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Proceedings of a
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CONFERENCE ON AUTOMATION

changing technology and related problems

January 9, 1957

Fairmont Hotel

San Francisco

Presented by the Institute of Industrial Relations, School of Business Administration,
College of Engineering, and University Extension, University of California, Berkeley.

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California, University. Institute of industrial relations (Berkeley)

PROCEEDINGS

of a

CONFERENCE ON AUTOMATION - Changing Technology and Related Problems,

at the

Fairmont Hotel, San Francisco,
January 9, 1957,

presented by:

Institute of Industrial Relations,
College of Engineering,
School of Business Administration,
University Extension, Northern Area

of the

UNIVERSITY OF CALIFORNIA,
Berkeley.

and others

in cooperation with:

American Institute of Electrical Engineers, San Francisco
American Institute of Industrial Engineers, San Francisco-Oakland
American Society of Mechanical Engineers, San Francisco
California Metal Trades Association
California Processors and Growers Association
Distributors Association of Northern California
Federated Employers of San Francisco
Office Employees International Union, AFL-CIO, Western Organizational
Conference
Pacific Coast Metal Trades Council, AFL-CIO
Society for Advance of Management, San Francisco
United Automobile Workers of America, AFL-CIO, Region 6
United Employers, Incorporated
United Steelworkers of America, AFL-CIO, District 38

Conference Coordinators: Thomas F. Murphy
Institute of Industrial Relations

Berkeley, 1957

P R O G R A M

9:00 Registration

9:30 Opening General Session

Welcome

ARTHUR M. ROSS, Director, Institute of Industrial Relations, University of California, Berkeley.

THE MEANING AND SIGNIFICANCE OF AUTOMATION

FRANK K. SHALLENBERGER, Associate Professor of Industrial Management, Graduate School of Business, Stanford University.

10:45 Workshop Sessions

12:15 Luncheon Session

LABOR LOOKS AT AUTOMATION

NAT GOLDFINGER, Department of Research, AFL-CIO, Washington, D. C.

2:00 Panel Discussion

THE FUTURE OF HOURS OF WORK, Panel Discussion

ARTHUR M. ROSS, Chairman
RICHARD LIEBES, Research Director, Bay District Joint Council of Building Service Employees
WARREN R. PHILBROOK, Industrial Relations Director, Food Machinery and Chemical Corporation, San Jose.

3:30 Workshop Sessions

6:00 Dinner Session

Session Chairman

EUGENE W. BURGESS, Visiting Professor of Industrial Relations, School of Business Administration, University of California, Berkeley

Workshop Summaries

INDUSTRY AND THE AUTOMATED FUTURE

JOHN DIEBOLD, President, John Diebold and Associates, Inc., Editor and Associate Publisher, "Automatic Control" Magazine; Author: "Automation, The Advent of the Automatic Factory."

W O R K S H O P S E S S I O N S

CHANGING TECHNOLOGY AND WORKER ADJUSTMENT

Discussion Leader:

JACK D. ROGERS, Assistant Professor of Business Administration,
University of California, Berkeley.

Resource Members:

JOHN B. KINNICK, Vice President, Office Employees International
Union, AFL-CIO; President, Local No. 29, Office Employees
International Union.

GEORGE F. KOTH, Vice President, Lenkurt Electric Company, San Carlos.

CHANGING TECHNOLOGY AND WORKER ADJUSTMENT

Discussion Leader:

CYRIL P. ATKINSON, Assistant Professor of Engineering Design,
University of California, Berkeley.

Resource Members:

RALPH SHOWALTER, International Representative, United Automobile
Workers of America, AFL-CIO.

JOSEPH P. WILLIAMS, Assistant to the Controller, Bank of America,
San Francisco.

LABOR NEEDS, TRAINING, AND LABOR UTILIZATION

Discussion Leaders:

LOUIS E. DAVIS, Associate Professor of Industrial Engineering,
University of California, Berkeley.

EDWARD C. KEACHIE, Associate Professor of Industrial Engineering,
University of California, Berkeley.

Resource Members:

ARNOLD ANDERSON, Industrial Relations Officer, Naval Supply Center,
Oakland.

JOHN J. KING, Grand Lodge Representative, International Association
of Machinists, AFL-CIO.

LABOR NEEDS, TRAINING, AND LABOR UTILIZATION

Discussion Leader:

WILLIAM H. KNOWLES, Visiting Professor of Business Administration,
and Research Economist, Institute of Industrial Relations, University
of California.

Resource Members:

JOHN HENNING, Research Director, State Federation of Labor

PETER D. REILAND, Personnel Manager, Schlage Lock Company,
San Francisco.

CONFERENCE PLANNING COMMITTEE

EUGENE W. BURGESS, Visiting Professor of Industrial Relations, School of Business Administration, University of California, Berkeley.

ARNOLD CALLAN, Sub-Regional Director, Region 6, United Automobile Workers of America, AFL-CIO.

LOUIS E. DAVIS, Associate Professor of Industrial Engineering, Division of Mechanical Engineering, University of California, Berkeley.

LOUIS H. ERB, Assistant Vice President, Pacific Telephone and Telegraph Company, San Francisco.

NEAL HAMMOND, Manager of Industrial Relations, Ford Motor Company, San Jose.

JOHN B. KINNICK, Vice President, Office Employees International Union, AFL-CIO; President, Local No. 29, OEIU.

GEORGE K. KOTH, Vice President, Lenkurt Electric Company, San Carlos.

GUS MALKAS, President, Rodeo Local No. 1-326, Oil, Chemical and Atomic Workers International Union, AFL-CIO.

THOMAS F. MURPHY, Acting Coordinator of Public Programs, Institute of Industrial Relations, University of California, Berkeley.

WARREN R. PHILBROOK, Industrial Relations Director, Food Machinery and Chemical Corporation, San Jose.

JACK D. ROGERS, Assistant Professor of Business Administration, School of Business Administration, University of California, Berkeley.

ARTHUR M. ROSS, Professor of Business Administration and Director, Institute of Industrial Relations, University of California, Berkeley.

THOMAS ROTELL, Executive Secretary, Pacific Coast Metal Trades Council, AFL-CIO.

JOHN T. SCHIAVENZA, Secretary, California Conference of Machinists, AFL-CIO.

JOSEPH P. WILLIAMS, Assistant to the Controller, Bank of America, San Francisco.

THE MEANING AND SIGNIFICANCE OF AUTOMATION

By

FRANK K. SHALLENBERGER

Associate Professor of Industrial Management
Graduate School of Business, Stanford University

I hope that when you get to talking about some of the sociological problems in your workshop seminars that you will recognize that this specialized age is in many ways getting very difficult to live in.

The arrangements for my participation in this conference were conducted by cable from some considerable distance between here and Australia, and I have had, for the most part, to determine for myself what coverage would be desirable in my address. When I thought about what subjects to cover I decided that it would be my job to introduce the subject and try to stir your interest in automation. As I see it this involves, first, defining automation and indicating a little of what it is doing and what it can do; that is, what it might mean in our industrial and economical progress. I wish I could give you a pat, neat definition of automation, but I can't. I don't believe that anybody can. I have found none that are inclusive enough to cover such a big subject and at the same time be specific enough to be of real practical value.

What I would like to do, therefore, is to give you several definitions and together they may convey the idea. First, automation definitely does not mean the push-button factory of "machines without men." Nobody who really thinks seriously about the subject visualizes such a monstrosity in the foreseeable future. Of course, this is one of the first uses of the word, automation, to mean only automatic handling between machines. In a broader sense it has been called any replacement of human operators by automatic mechanisms. Some of the purists define it as automatic control of machines, with emphasis on the control aspects rather than the machine itself. It has also been called continuous automatic processes. It's been called taking work out of work. Some people call it only advanced methods-study in work simplification. My own preference is for a rather broad definition. I think you must think of it in terms of four distinct phases. First of all, mechanization, which is sometimes called Detroit-style automation. This phase will, of course, make you think of the industrial revolution. It's typified by machines which replace men's muscles, eliminate physical efforts and substitute horsepower for manpower. The second phase of automation can be termed control-type automation. That has as its objective the elimination of mental effort in the human administration or direction of the control of the machine. This has sometimes been called "machines to run machines." It is the technique of the automatic mechanism which can watch what the machine is doing, make sure it follows the instructions, and then automatically corrects its own mistakes or the employee's. This is something new which has created a great deal of the interest that we see today in automation. There is a third phase which we sometimes call business automation. This is the use of computing and decision-making

machines -- electronic brains, if you will -- which hands out administrative, statistical and clerical policies. It is quite conceivable that an entire plant can be operated under the administration of these types of machines. It involves gathering sales analysis, ordering and checking the flow of materials, scheduling and controlling the operations, making out the invoices, etc. Finally, as a fourth phase, I think we should recognize that automation is both a new philosophy, a new concept, a new approach to production and administrative problems. It is also a means of what we call optimizing business operations, through the use of computers and mathematical techniques such as linear programming and operational research to plan and organize operations for the most effective uses of the available materials, machines, tools and manpower on the market.

To develop a proper perspective we should make clear several points. First of all that modern automation with all its expensive equipment and complex techniques is not new. Some of the techniques are new, but in a practical sense, it is only a continuation of what we have been doing for a great many years. It does represent an astonishing and very rapid acceleration of the application of these techniques. Acceleration has been stimulated by the refinements that have been made in equipment and techniques because of high labor costs, by expanding markets and demands for high volume and greater precision, and also by more confident and aggressive measures by men in business. These are the things which I believe are creating the high interest that we see in automation today.

Secondly, I think we should recognize that automation is not going to come overnight. We need fear no rapid and general change over this year or next year or probably over the next ten years, except in certain individual situations. The very basic and practical reasons are the lack of know-how, the high cost involved, the unpredictability, and the small markets which exist in certain areas, and, the lack of available equipment. For those reasons automation will tend to come in one operation in one department of the plant at a time.

