the situation where all the routine physical and mental activities are performed by machines, including setting-up and self correction, generally with the use of intrinsic electronic computers.

Fortunately, for the purpose of this discussion, it will not be necessary to make this choice. Arbitration cases involving the “correct evaluation” of jobs whose contents have been changed because of automation can and do arise at any of the levels within the broad range. They constitute an arbitration problem only

when the application of the job evaluation techniques prescribed in the labor agreement, either specifically or by reference, or those hallowed by past practice, or even those used by the employer, with or without the active or tacit agreement or acceptance by the union, yield a result which, in the arbitrator's judgment, is not correct.

This judgment may be based specifically on the record. An illustration would be where the application of the contractually required job evaluation system points to an evaluation for the automated job which would be substantially below that of its predecessor less automated job, an evaluation which the company has not sought to change. The union, of course, regards it as too low for the new automated job. Here, the result would be outside the range of difference between the parties and one which, if issued in an award, would promptly brand the arbitrator and the arbitration process as unrealistic.

More frequently, the judgment will be intuitive in that the arbitrator concludes that the result yielded by the application of the usual job evaluation techniques to the automated job is so at variance with the likely conclusions the parties would have reached had they been able to successfully negotiate the issue that it cannot be regarded as correct. An illustration might be the substitution of an automated job performed in air conditioned surroundings with the use of mechanical materials handling equipment for a relatively low skilled job performed in and out of doors in which the materials were loaded by the employee. The elimination of virtually all the points assigned to the Physical Demand and Working Conditions factors results in an evaluation for the job in question below that of the plant porter, which job, from the inception of the plan, had always occupied the lowest rung on the job evaluation ladder, even below that of the least skilled bench assembly jobs to which completely untrained young girls without previous job experience are normally assigned. While never articulated at the hearing, the message that it would be unthinkable to negotiate a new job with an evaluation below that of plant porter appears to come through quite clearly.

Consensus

While there is very little in the field of automation that can be

regarded as proved, in the few short years of this concept's prominence, a few areas have emerged in which there is a reasonable consensus, at least among the researchers. For the purpose of this discussion, they will be regarded as sufficiently validated to serve as "givens." They may be enumerated as follows:

1. The early notion that the spread of automation, particularly of the variety where most, if not all, of the routine physical and mental activity is performed by machines, will be accompanied by a virtual elimination of jobs requiring little or no skill or training and a substantial increase in the requirements for highly trained technicians has been virtually dissipated. While there is no final agreement among the "experts" as to the ultimate proportions, there is, by now, a substantial consensus that the automated factory will continue to include in its labor force a substantial number of workers with limited skill and training which can be obtained in relatively short periods of time.

2. There is an increasingly broad recognition that each substantial step toward a greater degree of automation is accompanied by two stages in terms of the job contents of the employees affected. The first stage involves installation and "de-bugging." It may be of any duration, but the larger the step, the longer it is likely to be. During this stage, the job content is likely to be greater than was required for the former, less automated job. More skill is required so that malfunctioning will be detected promptly before the rapidly functioning equipment either produces enormous amounts of scrap or destroys expensive parts of itself. Also, delicate adjustments may be required. However, once the equipment is operating smoothly and all of its automatic devices are functioning, the greater skill employed during the introductory period is not again used or useful.

3. There is also increasingly broad recognition that, in terms of changes in job content, there are substantial differences depending on the extent to which automation is carried. Where automation is carried only to the point where the employees monitor the process until something goes wrong, at which time they are required to intervene and control it, the automated job appears to require higher levels of skill and responsibility than the previous less automated job, if for no other reason than that the

employees are probably assigned to more complex, expensive and productive equipment. However, where automation is carried further so that the equipment is able to correct itself or if the malfunctioning extends beyond the limits of self-correctibility, it shuts itself off and the employee has no responsibility beyond notifying the proper authorities, the automated job appears to require lower levels of skill and responsibility than the previous less automated job where the employee either set up or was, at least, required to hold the set-up of his equipment.

4. With respect to job evaluation plans, it is generally agreed that the principal difficulty in their use as a measuring device for automated jobs is that, characteristically, they apply most of the weight (50% or more) to the skill factors which decline in importance as automation proceeds.

The Arbitrator's Authority

The final variable before we can turn to the consideration of specific cases is the extent of the arbitrator's authority. Here, too, there is a rather broad range.

For this purpose, the most severe limitations are placed upon the arbitrator by the contractual requirement, which has come increasingly into vogue in recent years, that the arbitrator evaluate the job in dispute on the basis of a specifically agreed upon job evaluation plan.

At the next level, no specific plan is prescribed in the contract although it is acknowledged that the existing jobs have been evaluated in accordance with a known plan. In some cases, there is also evidence that exceptions have been made in exceptional cases, generally involving "off-beat" jobs such as outside truck driver for a manufacturing plant.

Another common provision is one which directs the arbitrator to determine the evaluation of the disputed job by making job-to-job comparison and then slotting the disputed job into the proper location.

Finally, there is the contract which is completely silent on the subject in a situation where the value of each job has, essentially, been determined by agreement of the parties.

While the latter looks like the ideal situation for the arbitrator to find himself in when faced with the problem of prescribing the "correct" evaluation of an automated job, it is also the one which involves the greatest risk not only to himself but also to the parties. They may discover that, by failing to heed Professor Bright's advice to start thinking about the proper compensation for automated jobs early, they have abdicated this critical decision to an outsider whose award may determine their futures in the age of automation.

Facing the Cases

Let us postulate a set of facts which are very close to those in an actual case which I had the good, good fortune—or, perhaps, misfortune—of arbitrating twice. The first time around, the situation was as follows: The issue was whether the evaluation was correct under the job evaluation plan which was incorporated physically in a supplement to the labor agreement. After receiving much evidence in the formal hearing, at the request of both parties and accompanied by their selected representatives, I inspected the job in question as actually performed on the floor of the plant. Thereafter, I made a more detailed observation and study, spending several hours with the employee observing and recording his every action. He was operating a large piece of pulp mill equipment which was performing one of the early bleaching processes involved in converting brown wood to white pulp for later use in paper making. The job involved frequent testing and adjusting both the flow and the temperature of the water used and the adding of chemicals as required to obtain the desired results. The most impressive part of the job was the sickening odor which this mash exuded, so bad at times that not only I, but also the operator, had to take refuge in a nearby air-conditioned room provided for this purpose. In addition, during the process, there were times when the area was literally filled with steam to the point where visibility was zero and other times when the floor was flooded with the syrupy residue of the process. Because the working conditions were so clearly adverse, I felt no hesitancy about awarding an increase in the rating of the working conditions factor from one level worse than average factory conditions to two levels worse. Then, "letting the chips fall where they

may," the consequence was an increase in the total point value of the job which qualified it for the next higher labor grade.

There should be no difficulty in anticipating the sequel. In true second act fashion, time passed and the same cast of characters assembled in the same hearing room to consider a case with the same issue. Indeed, accompanied by sly smiles, it was suggested that I might remember and recognize the grievant. Of course, when we got around to making the plant visit, it was my old friend and co-refugee from the acrid fumes. He was still doing the same job. Now, he greeted me properly attired for it in freshly washed and pressed tan chino trousers and, truth to relate, a white shirt. While the equipment had not moved, his work station was no longer down on the floor in intimate relation with it, alert for its every belch of steam so that he could take immediate action. Instead it was up above the turmoil in an antiseptically white tiled air-conditioned room where, seated on a stool he was surrounded by myriad dials, gauges, lights and buttons reminiscent of an airplane cockpit but less compact. His duties consisted principally of recording for somewhat easier reference the information being recorded by the measuring equipment on the charts which he inserted in each. Also, if he noticed developments which had already gone, or portended to go, beyond the range of acceptability, he was required to take such corrective action as he could without leaving his location and to simultaneously notify his supervisor and/or the maintenance and repair staff. For the most part, this action involved slowing down or shutting off the process. The principal difference was that, whereas, formerly, each operator was responsible for the operation of two machines, now, the duties of the one surviving operator related to all six of the machines in the plant.

It was on this basis that the union argued for a substantial increase in the evaluation of the factors relating to responsibility for materials, for equipment and for operations, as well as the factor relating to mental and visual application. Initially, the company reduced the evaluation of the factors relating to physical demand and working conditions, thereby reducing the evaluation of the job by one labor grade. In an effort to settle the issue, it offered to increase the evaluation of the physical demand and mental and visual demand factors sufficiently to restore the previ-

ous labor grade. Since this proved unsatisfactory, it reverted to its original position and argued in the hearing that a strict interpretation of the job evaluation manual would even require reductions in the evaluations of the various responsibility factors since a careful reading of each of them indicates that nothing above the lowest level is warranted unless the employee is in a position to institute measures which would reduce or prevent damage or waste. While there was much opportunity for taking such action in the former job, there is virtually none in the latter job since the employee is nowhere near the location where valves have to be turned, pipes bled, chemicals added, etc. Nor is he permitted to leave his station to do these things even though he may know, from his previous experience, what has to be done.

To the relief of all parties concerned, some time after the observation of the job in operation, during which there was much pressing of positions in the form of good-natured recollecting of how things used to be, reasons developed for deferring further action—as it turned out, permanently.

The case, however, is useful for analysis in relation to each of the variables.

I. The Fully Automated Job

A.

In the state in which the case was presented, namely, a virtually fully automated job in which the contract requires the arbitrator to apply a job evaluation plan which was designed for the evaluation of far less automated jobs, there is little question that the result would have been an evaluation for the automated job lower by at least one labor grade than the predecessor less automated job. Yet, this outraged the union, made the company ill-at-ease and gave the arbitrator the strong feeling that the result, while technically correct, was not really so.