Finally, in trying to develop a sound and realistic perspective, we must realize that automation is only one of many alternative ways of decreasing costs and increasing productivity. In the excitement over automation we often forget the many other techniques that should precede automation; which in many cases will yield a much higher return on a smaller investment. Techniques such as better planning and control would eliminate downturns in sales and over- and under-production. Better training, better purchasing, improved product design, new products, and methods improvement are only a few of the many other measures we have to improve products and decrease costs. Automation is by no means a panacea. It is going to have to compete for funds and management's attention with all these other techniques. Automation is very important; it offers great promise. Nevertheless, it is still only one of many steps toward improved operation and administrative efficiency. If you want the right perspective on automation, you must regard it as such.

I think it should be recognized that there will be for many years thousands of jobs in which automation is not feasible or economically practical.

Theoretically, the techniques are now available to automate practically any job in industry. But it must be recognized that human hands, coordinated with human eyes and the sense of feel and touch, and human judgment are marvelous devices, and for some applications they are far superior, more effective, and less costly than any other electronic or mechanical devices that might be made to substitute for them. For other jobs, of course, automated equipment can do an infinitely better job than a human operator. Certainly they can see, hear and measure and move faster, move with greater efficiency than any human. They readily work around the clock without mistakes and, unlike many human operators, they are reliable, consistent, and predictable. In many cases automation may make possible operations which simply cannot be performed by humans such as when dangerous materials or high speeds are required.

I don't quite know why we, as managers, tend to be so timid and evasive about the substitution of automatic devices for human operators, but, by our timidity and evasiveness, I think we lose the argument by default to those who, for reasons of their own, make us fearful of automation. If you look into it, you will find inevitably that the arguments are all on the side of automation. To me it is quite inconceivable that society can be worse off for having found an easier and better way to do work and for having found a way to relieve people from heavy labor. If it is conceivable that this will make us worse off, then I think we should examine our society and find out what's wrong with it.

Technology does not discourage jobs, it creates jobs. There will be no widespread unemployment as the result of automation. We have already stated that it is a continuation and acceleration of the past. The experiences of the industries which have in the past automated most successfully indicate that this will not create unemployment, because they are the industries which today are the largest employers.

We should not overlook other benefits of automation. The precision and accuracy of these new machines will result in an infinitely better product, better performance and longer life. Since we can drastically reduce scrap and spoilage, it comes to a better utilization of available time, power, materials, and manpower. Productivity will be increased. Not only does the automatic machines typically have a higher output per hour, but it can readily work more hours in the day and week. The initial cost scares many people out of automation. However, the capital cost of automatic equipment may actually be less than that of conventional equipment. If a piece of automatic equipment costs three times as much as conventional equipment, and can put out six times as much, obviously the capital cost is only one-half. Another benefit is safety. No one can get hurt on automatic equipment. This has been one of the major objectives of many installations, such as the iron hands for loading and unloading heavy materials. There is the benefit of optimization. The human operator is always a compromise. No matter how high the skill, no matter how hard the work, no matter how great his efforts, being human, he varies, and consequently he can't always work at the ideal rate. The automatic controls do not vary and they can work right up to the maximum all of the time, as in packaging for example. When you are packaging by automatic control you can cut the variation down in the amount of the package to maybe one tenth of one per cent. The human operator can't and you always have to put a

little more effort and time in just to make sure he includes the full amount. You can get a given amount of production out with smaller motors and less power.

I'm sure it will be brought out in your workshop discussions that automation also promises great social benefits. It promises an opportunity in the distant future -- not tomorrow but some day -- for greater leisure with higher living standards and perhaps, someday, an economy of plenty and a real freedom from material wants -- one of the age-old dreams of mankind. It promises an opportunity for the elevation of the worker from the laborious, repetitive, monotonous, assembly-line jobs to jobs which take brains and training and initiative and provide, in return, challenge and job satisfaction and self-esteem to the worker. These are jobs which constitute what has been called "the human use of human beings." We should recognize that that is not always true. Just as mechanization created routine, assembly-line jobs, so will automation in many of them. But in the long run, in as much as the repetitive routine jobs are the easiest ones to be taken over by automatic machines, eventually it will tend to eliminate those and elevate the operators to jobs of administering control and maintenance of the equipment. I heard a remark made the other day that I would like to pass on to you, because I think it has some significance. The statement was made that: "Great as were the material contribution of the engineers -- skyscrapers, ships, automobiles, planes, energy and power or assemblyline production or the annihilation of man's bondage to space and time -- great as were these achievements by the engineer, the greatest contribution has been the elimination of the need for human slaves." This is, indeed, the greatest achievement of the engineer in commerce and industry. The removal of the need for human slavery has been, in fact, the greatest contribution to the world. Today we no longer have human slavery, but we have, in effect, an economic or job slavery in many instances. If you carry it one step further the next greatest contribution of engineering may be automation and the removal of the latter type of slavery.

Finally, I think you may find in automation the key to the survival of the free world. Automation is the key to increased productivity and only by a great increase in man-hour productivity can we hope to match the manpower advantages of the Soviet bloc. At present there is no evidence that we are winning that race. At the same time that we have these promises in automation, there are also many problems. Automation costs money and many plants have no funds to spare. Automation takes time and takes technical know-how, and it takes product re-design. It takes training for new responsibilities and better planning and control. In many cases it is simply not practical at present volume for even in America, which has been called the land of mass production, over 75 per cent of our production has been in lot-sizes of less than fifty units. There are other problems: labor resistance, high taxes, unrealistically low depreciation rates, management inertia, natural resistance to change, archaic economic thinking, an undue reverence for book value, and a lack of understanding of the economics of equipment replacement.

George Terbough has a famous story that he tells. A board of directors was meeting to consider the replacement of their 75 year old president. It

was pointed out that the company could save something like \$50,000 a year if they got rid of him. Some bright young boy stands up and points out the fact that if they wait until he's 80, it would be worth \$100,000 a year to get rid of him, and why should the company forego those greater savings by letting him go now. I think that there is that same type of thinking that goes on now, over discussion of equipment replacement. This country is not quite as modern as it is sometimes considered. I'm not sure where I picked up the term "ning-ning." A "nong-nong" is a businessman who can't see beyond the end of his nose and the "ning-ning" is the illegitimate son of a "nong-nong." I'm sure that many of the people who are writing our depreciation of equipment and replacement policies today, qualify for that name.

There are problems management will have in running the automated equipment, for automation is a great deal more than simply the purchase and installation of new equipment. You must find the technical talents and skills to install and tools to maintain these more complex machines. We must develop a much more confident and sophisticated management; a management that can plan ahead and can take substantial calculated risks; a management that can live with an operation that is accompanied by heavy fixed costs; a management that can establish and adhere to a realistic financial and operating budget and can move quickly as circumstances demand.

I would like, for the balance of my allotted time, to pass on to you some observations on automation in other parts of the world. I had it brought to me rather forcibly that we, as Americans, lead a rather sheltered, self-centered, and provincial existence. When we talk about automation we tend to think in terms of our own automobiles, appliances, petroleum and similar industries. Possibly we may extend our thinking to Europe. But if we really want the facts I think we should recognize that over 94 per cent of the world's population lives outside North America. These are people who may think and act in ways quite different from our own. And even the so-called industrialized nations, where automation seems most likely, accounts for less than a fourth of the world's population. We should take, at least, a brief look at how the other three-fourths of the world thinks.

Our trip was not planned as a study of world automation, but we did get a good cross-section view. We found that just as each individual company faces problems that are different from the neighboring company, likewise each country faces different problems. I think we got the most complete picture in Australia and New Zealand, where we spent several months working very closely with local firms on their automation problems. The most striking impression that an outsider gets of Australia is that here is a land of tremendous untouched opportunity. The country is almost exactly the same size as ours with much the same climate. The country, at the same time, has a population of only 10 million people, which is largely concentrated in an area a little larger than California. The natural resources are virtually unemployed and untouched. The industries are young, newly developed, and largely isolated from outside competition by distance and tariffs. At the same time this area is almost self-sufficient in iron and steel and most raw materials, chemicals, foodstuffs, automobiles and appliances. Furthermore, Australia and New Zealand are located on the

threshold of one of the greatest potential markets in the world, Southeast Asia. Their purchasing power of outside commodities comes largely from wool. This is a rather precarious dependence but wool prices have been quite high for the past years and everybody has been quite happy. Unfortunately labor costs are also extremely high, and the labor output is quite low by our standards. Presently there is full employment and even over full employment. Although a great deal of the land there is arid, it is potentially highly productive. Australians are now involved in such techniques as reversing mountain rivers through tunnels so that water will flow into the arid regions. They face a tremendous population pressure from the heavily populated Indonesia and Asia in the north. They have an ambitious immigration program to offset that pressure and increase the labor supply. They are bringing in immigration at a rate equivalent to one-half of two per cent of their total population each year. But it's a very costly operation because there is a shortage of houses and the immigrants have to be housed and fed until they can be productive.

The interest in Australia in management matters including automation is tremendous. The interest is, I think, much greater than in this country. I believe the universities are doing a better job in training in the new technologies than are our universities. Their industrialists realize that they are off the beaten path from the flow of technological information and travel frequently to America and Europe to keep themselves informed. But this is a rather poor substitute for direct contact, and it is more serious because they are still tied by tradition and economics to Great Britain. Unfortunately Britain seems to regard Australia as a country cousin whose only purpose is to provide British mills with wool and British housewives with mutton and beef. Consequently, British manufacturers make very little effort to sell equipment and machinery to the manufacturers in Australia. American manufacturers find that they can't sell because Australia does not have the dollars to pay.

Hence, Australia finds itself quite isolated from the technology of the world and the problem is, of course, to develop their own equipment and techniques or to forego profitable opportunities. Since in many lines there is virtually no competition, the situation is made even worse by the antiquated condition in many of the plants. Australians I am sure, coined the popular phrase, at least it is heard often down there, "I couldn't care less." And they don't have to until they are forced to compete in the world markets. So long as they protect their market the individual manufacturer still manufactures virtually any product. I saw old horse-driven milk wagons there for the first time in twenty years. Some of them hang on to their equipment like they hang on to their automobiles. At the same time some of their plants are excellent. The most highly automated iron foundry I have ever seen is just outside of Melbourne and a Sydney plant manufacturing refrigerators is mechanized to a point where its labor output is within 5 per cent of its American counterpart, although its production is less than a fifth. Most of the plants are quite small because there is a limited market. The nearby market of Asia is inaccessible because of Australia's high labor costs and inefficient operations. It's truly a difficult situation, and automation may well lead to a solution. But equipment has to be brought from outside

they don't make it there. Also there is a lack of knowledge of what is available and their capital for such purposes is severely limited.