What, if any, special responsibility does the arbitrator have in this kind of situation? First, he has to be aware of the problem and, insofar as possible, what is causing it. In this case, as in many like it, a good deal of the difficulty results from the causes pointed out by Professors Bright, Killingsworth and others that the measuring

devices used in most current job evaluation plans, that is, their manuals, involve a series of implied assumptions which are not appropriate for the measurement of automated jobs. The most serious of these is the assumption that skill is the key factor in determining the value of a job, as indicated by the fact that the skill factors generally receive half or more of the weight. In this case, if, instead of the prescribed manual in which the skill factors assume this level of importance, the agreed-upon manual used broadly in the basic steel industry (in which the skill factors account for less than one-fourth the weight while the responsibility factors account for over one-half the weight) had been used the result might have been quite different, particularly if the meaning of responsibility had been rather broadly interpreted.

It would also be valuable to recognize that while, in the automated job, skill may no longer be the principal quality for which the company is paying the employee, attentiveness has now taken its place; but there is no factor in the job evaluation manual which measures this part of the job content. Indeed, in less automated jobs, such as the predecessor job here, attentiveness is no problem, since it is an automatic necessity if the employee is to function at all in the dynamic situation described above. On the automated job, maintaining a continuing high level of attentiveness is the key problem. It was rather obvious that the purpose for requiring the employee to maintain records was more to maintain his attentiveness than to obtain the records which would have been available in any event, albeit in a slightly less convenient form.

While each case will have its own catalogue of reasons, at least one more worth mentioning here is one which is found rather universally. It is that, almost necessarily, where jobs are highly automated, the proportion of labor cost to total cost is relatively low. Persons with some sophistication in the field of wage rates, among whom arbitrators are generally included, know that in our economy in such situations, as in the oil refining industry which has been highly automated for a long time, wages are not low, but relatively high. To come up with lower wages when the ratio of labor cost declines appears to be the wrong answer because it violates the logic by which the competitive economy seems to operate.

In this arbitrator's view, the limitations imposed by the contract would require him to use the prescribed measuring device,

because that is what the parties agreed to unequivocally. He would come out with a less than satisfactory result. But this is not the first time that an arbitrator has been required to use inadequate tools which are not of his own fashioning. Indeed, this is the usual condition.

However, again in this arbitrator's view, the job would be inadequately done if he did not, at least, express his misgivings and the reasons for them such as those described above with appropriate additions and subtractions. This is an area where arbitrators can, and probably should, make a positive contribution toward clarifying an issue for solution in collective bargaining, an opportunity which was foregone in the instant case, but which might have served a useful purpose if it had been used. For that case was not really an isolated incident, but rather was recognized by both sides as a portent of problems to come. On the way to work each day, they passed the rapidly building new paper mill on the other side of the road where, it was reported, the most advanced equipment was to be installed. The automation achieved in paper making by mechanical means was to be nothing compared to that which would be achieved by electronic, computerized equipment. Mammoth machinery was to be operated from a console rather than from the traditional stations alongside it. Any contribution which would encourage and facilitate knowledgeable collective bargaining over the evaluation of the new jobs on the new equipment would appear to be to the good.

B.

Where the arbitrator's authority is somewhat less specifically directed, such as where no specific plan is prescribed in the labor agreement, and, particularly, where exceptional cases have, in the past, been handled by exceptional means, there is less reason for awarding a result about which he has misgivings. But there is a far greater necessity for explaining in detail why and in what respect, the usual methods for evaluating jobs has been modified, disregarded or even substituted for.

Such situations do present the opportunity to modify the traditional methods without upsetting their use for traditional jobs. A possibility which suggests itself is the use of the same job evalu-

ation manual without the inapplicable factors, such as some of the skill factors. Of course, these could not be given a weight of zero because that would not accomplish the desired result. However, for deciding the case, the evaluation might be made on the basis of the other factors and the result expanded by the proportions usually attributed to those eliminated as inappropriate, or by some lesser proportion. This rather mechanical approach is not suggested as an ultimate solution. Indeed, I would reject it for that purpose. Rather, it might serve as a method for avoiding the necessity for issuing an award which, in the arbitrator's judgment, is not really correct while, at the same time, encouraging, perhaps forcing—even shocking—the parties into facing the problem and developing collectively bargained solutions.

C.

Perhaps the most troublesome situation is where the contract, the parties, or past practice, prescribes job-to-job comparison for establishing the value of a new job, when that job is highly automated and the comparison jobs are substantially less so. Here, the arbitrator does not even have an inadequate measuring device to use either directly or with modifications. It can be anticipated with virtual certainty that the comparison jobs selected by the company will be widely different from those selected by the union.

In discussing this area, one is tempted to fall back on arbitral intuition and, no doubt, in many cases, this will be the final determinant. But, in exercising such intuition, it will be helpful to have, at least, some framework within which to operate.