Also, in Australia as in America, many of the plants are much more in need of improvement in management and methods than they are in automation. Even if one manufacturer manages to shake down his own operations and increase his efficiency, unless he is almost completely independent from supporting industries, he finds that he has to depend on inefficient proprietors. If he wants to compete in a highly competitive market this penalizes him just as much as inefficiency in his own plant would. It almost makes you think that one firm can't profitably automate in a community where others don't increase their efficiency also. I think it seems quite clear that if Australia is to maintain and increase their standard of living, support their immigration program, compete in these world markets, develop their resources, and support an adequate defense program then her industry, her labor unions and government will have to take steps to increase productivity and decrease costs. Part of this program of technological advancement will be automation. But this program won't be easy.

We tend to think of New Zealand as a next door neighbor closely associated with Australia. Actually, it's 1300 miles away and much more closely associated economically and philosophically with England. It is a fantastically beautiful country with rich dairy and grazing lands, natural wonders that are equal to Yellowstone, with mountains that are comparable to the Alps, with a coastline comparable to Norway.

Its industries are essentially primary -- wool, dairy products, agriculture and timber. But there are several automobile assembly plants, a number of textile mills. They produce their own refrigerators, washing machines, radios, and other items. Some of their textile mills are just as modern as you would find anywhere. But there is an extremely small market available, and output is divided among the large number of producers. There are, for example, seven companies manufacturing radios for a market of three million people. With low volume efficiency, high output machinery is not widespread. Occasionally, a company steps out of line, like one I visited who installed an automatic wire stripper. He stated that his volume is not large enough to justify the installation, but he sells the strips to his competitors. In that way he keeps the machines busy. However, there is very little automation in industries other than the textile mills.

There is a fairly high level of automation in agriculture, and I hope you'll recognize when we're talking about automation that manufacturing is only one of the many fields in which it applies. New Zealand was the first to take on modern farm mechanization, which, they say, has added ten years to the average life of the New Zealand farmer. A rather dramatic mechanization is that of fertilization of mountain pasture. Because of the rugged terrain it's most difficult to do with surface equipment. Aircraft is used on a grand scale and with great efficiency.

The land of real challenge, and the land of real future is India. Whereas, Australia has one-sixteenth of our population in the same area as ours, India has twice the population in less than half the area. It is a land of virtually unbelievable contrast. You have modern, efficient air

transportation, for example, as good as you'll find anywhere in the world. Beneath these modern planes, on the dirt roads and highways, you'll see ox carts and camels and even men pulling carts. There are modern hydro-electric stations, and yet in every village you will see women carrying water in cooper jugs on their heads from the waterhole to their huts. You see squalid and wretched poverty; people sleeping in the streets owning only the clothing they have on their backs. And next door you'll see magnificent luxury: beautiful homes with luxurious rugs and tapestries, teak furniture, silks, silver tableware and fine automobiles.

You find modern steel mills next to construction projects where methods a thousand years old are in use. You see modern and beautiful, almost futuristic apartment houses, hotels and office buildings which are constructed entirely by hand. The foundation will be dug with pick and shovel, and the earth will be carried out in baskets. You see cement mixed by hand, loaded into a shop basket, and put on the head of a woman who carries it to its destination. Where they are working on higher levels, they'll put it on a woman's head and she'll walk up the scaffold made of bamboo and deliver it there -- a human chain of women, either by that technique or by use of a bucket brigade. You'll see steel girders hoisted up by men using pulley and rope. If you go by a building under construction you may hear incessant hammering caused by 50 to a 100 stonemasons using hammers and chisels to fashion building blocks. The highway on which their modern buses, trucks, and automobiles run are virtually made by hand -- hand excavation, the rocks broken by hammer, carried in baskets, hand leveled and hand swept. They may make the concession of bringing in a steamroller. They will actually have a team of women go along on their hands and knees with whisk brooms cleaning off the dust before the blacktop is laid. It's almost unbelievable. You see this sort of thing and the word automation seems very remote -- almost a weird dream.

There are a very few people in India who are actually interested in labor saving devices. Here there is an abundance of labor, all you want for 50¢ a day. Automation here can qualify only on other grounds -- on its ability to deliver greater volumes with greater accuracy or greater quality. Mahatma Ghandi was opposed to mechanization because he felt that it concentrated economic power and control in the hands of a few and increased the social problem of industrial societies. He considered village life the true ideal, and today the government subsidizes the home crafts, and village industries, similar to our agricultural extension services with an elaborate program of government research and financial and technical assistance to these village industries. The government has even subsidized retail outlets for the products of these industries. When you go in and buy something, you will get a 10 per cent rebate on the price and the government will again take 10 per cent more and add it to what they give the village industry. Even sewing machines are produced in this way -- with one family making one part and another family making another part, and someplace in the community they are assembled.

At the same time Ghandi's disciple, Nehru, recognizes quite fully that the economic needs of people are food, clothing and other basic necessities and that these needs must somehow be met. And he recognizes that only through modern production methods can the problem be solved. The Nehru government,

while it also handles the home craft and the village program, is also underwriting the modernization of such industries as steel, power, chemical, and automobiles. While we were there they brought on to the market their first complete engine automobile. The government recognizes clearly that full-blown and large scale automation could cause economic chaos in India. We heard talk in practically every country visited whenever the word automation was raised -- and they all knew what it meant -- about the fear of technological unemployment. But the only country where such talk was really taken seriously at all was in India, where there is already unemployment.

The most fascinating aspect of all this is India's concept of her place in the modern world. By and large, she isn't interested in technological advancement, except as the means of feeding and clothing her own people. She doesn't want to be an industrial leader or compete in the world market and try to match the industrialized nations on their own ground. You see evidence all of the time that they feel their mission is to give from their past, the cultural and spiritual guidance that she feels the world needs, providing the philosophical ingredients that are necessary to keep technology and the craze for productivity and economic competition from destroying the world. You see that in Nehru's actions. You see it in books you read there. You hear it in talking with the people.

Hanging over all the Far East is the great threat of an industrialized Red China. For some reason we deny our own people the right to enter China and observe first hand the developments being made. But all reports from observers of other countries indicate that Russia is rapidly converting Red China from an underdeveloped agrarian country to a full-grown highly industrialized nation in the most modern sense. A French reporter, for example, described some of the new plants as being better than any he has ever seen in Europe and possibly better than any in Russia. I talked with a Swiss importer, who was returning from a Red China fair in Canton, and he reported seeing automobiles, bicycles, and watches on display -- merchandise of high manufacturing complexity and of very high quality. The social consequences of a rapid change like that from a backward agrarian country to an industrialized one must be very great. An English reporter emphasized that not only has rapid technological progress been made but that the government was passing on the benefits of that progress to the people in the form of better clothing, food and so forth. And now that the government was firmly entrenched in power, it could begin to tackle the critical problem of birth control, which is really the heart of the standard of living problem throughout the Orient. In Hong Kong, which is overcrowded and doubled in size by refugees from Red China, we saw evidence of the effectiveness of the Russian program in China. Many of the refugees were returning to their homeland in great numbers.

To me there are four significant aspects to this situation. First, the importance that Russia places on technological modernization of China, even at the expense of her own people. There seems to be no board of directors questioning whether automation will pay off, whether the market will absorb the increased production or whether funds are available. They go ahead with the most modern methods and that's it. Secondly, the substantial progress which is being made as a result of the success of this program. Thirdly, the knowledge that once China is tied to Russia

technologically, to the Russian standards, the Russian measurements, the Russian methods, and Russian equipment, the bond between the two will be very difficult to sever. In the same way Australia, New Zealand and other members of the British Commonwealth find it difficult to break economically and technologically and even culturally with Britain. Finally the industrial race between China and India may be the most important aspect of all. The most important problem throughout Asia is poverty. Raising the living standards above subsistence level will be the most convincing evidence of the success of any economic or political program. The threat is that Russia, through technology, is making more progress toward this end in Red China than is democracy and free enterprise in free India. The great fear is that other Asiatic nations, seeing the progress in China, will place emphasis on the results and forget the means. Lest you minimize the importance of such an event, let me remind you that when we talk of Asia we are talking about more than half of the world's total population. To me it is highly significant that the technology we are talking about today, of which automation is a part, is, in the hands of the opposition, being used as a weapon of tremendous importance.

For the time I must leave out the discussion of automation in Europe. We didn't see much of Europe, and I think that the situation there is similar to that of the U.S. To return to our own country, I don't think that anyone can doubt that automation is an essential part of modern industrial technology. Our total population is increasing three times as fast as our working population. It is only through extensive technology and automation that we can ever hope to support such an increase and maintain our standard of living. The fact is that change, constant change, is probably the most important characteristic of our times. And change begets change at an increasingly rapid rate. We've reached what one writer has called, "Not only an accelerated rate of change, but an explosive leaping." There will be problems out of this change. Change always brings discomfort and disruptions of established ways, and we can't minimize these disruptions. I'm sure that one of the functions of this conference will be to discuss these problems.

The promise of higher living standards and greater leisure is not without its problems also. Increased leisure is a blessing only if we use it well. I hope we won't give up the genuine satisfaction of hard work and accomplishments and get nothing in return. It is highly significant that many civilizations prior to ours have reached a high level only to fall apart. It's quite depressing and sobering to speak to people of those nations that were once mighty and are today so poor; to hear the Italians speak with pride of the past but never of the present or the future. I think history teaches a valuable lesson: the more we have of material comforts the more we attempt to protect what we have and the less we try to innovate and create and reach for the ideals that brought us to our present high level.

I think it is quite significant that only a small portion of the world's population, even today, regards material progress as a desirable thing. The Greeks didn't even have a word for it. And there is no evidence that this high level of technology will necessarily bring greater happiness. But whether we like the prospect of automation or not has absolutely nothing to do with it. We can't stop it. It is an essential and inevitable

outcome of our present industrial, economic, and political situation. Your own particular firm may not be able to automate Detroit-style, but there are profitable opportunities for automation in every plant even today. For most industries, and for most nations, there will come a time when there will only be two choices: automate, or get out. To me the important thing is that we automate with intelligence and imagination and with a view toward an understanding of the many problems involved. Thank you.

LABOR LOOKS AT AUTOMATION

By

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I'd like to start out by saying that organized labor is not opposed to automation. American unions, in general, are not opposed to technological change. We know that improvements in technology mean more efficient production and new and better products -- the possibilities of, over the long run, improving our standard of living, increasing our national income and reducing the hours of work. So we welcome technological change because we recognize the long-run advantages and the long-run benefits for improvement. Nevertheless, as Lord Keynes said, in the long-run we are all dead. So what we in the labor movement are interested in, and concerned with, is the short-run.

With the multitude of possible problems of the short-run facing us within the next five to ten years, most of us remember only too well the failure of the economy, in the 1920's, to adjust to the mass production techniques of industry. And the painful failure to adjust to the situation in the great depression of the 1930's. To make the adjustments that accompany the advent of automation, we have to prepare for the problems and work at them. But above all we have to face up to the probability that a great many social and economic problems may arise and some of them certainly will arise in the course of the widespread introduction of new technology.

As I see it this period of adjustment, this period in which the problems will arise, will be in the next five to ten years. Will we be able to minimize the social and economic disruptions that will accompany the introduction of new technology? Will we devise the methods to protect individuals in the community from the depressing effects of the transition to this new technology? Will the benefits gained from automation be widely shared among all groups of the population? Those are some of the questions, the general questions, that concern us.

I will list some, but not all, of the specific problems which we think will arise. Let me say first of all that we don't say with certainty that any of these problems will arise. We do fear that some of them may arise. We think that it is worth looking into these problems and looking into them squarely and trying to work out potential solutions in advance. First there is a wide area of problems that may arise concerning unemployment, concerning the possibility of dislocation, or of layoffs. Automation brings with it the raising of the productivity of each man hour of labor, raising the output per man hour. With this increase in productivity, you get the effect of layoffs, you get the dislocation effects, unless the demand for goods increases at about the same rate as increases in our productivity capacity. Now thus far, in the last number of years, we have been fortunate enough to avoid widespread unemployment because the market, in general, has been

expanding rapidly, because the total output of our goods and services has been increasing, because the demand for goods, consumer buying power, has also been increasing along with our improving productive capacity.

But let's look into the future. The economic and industrial experts tell us that within the next five to ten years we will witness a widespread production of various electronic equipment, various automation equipment, throughout a wide part of our economy. This will mean, inevitably, substantial increases in output per man hour during a period in which the labor force will be increasing rapidly. I think we have to keep in mind that the labor force is beginning now to increase more rapidly than it has in the recent past. We are beginning to get the effects of the rise in birthrates since the 1930's. Between 1950 and 1955 our labor force in the United States increased at a rate of about 700,000 per year. Between 1955 and 1960, according to the latest projections of the Census Bureau, the labor force will increase at a rate of about 900,000 per year. And between 1960 and 1965 the increase will be about one million two hundred thousand per year in the labor force, according to the same source.

In other words, in this period in which automated equipment will be introduced, this period in which productivity will be rising fairly rapidly, is also the period in which the labor force will be increasing at a fairly rapid rate. Now rising output per man hour of work plus a rapidly growing labor force can mean, but will not necessarily mean, that large scale unemployment will result unless the demand for goods increases along with our increased capacity to produce. Even if we are fortunate enough to avoid large scale unemployment, there is also the possibility that the economy may not expand fast enough to provide job opportunities for the growing labor force. It is possible that we may not expand the demand for goods and services at a fast enough rate to provide enough jobs for the new entrants into the labor force. This means that instead of large scale unemployment, we could have a slowly increasing amount of unemployment.

Underlying these possible problems is a basic threat that our improving ability to produce will not be matched by our improving ability to consume. In other words, there has to be some kind of continuing balance between productive ability on the one hand and a market for goods and services on the other. As I have said thus far, in the post-World War II period we have been fortunate enough to do a fairly good job, with unemployment remaining relatively low up to the present time. Now, what should we be thinking of in planning to maintain high levels of employment during this period of the next five to ten years. One thing, of course, is improving purchasing power of the great mass of American people. This means wages and salary increases on the one hand, and on the other hand, I believe firmly, that it would require price reductions for goods produced by industry whose productivity efficiency is rising. In other words, it depends on the proper balance of at least a relatively stable price level on the one hand and wage and salary increases on the other. These two things which may seem contradictory, I believe, are perfectly possible and perfectly compatible and make perfectly good economic sense because the rising productivity of the American economy which will accompany this introduction of automation will reduce unit cost of production and will make it possible, or should make

it possible, to maintain a relatively stable price level and a continuing substantial increase in wages and in salaries.

Another thing which would be an important development in this period between the next five to ten years is the gradual reduction of the number of hours per work. This, of course, as well as the wages and salary increases are challenges to labor and management and challenges to collective bargaining because they have to be worked out between the unions and the company on the basis of the conditions in each industry. Nobody can give you a formula for how the hours of work should be reduced in any particular plant or in any particular industry. This will have to be worked out in each industry and according to the conditions in each plant. Furthermore, and this is an important aspect of the problem, the governments-- federal, state and local -- must encourage economic growth and full employment, and that means full employment policies on the part of the government and it also means state and local government policies in terms of improving our unemployment insurance system and also in supplying educational facilities for retraining, something that I will talk about in a few minutes.

So far I have talked about a few of the broad general problems that may arise with the introduction of automation on a large scale throughout the American economy. Another problem of broad national and social interest is the possibility, and certainly there is a likelihood, that the number of distressed communities may well rise within the next few years with the widespread introduction of automation. We have witnessed these changes but we have been told frequently that possibly in most cases, it's financially cheaper to build a new plant with automatic equipment than to tear down and rebuild an old one. To the extent that this is true, this may well mean the aggravation of the current problem of the migration of industry. In other words, plants and companies may well move out of their old locations into completely new locations; not just out to the suburban area but to a completely different state and a completely different region. For various reasons, the old textile industry of New England has been moving down to the South. For various other reasons, the old coal mining centers are also distressed as well as the old textile centers in New England. For various other reasons connected with technological change, the old railroad repair centers like Altoona, Pennsylvania, are likewise in fairly bad economic shape. Now these are current problems, problems that President Eisenhower has promised to look into and do something about. If I may drop a political side remark, I will say that he has done nothing about them yet except to talk about them. These are the kinds of problems within the American economy at the present time.

Now if the widespread application of automation in the next five to ten years means an aggravation of these problems, I think it means that we'd better get on the ball and start to work out meaningful programs of assistance to the communities that are distressed and to the individuals within these communities who will suffer. Programs, for example, to attract new industries into those distressed areas. Programs to provide assistance to people in moving from the old localities to the new localities where they may be able to find jobs. Whether or not these economic and social problems occur, or whether or not they become serious, there may still be serious problems in the plant, in the offices, and in the places of work and here, I think,

is the real challenge to collective bargaining and labor-management relations. First is the important need that management give the union advance notice before automation or any drastic changes in technology are introduced in the place of work. This is, I think, essential because giving the union advance notice -- and I mean notice long in advance, not just a week in advance -- long enough in advance so that there will be joint consultation and an attempt to work out the various problems that may and will arise. There is one case study of the adjustment to automation published by the U. S. Labor Department, of a large industry in Philadelphia, where the union was given three years advance notice of vast technological changes. With this advance notice, adjustments were worked out by the union and management by the time the change became effective.

On the other hand, we have the example of a case in Great Britain where a motor company did not give the union advance notice and automated at a very bad point in the business cycle. This company introduced new equipment at a time when the sales of automobiles were declining and they gave notice that 3,000 people would be laid off. This, I think, is an example of irresponsibility on the part of management. It plays into the hands of demagogues who want to make use of this kind of situation and it certainly jeopardized labor-management relations in Great Britain over a long period of time.

Through advance notice and through joint consultation it is possible to permit dislocations to work. Unions and management can plan for the lay offs that will occur and what to do about these lay offs. The union can plan for possible changes in the seniority system because the seniority system may have to be broadened in some cases from departmental seniority to plant-wide or company-wide seniority or even, perhaps, to area-wide seniority. It also provides time for workers to be retrained for new responsibilities and new positions with the new equipment. Now, as far as the retraining program goes, and this, I think, is a very important part of the problem, I think the responsibility belongs to both the community and to the management of the company. The community certainly has a large part of the responsibility for providing the facilities and instructors for retraining and providing the possibility that workers may be retrained within the community in which they live or in the community in which they work. I also think there is responsibility on the part of the management here because most of the workers who will require retraining will be the workers who have families and must have some type of income for maintaining their families. It may be, also, that here is a responsibility for the state and for the state unemployment compensation laws to provide incomes for the workers during the period of retraining if, during this period, they are not working at all.

I have discussed what I would call the possibility of large scale turnover displacement and the possibility of large scale unemployment. But let's look at the turnover displacement problem in terms of the plant or in terms of the office. Here, especially if there is advance notice and good labor-management relations, it will be possible to work out changes which might be necessary in the seniority provisions of the contract. Seniority, as I mentioned before, may have to be extended from department to plant, to

company, to industry or even area-wide basis. If sufficient advance notice is given, there will tend to develop such seniority provisions with sufficient time to work out the problems. Furthermore, there is the importance of rehiring rights of laid-off workers. If a worker is laid off a job on which he has ten years' seniority, what are his rehiring rights in that plant? In that company? Also, there is the importance of developing some sort of severance pay provisions or supplementary unemployment benefits. This is another plan which can be worked out on a company basis, between the company and the union.