The best that can be suggested at this time is one that considers how the general wage rate structure in the establishment evolved. For the most part, where job-to-job comparison is the rule for evaluation, the basic wage rate structure is likely to represent the general evaluation of the various jobs in the labor market rather than a rationalization of the individual establishment's wage rate structure. Where this is the case, it may be appropriate to accept, and perhaps even seek, evidence on the evaluation which the labor market in which the plant operates places on highly automated jobs. This is really saying that there is a legitimate interest in what the other plants in the area of competition for labor are

doing about the problem. It is unlikely that this will supply the final answer although it might provide some practical limits to the range of intuition.

D.

Where the arbitrator is provided with no evaluation guides such as where the contract is completely silent and no others have been developed, the arbitrator has an opportunity and a risk. Certainly the same use of intuition and the same framework as was considered immediately above is appropriate.

However, this does present the one opportunity to start afresh. It would be a shame not to use it to some advantage. This is not to say that arbitrators should develop a job evaluation plan of their own for automated jobs and plug, peddle or use it when they get this kind of chance. This would be entirely inappropriate.

What does appear to be called for in coming to a decision in this somewhat freer area is a more penetrating analysis of what wages are being paid for on automated jobs. Some of the factors for consideration have already been pointed out. Certainly alertness and attentiveness are among them but, as was indicated above, these may be of quite a different order than in less automated jobs, since the industrial environment is likely to be one in which boredom must be fought. It has been noted that highly automated jobs are less supervised. An appropriate factor might, therefore, be the ability to accept direction at long range, perhaps through written rather than oral communication. Similarly, it has been noted that highly automated jobs are frequently isolated jobs. This may have substantial effect on the meaning of the training and experience factors. When a new, less than fully trained, employee is placed in the midst of others doing similar work, he continues to learn by observing his neighbors. If uncertain, he can ask questions and receive informal instruction. If he is required to work alone, he must be fully trained before the initial assignment. Perhaps, in our modern tension conscious society, a factor which measures directly the degree of tension involved in jobs which monitor enormous quantities of output must be considered.

Essentially what is being suggested here is that if the arbitrator is called upon to evaluate types of jobs with new characteristics,

it would be less than adequate if he failed not only to recognize and consider them in his decision but to point them out carefully for the understanding and consideration of the parties. This is what the early developers of job evaluation programs did back in the 1920's. Their latter day counterparts have not yet done a similar creative job for the solution of the newer job evaluation problems. The arbitrator who is required to render a decision within the usual 30 days plainly cannot wait for the "experts" to get around to tackling the problem. There is no need for the arbitrators to fully solve the problems, but there is no reason why they should not point the way.

II. *The Transitional Job*

Using our same illustration, had the union chosen to file its grievance somewhat sooner, the situation might have been quite different.

The installation of the highly automated equipment took many months. During the latter few months, our same employee, according to the undisputed evidence, carried an almost dual job. Not only was he continuing to operate the washing and bleaching equipment as best he could while all sorts of mechanics were working around him installing the new control devices but, in the breaking in and "debugging" period, he was working both in the new control room and on the floor of the plant. Essentially, he was checking out each presumably automated adjustment. Frequently, he was required to make corrections. The installation engineers, technicians and mechanics were reliant on him.

If this transition job had been evaluated in accordance with the job evaluation plan, it would, almost certainly, have received higher ratings in, at least, the skill factors and perhaps in the responsibility factors as well while retaining its relatively high rating in the physical demands and working condition factors. In view of the temporary character of these additional duties, such a higher evaluation would also have given the arbitrator the same feeling that this is not the correct evaluation which the submitted issue required him to award. The problem would be no less difficult in each of the other variations of the arbitrator's authority.

The text-book answer, of course, is that no action should be

taken until the job content is stabilized. Such deferment can probably be achieved where the actual transition, as in this case, was relatively short—a matter of a few months. However, many arbitrators have, no doubt, had cases similar to the one submitted to me not so long ago involving an automated job.

It involved the following dual issue: “Is the Company required under the contract to place a permanent rate on the job? If so, what should the rate be?”

The labor agreement included a clause which required the company to install permanent rates on new or changed jobs within a reasonable period of time. The problem here was that two years had elapsed since the original installation of the new automated equipment. In the company’s judgment it was still not operating entirely satisfactorily. Nor could the company give any firm assurance as to when the job would be ready for evaluation.

It is, of course, not possible to prescribe any procedure for an arbitrator faced with this kind of problem—so much will depend on the facts of the specific situation. In this case, it did appear to be appropriate to require that the job be evaluated and a rate set. But, this was because the facts indicated that, fundamentally, the content of the new job had been established for some time. It was principally the perfectionist tendencies of the development engineers which led them to make a continuous series of relatively minor improvements which prevented the company from taking a job evaluation action. With respect to the evaluation itself, the company and union were only a short distance apart, which gap was closed by an arbitration award.

What is important, however, is that the arbitrator be aware of the fact that an evaluation which is correct for the comparatively short transition period runs a serious risk of being incorrect for the far longer period which follows. The establishment of an incorrectly high rate will, in most cases, be irreversible. It may set so high a price on automation that it will stop or retard its development. The ultimate effect could be a falling behind in the competitive race.