The problem of layoffs is only one part of the broader problem of displacement. There is another category of problems which I would call "internal problems" -- the problem of the worker who is moved from one job to another; the problems which arise when an entire department may be eliminated by a new production; the problem which may arise when an entire job classification may be wiped out as a result of changes in production techniques. Now with these changes there would, of necessity, have to be changes in the job titles, because the old kinds of job classifications are not longer applicable. With the changes in job titles come the necessity of changes in the wage rates. Here, of course, the union would be encroaching on all kinds of problems of managerial prerogatives, and of company finances. But these changes are necessitated by the technological changes. Now in connection with these types of changes, changes in job content, changes in job titles and in wage rates, there comes a lot of other questions such as what happens to an old job evaluation formula. Does it make any sense to continue the old job evaluation policy in the face of new technology? Or shouldn't you completely revise and build up a new program? The entire wage structure of the plant is radically changed by the innovations in technology.

Another series of problems, where the unions and company must work together, will arise where incentive wage systems exist. As far as I am concerned, I don't see how you can maintain any system of individual piece rate methods of payment or individual incentive rates once you bring in automation or automated equipment, because the individual's contribution to the productive process is very small. This, of course, depends upon the extent to which the production process has been changed. With the introduction of automated equipment, the contributions of a particular individual to the production process becomes very small and there is not much sense in continuing an individual piece rate incentive system. Here again vast changes in the wage structure will be needed. Perhaps as some unions have suggested you will have to completely toss out incentive payments. Or perhaps as other unions have suggested, you can develop group incentive programs or plant-wide incentive plans.

Another real and serious problem is the problem of down grading. All too often when we speak of automation, we speak of up grading of the skills of the labor force and we forget that, for the existing labor force, for those who are working at the plants and offices now, the problem is frequently one of down grading. I can give you an example, which was brought to my attention, of a girl who worked as a bookkeeper in an office of an electrical manufacturing company. When an electronic computer was brought into the office of this organization, she voluntarily, on her own, went to a school at night and was retrained. But when she discussed her future possibilities

with her supervisor, he called to her attention the fact that with the computer, there was no longer a need for a bookkeeper and that her future job classification would be that of assistant statistical clerk with the implication that not only would her job title be down graded but so would her salary. Now here is another problem which I think unions and management must work at together. And as far as unions go, they are convinced that this problem should be worked out on the basis of working out a new job evaluation program, or by use of red circle rates by which the worker would continue at his old wage rate or salary as long as he works for the company. New workers hired for that job could start at the lower rate but the old workers would be protected from this problem of down grading. This is a small kind of a payment, among others, that management can and should make. Another problem that may arise for unions and that has to some extent already arisen, is that frequently management has attempted to use technological change for the purpose of cutting down the size of the bargaining unit. For example, some unions have been confronted with, particularly in the case of the public utilities, a worker being put on automated equipment and being reclassified as a "supervisory employee." As a supervisor, he no longer belongs in the bargaining unit. Unions have been fighting this and certainly will in the future because we cannot permit the introduction of automated equipment to be used as a means of whittling down our collective bargaining unit and our collective bargaining strength.

Another problem area, and this is a broad social problem, is that concerning the older worker. The older worker faces special problems of adjustment, especially the older worker who may have been a skilled or semi-skilled worker. Here unions and management will have to work out the problems in such a way that the older worker will be satisfactorily placed in a new position. Possibly we could improve our collective bargaining pension plans to permit the older worker who wants to retire, to retire at an earlier age if, under certain conditions, they cannot adjust to the changes in technology. We believe, also, that there is a need for changing and improving the social security act so as to provide for the possibility of earlier retirement for workers at an age under 65.

Another problem into which some people are looking at the present time is the problem of fatigue. With the introduction of automated equipment, physical fatigue is probably largely eliminated, if not completely eliminated. But the question of nervous fatigue and worry comes in. This is possibly a new problem and possibly a serious one. In a case study that was conducted by the Survey of Research Center at the University of Michigan, this was definitely pointed to as a problem of some seriousness. The company attempted to provide a partial answer by rotating the people on their jobs so that a worker was on one job one week and on another job another week. It is certainly not clear whether this answers the problems or creates new problems. It is fairly clear, however, that automation may introduce new types of fatigue, problems not connected with physical fatigue but nervous problems which may result in accidents and other mishaps. This problem, too, calls for collective efforts to work out solutions.

I have been here speaking to you for the last forty minutes about all kinds of problems. I don't think I gave any satisfactory answers to any of these problems, but I don't think it's possible for any single individual or even a small group of individuals to come up with positive certain

answers to all of these various problems. These problems have to be worked out on the spot between the local union and the local management official and between the international representatives of the union and the hierarchy of the company. The solutions cannot be directed from San Francisco or from Washington, D. C. The problems in plant "x" will be different from the problems in plant "y". I believe that the introduction of automation is a serious challenge to labor-management relations and to collective bargaining, but, on the union side, I would like to emphasize that there is a particular challenge to the local unions because the particular problems in the locality cannot be worked out by any international union, wherever they are located. In a large part they have to be worked out on the spot. This means that the unions have a responsibility to educate and train their own local officers. There is no reason why we should fail to come through this transitional period in the next five to ten years of adjustment without creating any great social cataclysm. I certainly think it is feasible that we will be able to minimize dislocations that will come as a result of technological change. I think it is certainly possible for us to develop solutions, not formulas but workable solutions, for the various problems that will arise and for others that may arise. But first we have to be willing to discuss these problems as you people are here today at this conference. Furthermore, it means that we have to be working on these problems at all levels of industry. It requires a cooperative effort by labor, management and the government.

I would like to say one more word and this might be directed at Dr. Ross. I think the universities can be of great assistance to us. Certainly, the University of California is of assistance in arranging a meeting of this sort and I think the universities and the government can be of more assistance to us in terms of developing case studies. It is essential that we develop more and more information, detailed information, on the social and economic effects of technological change. This can be done on the basis of studies of specific plants and specific industries. This information will be vital to labor, management and the government in their attempts to find solutions to these problems which will certainly be upon us in the next decade.

THE FUTURE OF HOURS OF WORK

A Panel Discussion by

ARTHUR M. ROSS, Director, Institute of Industrial
Relations, University of California, Berkeley
RICHARD LIEBES, Research Director, Bay District
Joint Council of Building Service Employees
WARREN R. PHILBROOK, Industrial Relations Director,
Food Machinery and Chemical Corporation, San Jose

ARTHUR ROSS: I would like to introduce the other members of the panel who will discuss the future of hours of work. On my right is Richard Liebes, Research Director for the Bay District Joint Council of Building Service Employees. On my left is Warren R. Philbrook, Industrial Relations Director of the Food Machinery and Chemical Corporation in San Jose. We agreed that I would make a few remarks of an historical and orientational character concerning hours of work in the United States, after which they will present their own viewpoints. The subject of the hours of work is very intimately related to the general subject of our conference. As technology has advanced in America, and, indeed in all industrial societies, productivity has been increased and more goods and services can be produced with an equal or fewer number of hours of labor. There is a choice between taking the gains of the productivity increases in more goods and services or more leisure time or some combination of the two.

Insofar as we have records, history shows that there has been an interesting combination of these two choices. We have, for example, some very interesting ratios which go back to 1910. To give the details of the derivation of these figures would take a long time so I won't attempt a complete explanation. Very briefly, the basis is: one, the percentage increase of gross national product per man hour; second, the percentage increase of gross national product per capita; and then we derive the ratio between the two. Finally we take the remainder from a hundred per cent. This shows in a rough form the extent to which we have used our increased productivity in more goods and services, and the extent to which we have used it in providing more leisure. It shows a gradually changing trend in that respect. For example, between 1910 and 1920, 30 per cent of the increase in productivity was used for more goods and services, and 70 per cent for more leisure. Between 1920 and 1930 it was just about 50-50. About one-half of the increase was taken in more goods and services and the other half in increased wages. Between 1930 and 1940 about two-thirds was used for more goods and services, and only about a third for more leisure. At this point we will have to skip the war years. There were such radical changes in the labor force and so much overtime that the figures don't have much meaning. If you take the post-war period between 1946 and 1953, it shows that we used 80 per cent of our increase in productivity for more goods and services, and only 20 per cent for more leisure. So the trend has definitely shifted so that we are giving more emphasis to raising our living standards and less emphasis to increasing our leisure. The significance of that, of course,

is something that will have to be discussed.

You may ask how it is that we put any of the increases in productivity to more leisure since 1946, since working hours have seemingly remained the same. The answer to that is that in the first place, since the Fair Labor Standards Act was passed in 1938, there has been at least a 10 per cent decline in working hours as a result of the vacation movement and the paid holiday movement. We have to look at working hours broadly in terms of annual working hours and not narrowly in a sense of hours per day or hours per week. In the second place, as you will see, working hours have been decreased below 40 hours a week in a good many industries. These figures also reflect the increase in women working and the earlier retirement age. All this has to go into how much leisure we have as against how much work we do.

The history of working hours per week is a rather gradually and evenly declining trend until recently when there has been a leveling off. Our figures go back to about 1850 -- that is, the figures that are at all reliable. We know that people at that time worked from sunup to sundown, which, I suppose, would average around 12 hours a day. In the summer, for a six-day week, the average number of hours of work would be about 72. In 1860, however, the average scheduled hours per week for all manufacturing workers was about 65, which would be about $10\frac{1}{2}$ hours a day, six days a week. By 1885 that had decreased to 60. It took until about 1910 or 1915 for the average weekly hours to decrease to 55, and it was 1920 before they decreased to 50. Throughout the 1920's the most common work week was 48 hours a week. During the 1930's the scheduled hours became not so important in comparison to the realized hours of work, because so many firms were scheduling short days and short weeks in order to "spread the work." By 1935, therefore, the average realized hours of work was down to 35, although scheduled hours were considerably higher. In 1938 the Fair Labor Standards Act was passed and for the first time we had a nationwide regulation of standard working hours. They were set, as you all know, at 40 hours per week. Since 1938, for about 20 years now, there has been no change in the standard number of hours of week worked in most manufacturing industries although, as I shall point out, there have been quite a number of industries which have adopted shorter work weeks.