Accordingly, little more can be advised beyond caution, with a full explanation of any action by the arbitrator.

III. *The Partially Automated Job*

Automation is not an all or nothing proposition. The degree of automation is partially a function of technology and partially a function of the extent of capital investment. Since neither are available in unlimited supply, situations of partial automation, that is, where only some of the routine physical and mental activities are transferred to the machine, are likely to be the most prevalent.

Certainly, if the transfer is small, the situation is not different from those which have been occurring virtually since the invention of the wheel. For the most part the same method for evaluating jobs in arbitration proceedings as was used theretofore will continue to operate equally satisfactorily.

Where the transfer is relatively large, however, adjustments to those methods may be required. At some levels, creative interpretation of the contractual or job evaluation manual language will be sufficient to yield a result which, in the arbitrator's judgment, is correct. Indeed, this is the traditional way for avoiding premature obsolescence of fundamental documents—from the U.S. Constitution to the lowliest Memorandum of Agreement. It may be hoped that, through such interpretation, plus amendment by the parties where the need is apparent, the evolution of job evaluation techniques will parallel the development of automation. The most likely development along these lines will be broader interpretation of the aspects of the job content which are subsumed under the factors involving responsibility and narrower interpretation of those subsumed under the skill factors, plus some reassignment of weight from the latter to the former.

Where, however, these stratagems prove inadequate to the task so that the application of job evaluation techniques prescribed by the contract yield a result which, in the arbitrator's judgment, is not correct, the problems, to a greater or lesser degree, resemble those considered above in relation to the fully automated jobs and, to a greater or lesser degree, that analysis is applicable.

Closing the Circuit

A favorite analogy of earlier writers in the field of automation related it to electricity by referring to open circuit automation

as the situation in which the process could not continue without human intervention to close the circuit and closed circuit automation which included feed back devices which permitted self initiation and correction without the necessity for human participation in the circuit.

In the area of automation and job evaluation, there are still many places where the circuit is wide open. Human intervention is desperately needed. It should take the form of the development of job evaluation plans in highly automated plants, preferably where there are few, if any, jobs of the traditional type. Hopefully, at least some of these will be highly regarded in both union and management circles, as, for example, the plan in the basic steel industry.

Such a background would be immeasurably helpful to an arbitrator who is forced to break new ground in the particular plant where the case before him originates. At least, he would not be exploring completely virgin territory, even though all the pitfalls would be far from revealed.

Concluding Summary

Because, under the new rules, the above will not be read but only summarized at the 1963 Annual Meeting of the National Academy of Arbitrators, the following summary, somewhat more detailed than usual, has been prepared:

1. It has been broadly recognized that the job evaluation techniques generally in use may not be adequate for the measurement of automated jobs, principally because the factors they weight heavily in determining the value of a job are of lesser significance in automated jobs and other factors are of greater significance.
 2. To date, better techniques to meet this problem have not been developed.
 3. No specific definition of automation is required since any improvement which transfers any physical or mental activity previously performed by an employee to performance by a machine may lead to an evaluation problem which eventuates in arbitration.
 4. Not every such case constitutes a difficult arbitration prob-
-

lem. This occurs only when the application of the agreed upon job evaluation techniques yields a result which in the arbitrator's judgment is not correct.

5. Further analysis requires the recognition of at least three areas in which there is by now a reasonable consensus of opinion and four levels of an arbitrator's authority:

The three consensuses are:

- a. The automated factory is now expected to include in its labor force a substantial number of workers with limited skill and training as well as relatively highly trained technicians.
- b. Each substantial step toward a greater degree of automation is generally accompanied by two stages. In the first, which involves installation and "debugging," job content is likely to be greater than in the previous less automated job: later, when the equipment with all of its automatic devices is operating smoothly, the greater skill employed during the introductory period is not again used or useful.
- c. Changes in job content differ significantly depending upon the extent to which automation is carried. Partial automation may involve greater job content than the predecessor job and full automation lesser content.

The four levels of arbitratorial authority generally provided in labor agreements are:

- a. The arbitrator is required to evaluate the job in dispute only on the basis of the agreed upon job evaluation plan.
 - b. The arbitrator is required to evaluate the job in dispute in a situation where no such plan is part of the contract but the other jobs in the establishment have been evaluated in accordance with a known plan, which practice, to a greater or lesser extent, has been recognized by the parties.
 - c. The arbitrator is required to evaluate the job in dispute on a job-to-job comparison basis.
 - d. The arbitrator is required to evaluate the job in dispute where there is no contractual or other guidance.
6. How the issue of whether the evaluation of a highly automated job is correct might be handled under each of the levels of authority is considered.

Application of the job evaluation manual yields a result which in the arbitrator's judgment is too low, principally because that manual weights the skill factors, which have declined in impor-

tance, very heavily but fails to provide any special weight for other factors, such as attentiveness, which have increased in importance. It is observed that if a manual with a different weighting scheme had been used, the result might have been different—perhaps even acceptable.