There has been a great deal of attention given to the subject of working hours. Recently the AFL-CIO had a conference on hours of work, in which representatives from all over the country participated. In the workbook for this conference you will find a statement by the Chancellor of the University of California, Clark Kerr, predicting that by 1970 the average hours of work per week, figured on an annual basis, will be down to about 33. At the same time we see that there is some doubt as to whether the majority of workers actually want fewer hours of work than 8 per day. After all, if they have to make a trip to work and a trip home after work, change clothes and take out their tools and so on, perhaps the preference will be for fewer work days rather than shorter hours. Furthermore, problems of dual job holding associated with shorter work days has come to our attention. This has been a problem, particularly in the rubber industry. There is a very frank report by a rubber workers' union on this dual job problem

which was presented to the AFL-CIO conference on shorter hours and is a problem which would be worth discussing.

I have prepared a table according to a recent study made by the Bureau of Labor Statistics in 17 of our chief labor market areas. (This study covered the period 1955-1956, so it's very recent.) They found that about 17 per cent of all workers studied in both plant and office have scheduled work weeks of less than 40 hours. They found that 46 per cent of all office workers and 7 per cent of the plant workers had less than 40 hours scheduled. Very considerable variation between one industry and another was found. For example, around the New York City and Philadelphia areas the great majority of office workers are on shorter work weeks, 87 per cent of office workers in New York, 61 per cent of the office workers in Philadelphia and then there is an intermediate group of cities, including San Francisco and Oakland, where 37 per cent of the office workers are on shorter work week -- that is, less than 40 hours. They found a great many cities, particularly in the middle-west, like Chicago, Detroit, Milwaukee, and so on, where about 90 per cent of the office workers are still on 40 hours a week. In the case of plant workers there are similar variations. In New York City, about 19 per cent of the plant workers are on shorter work weeks. Next comes San Francisco, which, among all the major areas of the countries, is the second in terms of the percentage of plant workers who have work schedules of less than 40 hours per week. I think probably the reason for the relatively high proportion of plant workers in San Francisco and Oakland with short work weeks is the particular industries which are represented in our county. The industries which commonly have short work weeks are fairly prominent in the San Francisco Bay Area. You might be interested in some of the reasons why they have adopted shorter work weeks. Among the industries which have recently gone on a shorter work week are the garment trades industries which began in the 1930's as a work spreading measure. At present about 97 per cent of these workers are covered by a 35 hour week. Another occupation with a less-than-forty-hour-week is the printing trades. Most of their shorter work weeks have been negotiated since World War II. They average about 37 hours a week, which means about 7½ hours per day. Another is the construction industry. About 12 per cent of all construction workers are on a less than 40 hours week including one or two of the crafts in the San Francisco area. In the brewing industry about 50 per cent of the brewer workers are on the 37½ hours a week. This industry began to shorten the work week around 1949. This action was an expression of concern over increasing displacement by technological advancements for mechanization of the breweries. There are some bakers, especially on the West Coast, on a 35 hour week. The railroad industry, particularly around Akron has a 36 hour week for their employees. Some of the rubber plants on the West Coast were originally asking for a 36 hour week and they moved back to a 40 hour week probably because of the preference of the union and the employees. The newspaper publishing industry, in addition to the printers, has about one-third of the membership of the newspaper writers guild covered by a 35 hour weekly contract. And, as I pointed out earlier, 35-37 hour weeks are quite common among the office workers. According to the Bureau of Labor Statistics, 46 per cent of all the office workers covered by the survey of the 17 areas have working hour weeks of less than 40 hours.

I would like to say, just parenthetically, that if you look back through history you'll see interesting changes in the appeals, philosophies, and the reasons given for shortening the hours of work. Of course, back in the old days when man worked from sunup to sundown much stress was laid upon the physical condition or health consideration and on the need to have some time to spend with the family. As hours have declined to 40 there has been a natural tendency for that appeal, based on health consideration, to decline in strength. A lot of the agitation for shorter hours has come during periods of economic depression. If you go back to the depression of 1837 you'll see that the 10 hour movement was then very strong or, back to 1873, when the 8 hour movement was stressed. During these periods of depression a great appeal was to share the work. As a matter of fact, the Fair Labor Standards Act in 1938 was primarily a depression-fighting move. Very strong rationalization for minimum wages was to increase purchasing power and rationalization for shortening the hours was to spread the work. So that has been a strong appeal. But at the present time there is not a lot of force behind any spread the work philosophy, in view of the relatively full employment which we have enjoyed for almost 20 years.

More recently the appeal seems to be of two characters, first the fear of future unemployment and displacement and, secondly, the argument that men should have more leisure; that is, as productivity increases men should continue to have increased goods and services on one hand and increased leisure on the other. And if they want to take their pay increases in the form of more leisure, than why not? And, of course, it almost goes without saying that as an accompaniment of shorter hours the take home pay should be maintained or raised. That would mean, of course, an increase in hourly rates. In going back to the old catch phrase of the 1830's "Whether you work by the hour or work by the day, decreasing the hours increases the pay." So to be realistic the shortening of hours always goes along with increasing or maintaining the present rate of pay.

I'd like to close with a reminder that if it is assumed that working hours are going to continue to decline, the question will remain: In what way? Reducing the daily hours to less than 8 has been the most common method so far. However, another alternative is fewer days per week. This could be appealing and it would provide the worker with the opportunity to enjoy short trips over the extended weekends and to participate in do-it-yourself projects. Another alternative would be the occasional three-day weekend. This method would have great flexibility in that the number of three-day weekends per year could be varied depending upon the employer's cost and the union membership's desire for increased wages as compared with increased leisure. There is the possibility of more holidays. You might go back to the system of the Middle Ages, when every Saint had a holiday and there was a festival on these Saint's holidays. There were a great many Saints, so that there were a great many holidays. Then, of course, there is the additional vacation, which has spread very rapidly in recent years; three weeks vacation for men with "x" years of seniority, four weeks vacation for men with "2x" years of seniority, and so on. Even if we should agree with Chancellor Kerr that by 1970 working hours will be shorter, the question does remain: "In what form will these lessened working hours come about?"

I think this covers what I intended to say in my introduction, so now I would like to introduce Warren R. Philbrook, Industrial Relations Director, Food Machinery and Chemical Corporation. I suppose in one sense Mr. Philbrook and Mr. Liebes are representing union and management's viewpoints, but only in a very limited sense; because if you know them as I do, you'll know that they are too individualistic to merely represent an institutional point of view. Basically they will be presenting their own points of view on the question of future hours of work. Mr. Philbrook.

MR. PHILBROOK: Thank you very much Art. I confess to being in a state of confusion. I am not an economist but I would like to deliver a quote that I got from an economist who shall remain nameless. He has said that, "The orthodox school of economics has given way to the confused school of economics, wherein there has been established a law of increasing rate of marginal invalidity. This states that beyond the point of bewildered return lies an area of implausability surrounded by an area of equal unlikelihood." That's about the state of my mind.

I'd like to preface my comments by saying that they will hold only in the event that we face no major war, no major depression, and I would like to add a third, no major peace. If we hit a major peace with the abrupt cutting off of our national defense activities and expenditures, our work week would be affected very quickly and very drastically. I'd like to make two subsequent points. The first is that any major reduction of our working hours is not likely to come as an explosion. It is not something that we are going to face as of any particular time on a "catastrophy" basis, in my opinion. There are two reasons for that. If any of you have been following the financial journals and the daily press you are certainly aware that capital is becoming increasingly difficult to rent at almost any price. The price is going up very rapidly. Capital is simply not available to justify or warrant many companies to go ahead with major plan innovations today. I have seen in the press recently a number of comments and notifications of some of the largest companies, General Electric I think is one, which have decided to abandon, or at least defer until some future point of time, operations for new plants that they were going to build. The capital has simply become so scarce that they have had to back away from expansion plans. Another reason that this can't happen on a "catastrophy" basis is that there is simply not enough technical help available to jump in and do this job in a hurry. We are all aware of the shortage of engineers and technical help and scientists. There just isn't an adequate supply of engineers, draftsmen, electronic technicians or other high skilled technical employees (available now, nor will there be in the next five to ten years. There is no question but that labor, call it common labor if you will, is in relatively ample supply, but much of it is not of the type that is susceptible to training for these new skills. I believe that the shortage of engineers and skilled technicians that we all hear so much about is merely a symbol, or a symptom, of the shortage of skilled labor, in all sorts of fields, that exists pretty well throughout the country and one that is going to be with us for some time to come.

Another point that I would like to make is that we tend to think of automation with somewhat of an utopian view -- wherein the plant manager drives up in

a big limousine and sits in his office pushing buttons and the product goes out the other end of the plant. There is a cartoon in a recent New Yorker Magazine which represents this view. The plant manager drives up to his plant and sees the factory buried under a mountain of its products and shouts, "My God, I forgot to shut it off last night!" By our experience in the plant we operate has been that when we install automation operations instead of displacing workers and laying them off we find ourselves faced with a furious retraining job on pretty much of a crash program basis. I think that is characteristic of these highly technical automated operations. You may eliminate the direct labor but it takes many highly skilled,, highly trained mechanics to keep the process running properly.

Concerning the future hours of work, I think there will be some industries where less hours can be anticipated. For example, in the oil refineries, which have developed automated control to the furthest point that exists today, the percentage of labor costs to total cost is rather low. A given oil refinery is going to produce about the same amount of material whether the operators working in that refinery are working on a 32 hour week or a 35 hour week or a 40 hour week, and, assuming that they maintain the same take-home pay, the increase in the cost of the labor dollar will not be of tremendous importance. At the other end of the picture are the ordinary variety of the machine tools. If, for example, a lathe can produce "x" widgets an hour, and it operates 40 hours, it's going to produce "x times 40" widgets. If the man operating that lathe works less hours, however, the company is going to be short some widgets. The only way that this reduced amount can be made up is by getting a newer, higher speed lathe that can produce the same number of widgets in the lessened number of hours. That's a big order. It takes a good deal of capital and it takes considerable engineering talent to work it out. Technological improvements of this type have been going on for years and will continue to go on. It is not something that can be regarded as an impending disaster.

We have been discussing problems. I would like to relate to you what a very practical-minded chap in our organization said to me recently. He said that he learned a long time ago in engineering school that there weren't any problems; there were only challenges. And I concur with that. I think that is what we are facing here, challenges. I agree with some of the things that Mr. Goldfinger said, in particular, that we are facing a greater and greater retraining task as technological change goes along. And I agree completely that it is a triple-jointed problem. It's a problem of the community, of management, and of labor.

MR. LIEBES: As the chairman has already said, I am not appearing as the official spokesman for organized labor. I would like to give you some impressions that I have about this very complex topic, the future hours of work. I agree with Mr. Philbrook that we must assume that we are going to be living in a peaceful world. I would like to say one word about the past history of labor's drive for shortening the hours of work. The drive for the 8-hour day was, as you know, one of the battlegrounds of union-management disputes. In an effort to recapture some of the flavor of the atmosphere of the struggle for the 8-hour day not too many decades ago, I would like to quote for you a statement of Samuel Gompers written in 1915 when the 8-hour day fight was well under way. He said at that time:

"The man who works 12 hours spends perhaps 1 hour going to and from work, and surely some time for meals -- the rest of the day is for sleep and -- shall we say -- opportunity for self-improvement. Twelve long hours of work exhaust physical strength and fill the whole body with the poison of fatigue. The time for rest is sufficient only partially to counteract the fatigue and so the deadening effect of the poison is cumulative. There is neither energy, inclination, nor opportunity for the man or the woman who works 12 hours -- the worker becomes only a work machine. The darkness under which he creeps to and from work hides his misery and his poverty from the world and often from himself. Daylight and a chance to see, stir up discontent necessary to arouse action.

"The individual who works 8 hours or less does not each day exhaust his energy. He has time for recuperation and something more. His mind is more alert and active. He is capable of more vigorous and more effective work. He goes to and from work at a time when well-dressed people are on the streets. He really has time and opportunity for making comparisons and forming desires. He has longer time to stay at home, sees other homes better furnished, and consequently wants a better home for himself. He wants books, pictures, friends, entertainment. In short, he becomes a human being with intellectual desires and cravings. This change makes him a more valuable worker. Because his standard of living has changed, he demands higher wages. Men and women will not continue indefinitely to work for wages that force them to live below their concepts of what constitutes standards of living.

"This is why the shorter workday is one of the primary, fundamental demands of organized labor. The labor movement represents organized discontent with poorer conditions and definite purposeful effort to secure better. It represents ambition and ideals.

My guess is that these conditions which have impelled organized labor to make the drive for the shorter workday no longer exists. In fact there have been some expressions by people in the higher ranks of organized labor to the effect that there exists today no serious, overwhelming drive on the part of organized labor for shorter hours. I think that can be confirmed by individuals in industries, although I will say that I do believe that in the coming years there will be continued efforts for shorter hours and that those efforts will be marked by success. I can illustrate the proposition that there is no strong desire by the members of unions to have their workday shortened by an example occurring in San Francisco. In the Building trades industry of this area two unions, the painters and the bricklayers, have achieved a 7 hour day through their collective bargaining agreements. The city of San Francisco, which is one of the largest employers of labor in this area, has employed various trades workers. The city has a standard 8 hour day. A provision was established whereby any of the crafts employees who have a 7 hour day in private industry -- and thereby are entitled to their 7 hour day working for the city -- can waive the privilege on an individual basis and choose to work an 8 hour day with no overtime provision for that extra hour worked. Interestingly, all of the 96 painters and bricklayers employed by the city of San Francisco have signed a waiver giving up the 7 hour day, and they

are working an 8 hour day. Likewise there are some 70 culinary workers who are entitled to a $7\frac{1}{2}$ hour day on the basis of their privately negotiated collective bargaining contract with employers in private industry. These workers, working for the city, have also agreed to sign this waiver provision and are therefore working 8 hours instead of the $7\frac{1}{2}$. In other words, these workers have expressed the desire to increase their earnings rather than to lessen their hours of work. They chose the realities of the higher pay check rather than the possibilities for more valuable leisure. The same thing has been observed here locally in the last ten years as was the case when the Fair Labor Standards Act was passed shortening the work week from 48 to 40 hours. Speaking from personal experience I can say that it took a considerable act of union leadership to go before the members and convince them that it was to their long-run benefit to go on a 40 hour week rather than stay on a 48 hour with the possibility of somewhat lesser earnings.

I think what we have today is a problem facing unions and facing management in a collective bargaining situation that concerns, in a case by case situation, what is the soundest procedure in that industry. I certainly agree with the comment made earlier this afternoon by Mr. Goldfinger that there is no easy, uniform solution by which this "problem" of increased productivity can be generally solved throughout the country. There will be instances where a greater amount of leisure time is the major desire for a particular industry or particular group of workers, and there will be other cases in which shortening the work week is not a practical solution at all. When the 40 hour week was established in 1938, the major reason was one of sharing the limited amount of work that was available. Something has changed since those days. Today we have the situation which comes up time and again in grievance cases in which the complaint is made that an individual is not getting his share of hours of work per week in excess of 40 hours. He wants that overtime. In many cases unions are faced with the problem of sharing this allocation of overtime work among their membership. Now, this is a very understandable phenomenon. It certainly reflects the condition in which we find ourselves today. Nearly all of us are victims of Madison Avenue to the extent that our wants are continuously stimulated. Whereas, figures show that the real income is increasing, certainly real income in terms of unfulfilled wants is far below what the worker feels it should be. Hence, there is a very real need on the part of the wage earner to increase his purchasing power in order to keep his head above water. We find that many workers are now fighting for overtime work -- certainly not because they want to put in more hours but because they are trying to build up their pay checks. I would guess that if the issue is proposed in collective bargaining in most situations today in which there is a choice between less hours or more dollars, the decision reached independently by most working people will be that the amount in the kitty will be taken in terms of more dollars. This is something that is subject to modification depending on the individual circumstances. In some industries where there is a large portion of female workers, shorter hours may be very attractive to those unions, and those employees. On the other hand there are cases in the service industry where shorter hours are definitely not attractive, because the possibility of shorter hours might include the possibility of a speed up. This fear is especially held by janitors and janitresses who are somewhat beyond

middle age and who would have a difficulty getting a new job if they lost the job that they are on. In these cases cutting the workday by an hour or two would mean the obligation to perform the same amount of work in a shorter period of time. The situation would arise in which some of their own physical weaknesses might be exposed. And in those situations the idea of a shorter workday is one which is fraught with dangers. In this case the union is not likely to demand a reduction of working hours per day. This is not the sort of things that brings any type of security to large numbers of this group of union members.

In other cases where the cost picture is important we will again be faced with a variety of situations. Certainly any talk of shorter hours means shorter hours without any reductions in the weekly take-home pay. In the case of a substantial reduction of hours we will be talking also in terms of an increase in the hourly rate of pay. Reducing the work week one day from 40 hours to 32 hours is a decrease of some 25 per cent. This means that the hourly rate of pay will also need to be increased by 25 per cent. There aren't too many industries which are able to negotiate a 25 per cent increase in the hourly wage rate of pay. Certainly a substantial cut in the work week can mean a very big increase in the hourly rate.

I would like to turn very briefly to the matter of other ways of absorbing the increased earning capacity of industry. It seems to me that the most important method by which the increased productivity will be absorbed, will be primarily through an increase in vacations. The trend since the war has been most remarkable. We can all recall the War Labor Board days in the early forties when the pattern of one week's vacation after one year and two weeks' vacation after five years was established. Many unions gained that particular fringe benefit during the wage freeze period. At that time the one to one and the two to five was considered to be on the fairly liberal side. Today, just a short ten years later, it is an antiquated organization, indeed, which is still saddled with the one to one and the two to five formula. Today the cases are rare where two weeks after one year is not already established or where there isn't a third week of vacation even after as short a period as five years. In some industries, such as the newspaper industry, a three week vacation comes after two years.

This trend has occurred with, I think, not any conscience evaluation of saying: "Well now, this is what we are going to appropriate from the leisure time which has been made available to us by automation or by increasing productivity." Rather, it expresses a very strong belief of the workers themselves that this type of vacation benefit is highly desirable. It is not at all unusual for some collective bargaining negotiators to discuss four weeks of vacation after ten or fifteen years of service. Several participants at the recent AFL-CIO conference on hours of work discussed several methods of utilizing the available amount of leisure time. There was the idea that Dr. Ross expressed of long weekends. Another matter that was discussed was having a full year of vacation at age 50 or 55 as a sort of preliminary, pre-retirement plan for workers in this age bracket. There was some discussion that, in collective bargaining negotiations, instead of talking about hours per day or hours per week the talk should concern itself with annual hours of work. Instead of having 2080-hour work years that the negotiations should set up perhaps an 1800-hour work year or 1600-hour work

year, in which the decisions could be made on an individual or departmental basis as to how this time should be allocated in terms of shorter workdays or shorter work weeks or longer vacations.

If I were to make my concluding remarks in an outline form, I would say that: On the assumption that this country will maintain a peaceful and relatively prosperous condition, the major decision will be between an allocation of the increased productivity between income and leisure. Concerning leisure, itself, there are numerous methods by which this leisure could be utilized within the collectively bargained contracts. As of now I think that if the working force were polled, the main demand would be higher wages for increased purchasing power. But I think we will see the decision decided on a local level with a great deal of variety.

In conclusion, I would like to cite some figures on the relationship between cutting of hours and increasing the hourly wage rate -- that is, the equivalent increase in hourly wage rates necessary to permit the decrease in hours of work:

Reduction from 40 to 37½ hours	- 6.7% increase in hourly wage rate
" " 40 to 35 "	- 14.3% " " " "
" " 40 to 32 "	- 25% " " " "
" " 40 to 30 "	- 33 1/3% " " " "

MR. ROSS: Thank you Dick. Are there any questions?

Q. We've been talking of ways to utilize the increased leisure time that future gains in productivity promises. We've also discussed the shortage of skilled labor that hampers technological advancement. Why can't unions and management get together and provide one day a week or one day a month for the purpose of providing training and education required for these new skills instead of having that day be one less day worked, or one more day of vacation? Schools could be set up by the company, on company property. The workers could learn skills that would be useful to them and use ful to the company.

MR. PHILBROOK: I think eventually we will have to. The trouble is that many of us are training workers for higher skilled jobs and then losing these workers to other companies.

MR. LIEBES: Another difficulty is the fact that many of those workers with lower skills who are faced with displacement by machines are not the people who have the opportunity or ability to learn these higher skills and, thereby, remain employed.