Where application of a specific manual is required unequivocally and, consequently, the arbitrator must come out with a less than satisfactory result, it is suggested that his job would be done inadequately if he failed to express his misgivings and the reasons for them. This is how he can make a positive contribution toward clarifying an issue for collective bargaining.

Where the arbitrator's responsibility is less specifically directed, opportunities to modify the traditional job evaluation methods should not be foregone.

The most troublesome situation is where job-to-job comparison is prescribed since this essentially requires comparing relatively incomparable traditional jobs with automated jobs. It is suggested that looking to how automated jobs are being evaluated in the labor market in which the plant operates would not be inappropriate in this situation.

Where the arbitrator is provided with no guides, more penetrating analysis of what wages are being paid for on automated jobs is encouraged in order to reveal the new factors worthy of consideration. Attentiveness, alertness, ability to accept indirect supervision, to work effectively in relative isolation, the quality of training required and, perhaps, tension are illustrations of such possible new factors.

It is not recommended that the arbitrator develop and use his own plan for evaluating automated jobs but, rather, that to meet his obligation to render a prompt decision, he cannot wait for the "experts" to get around to developing such plans—an activity which they have not pursued with deliberate speed. While meeting this obligation, there is no reason why arbitrators should not point the way.

7. How the issue of whether the evaluation of a transitional job—that is, the job which is performed during the installation and "debugging" period—is correct might be handled is next considered.

Here a special caution is issued that an evaluation which is correct for the transitional period runs a serious risk of being incorrect for the far longer period which follows. An award at this critical time may set the price for automation so high as to retard it with very long-run effects on the survival and growth power of the enterprise.

8. How the issue of whether the evaluation of a partially automated job is correct is considered.

This is identified as an in-between situation which might well be handled in the traditional manner with a dash or more of creative interpretation of the contractual or job evaluation manual language. The view is expressed that such interpretation, plus amendment by the parties where the need is apparent, offers the best possibility for the evolution of job evaluation techniques which will parallel the development of automation.

9. Finally, the pressing need is cited for the rapid development of new job evaluation programs in highly automated situations, preferably programs which would be highly regarded in management and labor circles. Arbitrators, no less than managements and unions, need these as a background against which to better perform their assigned function.

Discussion—

CHARLES C. KILLINGSWORTH*

Herbert Unterberger's paper is a perceptive statement of some of the most important and perplexing problems which automation creates in the field of job evaluation. I find myself in substantial agreement with most of his major points. But it is not my assignment today to praise Unterberger. In the job description of "Discussant," the primary function that is given is "to promote controversy." I do hope that my efforts to perform this assigned function will not obscure my appreciation of the highly competent and illuminating job that Herb Unterberger has done for us.

I wish to make four points. I must make them briefly and, therefore, dogmatically.

* University Professor of Labor and Industrial Relations, Michigan State University.

My first point is that it is highly desirable or perhaps essential for those wrestling with some of the problems growing out of automation to have a grasp of the fundamental nature of this development. Unterberger understandably wishes to bypass the controversy over the proper definition of automation, but such bypassing unfortunately leads away from some important aspects of the subject.

Much of the aura of mystery and novelty which has come to surround automation would be dissipated if we would keep in mind the derivation of the term. Del Harder of Ford coined the term as a shortcut way of saying "automatic operation." Hence, it refers to a familiar development, with roots going back to ancient times. This continuity with the past should not be permitted to obscure the important fact that there are new dimensions today in automatic operation. The best statement of the matter that I have seen is one provided by Vannevar Bush back in 1955. In testimony before a Congressional committee, he made the following comment:

The point is that the presence of a host of versatile, cheap, reliable gadgets, and the presence of men who understand fully all their queer ways, has rendered the building of automatic devices almost straightforward and routine. It is no longer a question of whether they can be built, it is rather a question of whether they are worth building.

What this great scientist was saying, in effect, was that we have developed a lot of hardware and a lot of know-how which together make it technologically possible to automate almost anything. It's the dollars and cents equation and not technology as such which is the really important limiting factor in the spread of automation. This fact makes it very difficult to formulate useful and valid generalizations concerning the human skill levels and the industries most likely to be affected by automation. We have the technical ability to automate almost any operation today. But we're not going to automate everything this year or next year or even in the next generation—because of the relative cost factors.

My second point is that automation today fundamentally changes man-machine relationships. The greater the *degree* of automation, the greater the change. Automation is essentially the substi-

tution of mechanical devices for the human nervous (or sensori-motor) system—the iron hand on the stamping line for the flesh-and-blood hand, the electric eye on the camera for the human eye, the electronic computer for certain kinds of brain functions, and mechanical or electronic linkages or circuits for human button-pushing or lever-pulling. We have not gone very far as yet in the analysis of this new man-machine relationship. Some specific and immediate problems have arisen, but they have been dealt with almost entirely on a catch-as-catch-can basis.

Parenthetically, my view is that the most difficult and intriguing arbitration problems created by automation do not involve job evaluation strictly defined; rather, they involve the question of the scope of the bargaining unit. When you go to computer control of a rolling mill, is the work that remains for human hands (and brains) of such a nature that it should be assigned to a supervisor, or does it still belong in the bargaining unit? Perhaps we might regard the resolution of this question as a kind of “job evaluation,” very broadly defined. Certainly some of the same techniques of job analysis and comparison are useful.

From the conventional job evaluation standpoint, however, the basic question that automation poses is, what should wages be paid for? A major contribution of Unterberger's paper is his elucidation of some of the possible answers to this basic question. But we need to give more attention than we have to the context in which the question arises before we can realistically evaluate the proposed answers.

My third point relates to the role of the arbitrator in this problem area. I have serious reservations about Unterberger's suggestions concerning the contributions that arbitrators can make. Many company and union representatives—as well as arbitrators—would strongly disagree with the suggestions that arbitrators' decisions should express their misgivings about the contract terms under which they are asked to arbitrate, should help to “frame issues for negotiations,” or should engage in “creative interpretation” of job evaluation manuals. Most company and union representatives that I know quite properly regard the “overly helpful” arbitrator as a menace. Gratuitous advice in a decision usually creates many more problems than it can possibly solve. Herb Unterberger, with all of his experience, probably did not

intend to advocate this "overly helpful" approach; but some readers of his paper might get that impression, which would be an unfortunate one.

Perhaps arbitrators can contribute to the solution of some of the problems growing out of automation, but I do not believe that they should undertake to do so in particular labor-management relationships unless the parties themselves specifically invite the arbitrators to undertake such a contribution. I doubt that the arbitration of specific cases is an appropriate context in which to give such help even if it is requested. What is an appropriate context? Several examples come to mind, the most obvious of which is the Kaiser Long-Range Committee. But we are concerned here with conventional arbitration. In that setting, even where an arbitrator feels that a result in a particular case is "wrong," it is quite enough for him to show in his decision as clearly as he can precisely why that result is required by the contract or job evaluation manual that he is required to follow. I think that most parties would get the message—that if the result is unsatisfactory, they should blame the contract and not the arbitrator.

In conclusion, I want to underline a point which Unterberger touches on. We badly need to know much more than we do about the ways in which particular job evaluation plans are actually being applied to jobs affected by automation. I have made a great many inquiries on this point of labor and management representatives in the last four or five years and have found a surprising lack of readily available information. Without this kind of specific, concrete knowledge, our efforts to deal with the subject of job evaluation and automation may be as frustrating as the legendary efforts of the blind man in the pitch-dark cellar to find the black cat that isn't there.

Discussion—

PAUL N. LEHOCZKY*

The panel has been severely limited in the amount of time it has been allowed for its formal presentation and in consequence,

* Professor and Chairman, Department of Industrial Engineering, Ohio State University.

you have become acquainted with little more than the outline of my colleague's paper. His paper presents a comprehensive and thorough treatment of the subject and because I do not want to use my short discussion period to reaffirm what he has already said, and with which I am quite in agreement, I have decided to concentrate my discussion on two specific, although widely separated, phases of the general problem treated by this Workshop.

The impression I have gained from much that has been written on the subject is that those concerned with the effects of automation reflect the impression that it is something new which appeared on our industrial scene only within the past 10 or so years. This is contrary to fact. Automation and its older companion, mechanization in its many forms, have been with us to a variable degree for many years. I know of a recorded case which dates back 300 years and it had become quite commonplace in industry some 40 years ago. In 1926, for example, I visited an almost completely mechanized high-output automobile frame plant in Milwaukee. Here, raw materials were checked automatically by mechanical devices for thickness, width, finish, warp, length and other characteristics. Machine tools traveled to and from the product automatically as the product progressed along the conveyor line; what visible productive manpower still remained was concentrated at the final "right-side with left-side" assembly point. Even here, the last four men could have been eliminated but, I was told, it was deemed more economical to use direct manpower for this particular operation. The machine tools had built into them signal systems which signaled a small crew of experts in the event of a line failure at any point. All this in 1926, and probably for some years before 1926. Nor was the frame plant unique. Similar types of applications existed in the automobile industry and in many other industries as well.

Changes which have occurred since 1926 are sensational only because of their magnitude and because the rapidly developing electronic techniques make applications possible in an increasing number of new areas of activity. This brings me to the first of my two points: Because mechanization and automation have been with us throughout the formative and developmental stages of job evaluation (it too began to be applied in industry in the late 20's) there is reason to assume that the evaluation systems, as such, were

designed to take care of mechanized jobs including those which are more recently being affected by automation.

The forerunner of the CWS system as developed at American Steel and Wire in the early and middle 30's, and 10 years later, the CWS system bilaterally adopted in the steel industry, were not developed in a vacuum. The men who did this developmental work were certainly aware of the fundamentals of mechanization and of its by-products. The builders of other evaluation systems and the negotiators who applied them, were fully aware of the Bullard Multimatic and of the host of other automatic machine tools as well as of the semi-and-fully automated lines which (like the Ford windshield line, for example) have been with us for many years.

Thus, it seems to me that arbitrators need not view this phenomenon as something unheralded that appeared very suddenly and to which they must now apply new solutions. At the very time that unions and companies were thinking about, negotiating, and then applying their new yardsticks, automation already had set in and in many places was already in full bloom. The newly-found yardstick thus was being applied to mechanized jobs from its origin; not yet perhaps to the nut starter on the automated engine line but definitely to the unloader-loader on dozens of mechanized tools; not yet perhaps to the cardpunch operator but definitely to the feeder on a multitude of mechanized lines. These mechanized jobs are an integral part of the bases of evaluation systems, they were there when the parties negotiated the skill-effort-responsibility relationships, they are not something that happened suddenly since 1960.

The problem, ably outlined by my colleague, is thus created not so much by any technical weakness in the currently applied evaluation systems as by collective bargaining pressures. As the number of demotions increase, the pressures increase. The logical answer seems to be to revise the system in such a way that it will yield a higher wage rate for a given job. Whether or not such a revision is acceptable to all those who work under the original system is seldom debated. It is my contention that pressures of this type should not be relieved by arbitrating inequities into existing wage evaluation and wage payment systems. An arbi-

trator can, I am confident, develop a new evaluation system which is less sensitive to skill and more sensitive to time, to attention, to constant attendance. Whether or not a radical change in the weighting of one factor (such as skill) as over other job factors conflicts with natural or social values is open to question. Only the principals should make this determination.

Let me turn now to the second of the two problems and one which seems to be appearing with increasing frequency. This problem again is not a product of any weakness in the principles or techniques of job evaluation nor is it caused by these systems' insensitivity to certain jobs or job characteristics. Its cause is based upon certain indirect effects of automation upon job evaluation.

Automation tends to divide jobs into two categories, setup and operate. We've dealt here today at some length with the problems created by the "operating" jobs. The setup jobs create entirely different problems and how serious these are, will depend somewhat upon the degree and extent of automation coupled with the size and nature of the enterprise. Size may vary anywhere from a single tape-recorded machine tool, to a simple processing unit such as a stretch unit in a textile mill, to a completely automated line such as an automobile engine line. Under highly automated conditions, for example, the setup function breaks down into two parts, programming and trouble shooting.

Programming in its pre-automated stage is normally performed by exempt personnel. The operating personnel usually receives a list of suboperations, their sequence, feeds, speeds, etc., and these from an engineer, a technical clerk, or from some other excluded employee assigned to perform this function. These are types of jobs which give the employee a great deal of latitude such as is the case with the toolmaker; on the other hand, there are types of jobs which are clearly defined and detailed, which leave very little to the imagination of the setup man, as for example in the case of the setup of an automatic screw machine. The argument here still centers around the inclusion and exclusion of the jobs, their assignment to technical personnel versus bargaining unit personnel, rather than around arguments over factor slotting.

Trouble shooting, the other half of the new setup function,

varies in scope with the type of equipment used. Here the job frequently is assigned to an outsider and the included-excluded argument is replaced by the "sub-contracting" argument. One of the currently existing peculiarities of tape-controlled equipment seems to be its predisposition to breakdowns. One of the users of such equipment indicated that the automated machine tools he uses are "down" as much as 25 percent of the time. Consequently, the amount of trouble shooting required is relatively large and the subcontracting issue may well become important for this reason alone. The basic problem, however, is not with job evaluation; it is with demand-and-supply.

Electronics is a rather recent branch of industrial activity; it is sufficiently abstract to warrant an off-the-job training course; it is sufficiently complicated to call for special talents and interests on the part of the employee; it is sufficiently difficult not to interest the capable employee who "has it made" in terms of an occupation involving existing skills. Thus the demand and supply relationship is usually so tight in most plants that:

- a. Either there is no in-house talent of any kind available, capable of programming and/or trouble shooting.
- b. Or, what promising or qualified in-house talent is available or can be secured by hire, will not be satisfied with wage rates based upon orthodox job evaluation principles.

The consequences should be clear: Either the work will be contracted out or it will be handled on a non-bargaining unit basis to avoid wage-rate restrictions. All this because of the relative scarcity of trained talent.

I suppose one could argue at this point, for reasons just opposite to those given earlier, that the relative weights of the skill and training factors should be increased rather than reduced and possibly that special slots should be assigned to work entailing a knowledge of electronics. But this again results in the same old arbitral problem, best expressed by the question: How can we twist this thing around to satisfy a special condition? The special operating condition: To maintain a customary wage in face of a drop in skill and effort requirements. The special setup condition: To raise the wage rates for certain jobs to a competitive level.

These problems belong in the realm of collective bargaining; they cannot be solved by having the arbitrator rationalize and interpret the parties out of their difficulties on a case by case basis. Both problems are symptomatic of possible changes which may have taken place in our natural and social value system. These changes may have made our 20-year-old evaluation plans partially obsolete. If so, let it be the parties directly concerned who rebuild or modernize them.