Q. Are these lower skilled workers untrainable or just untrained?

MR. PHILBROOK: Our company has had experience in Texas with the so-called "wet backs." We found that it was almost impossible to train them for better jobs. The reason is not language difficulty because we employed foremen who spoke their language. These workers just were not inclined to learn the skills required for job advancement. I suppose the reason is their background and their agricultural ways of life.

Q. Who should be responsible for retraining workers? Mr. Philbrook spoke of the reluctance of the companies -- in some cases -- because of the fear of pirating by other companies. What can be done about this?

MR. PHILBROOK: I think we have to tackle this problem on a community-wide basis. Unions and management should work in conjunction with the facilities available in the community such as technical and vocational schools and classrooms. There should be a pooling of efforts. I think there has to be such an effort.

MR. ROSS: If there are no further questions, we will adjourn this session and proceed to our workshop sessions.

SUMMARY OF WORKSHOP SESSION ON
CHANGING TECHNOLOGY AND WORKER ADJUSTMENT

By

Professor Jack D. Rogers, Discussion Leader

Resource Members:

John B. Kinnick

George F. Koth

In our workshop session we didn't reach any real conclusions. There was very little attention given in our session to the technical problems of automation. I don't know whether to presume that nobody thought they were important or whether they reserved their concern for the broader social issues involved. There was some concern expressed for economic effects of automation -- primarily the question of whether there would be an excessive centralization of economic power. The argument being, very briefly, that the companies which can automate are those which are large, which have very large resources, and the required technical personnel. Those who show efficiency could likely cause a premature demise of small enterprises. This was advocated very strongly by some participants and very hotly contended on the other hand by other participants. There was some attention given to the problems of distribution that are presented by extensive automation -- that is, the worries of sharing the gains of productivity. Here the views split, I think very sharply, between optimistic and pessimistic. One group feeling that there are sufficient protective mechanisms built into our economy, particularly in labor-management relations, to guard against any malallocation of income from the gains of increased productivity. Others feeling that there is at least a potential threat here and that it is something to worry about with respect to the maintenance of the economic stability and the maintenance of opportunity under the advent of automation. These are the two central highlights that I can recall.

SUMMARY OF WORKSHOP SESSION ON
CHANING TECHNOLOGY AND WORKER ADJUSTMENT

By

Professor Cyril P. Atkinson, Discussion Leader

Resource Members:
Ralph Showalter
Joseph P. Williams

In our workshop we tried at first to confine our discussion to the particular subjects "Changing Technology and Worker Adjustment." Although we did get off into related subjects, we tried to point out to ourselves that there were two main problems of worker adjustment. One, the economic problem and the other the psychological. But we did not discuss, in great detail, the psychological side but rather concerned ourselves with the economic adjustment. A particularly important point brought out in our workshop session was the point made by Mr. Goldfinger at the noon session that each particular locality will have its own set of particular problems and must solve its problems in its own way. This was brought out by the other two members of our workshop group. On the one hand, we had Mr. Joseph P. Williams, Assistant to the Controller, Bank of America, whose bank is establishing automation in their office work. He stated that no one was being put out of work, rather that there was still a severe shortage of clerical help. He said that there were still a hundred thousand openings for clerical personnel in California. There didn't seem to be too great a problem in the field of employment opportunities on the basis of the example cited by Mr. Williams. On the other hand, Mr. Showalter, International Representative of the UAW, pointed out the situation in a Detroit area and gave the particular example of Murray Body Company and the 5,000 workers who were thrown out of work and who were unable to find work for a considerable length of time. Even after a year had elapsed, 30 per cent of the work force were still out of work. The particular point was made that these people who were displaced, and who were unable to find jobs, could be classified as older workers, women and people of minority races. Several specific points were mentioned as to what should be done about this particular problem. In-company training was one method of dealing with this that was brought out by the Bell Telephone people and Mr. Williams in the workshop session. This training could be accomplished by the company, on company time, on company property. Then the comment was made that the large companies could do this, but what about the smaller companies? This probably could not be handled by small companies. Another form of training would have to be tried. Another point was brought out, a point also mentioned by Mr. Goldfinger, that there is a need for union and management to get together and discuss the problems that might come up and plan for the future; to attempt to make long-range solutions for the potential problems. Another specific proposal was that financial benefits could be allotted for those who were displaced or laid off with the advent of automation. Unemployment compensation is one form of such a benefit; compensation for training benefits is another. If it is necessary for the worker to move to another area to find employment, perhaps moving fees could be allowed. Extension of seniority rights was another

idea expressed. Perhaps if the seniority were carried throughout the entire plant or throughout the entire company or even throughout the industry, it might facilitate labor mobility. Another general idea I want to bring to your attention was the problem posed by the question, "Who is responsible for the worker adjustments that have to be made?" It was generally agreed, I think, that this responsibility was that of management, union and the community, combined. One person in our session raised the interesting point that part of it is up to the individual -- that he has at least some share of the responsibility. He must have the desire to be readjusted. And then, finally, although I felt this point more strongly than did the other participants in the workshop, I have the feeling that there is still a general lack of information and facts concerning this problem. We don't really know enough about the type of problems with which we will be faced, and, due to this lack of facts, we are unable to make any definite program to cope with these problems that may arise.

SUMMARY OF WORKSHOP SESSION ON
LABOR NEEDS, TRAINING AND LABOR UTILIZATION

By

Professor Louis E. Davis, Discussion Leader

Resource Members:

John J. King

Professor Edward C. Keachie,
Alternate Discussion Leader

Arnold Anderson

Although I was the discussion leader for the second workshop session only, the first workshop session was headed by Professor Keachie. I will attempt to summarize the findings of both workshop sessions. In the afternoon, I would say that our group had mixed views concerning the immediate impact and effects of automation on the work force. I would say, with few exceptions, the group thought that this would be a slow process, that we would not be plunged into a crisis situation. The group expressed considerable concern about displacement of workers. The type of worker that the group was most concerned with was the unskilled and semi-skilled workers. There seemed to be practically no concern for the high-skilled workers. This group felt that the latter group of workers would be able to integrate easily into positions of gainful employment without much difficulty. With regard to displacement, the thought was expressed that displacement would be heavier in clerical work than in manufacturing or industrial work because of the vast differences in technology which exists now, prior to automation, in these two different segments of our economy. At this point, our discussion group became almost entirely concerned with the problem of training and retraining and education, and we got into some discussions that were rather esoteric concerning the social adjustment type of training in high schools versus traditional types. It was felt, as Mr. Atkinson has said, that the problem of training and education will be one which will have to be shared by management, labor and the community. In the community setting, the burden will not have to fall on individual companies and individual unions. There was considerable discussion about the kind of training needed to prepare young people, who are not yet employed, for the working conditions of the future. We heard a great deal of criticism about the kinds of education and training given in the high schools of today, especially the lack of education in mathematics and sciences subjects. Of course, I can't say that I didn't take a hand in this, because I felt very strongly about this subject myself. Many of the training problems with which we are faced today can be traced back to the type of pre-employment education and training these persons have had. Unless we do something about the situation of the students still in school, we will have this problem perpetuated for a long time. It was also felt that there are real capabilities among the work force for training for higher skilled positions. It was felt that there were quite a number of workers in industrial and clerical situations who are working below their capacities. In the application of automation, it was felt that the monotony and drudgery of many jobs will be eliminated in industrial and clerical work and many of us are quite hopeful that this will be the case.

SUMMARY OF WORKSHOP SESSION ON
LABOR NEEDS, TRAINING AND LABOR UTILIZATION

By

Professor William H. Knowles

Resource Members:
Peter D. Rieland
John Henning

It is interesting to me that the subjects talked about in Lou Davis' discussion were exactly the same type of subjects talked about in our session. We covered a great many different areas and I am not able to adequately cover them in this summarization, so I will attempt to extract the things that were talked about more than anything else. In the first place I would say that neither labor nor management representatives felt that there was going to be any serious unemployment arising from automation -- rather, the problem was one concerning the unskilled worker. The consensus of opinion was that skilled workers could adjust themselves to the changes brought by automation. The unskilled worker who needed retraining and didn't have the background for that retraining, presented a serious difficulty. We also talked about the fellow in school now, who was not in a college preparatory program and who is not preparing himself for a skilled trade, and, who thinks he can go right to work on the assembly line and earn piece rate wages that are as high as those of the skilled worker. There was considerable discussion about just what to do with him when he finds that he is displaced. In this regard, of course, everybody felt that this was a joint responsibility. The individual worker has to look out for himself. Of course, the company has an obligation to retrain workers who are displaced, and the community at large has a responsibility for its displaced workers. It was felt, also, that the workers coming into the labor market should be qualified workers, but there was no general agreement as to how that responsibility should be shared. In fact, there was considerable debate on this point as to where the weight of the responsibility should fall. We also devoted much of our discussion to the shortage of skilled workers that now exists and probably will be accelerated by the advent of automation in the near future. We got into a rather interesting discussion over whether, perhaps, too many people are going to college -- people who ought to be in some training program to become skilled workers. Some people raised the point particularly that there are too many business administration majors and they maintained that some of those people should be learning a trade. I hasten to add that there was no general agreement on that point. There is also a shortage of administrative and professional type of personnel. Given the existence of these shortages which we have been talking about, it looks as if there might be a division in our society between those in the up-graded skills and the professional people, and those who are left far behind -- they couldn't or wouldn't fit into modern technology. I think I could safely say this for the group, that no one thought that any workers would be left behind simply because they didn't have the necessary I.Q. to live in the modern industrial world. But rather, it's a problem in wages, status, and market information and that our problem is to convince young men and women that they ought to train themselves for the type of industrial world that they are going to have to face.

INDUSTRY AND THE AUTOMATED FUTURE:Problems Along the Way

by

John Diebold

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Despite the millions of words that have been written about automation, from Congressional hearings to comic books, very little has been said about automation as a business problem. And yet automation presents a unique problem to business management. It is only through the successful solution of this problem and through the widespread application of automation to business and industry that we can realize the benefits it promises to our society - in taking the work out of work, and in freeing mankind for the human use of human beings, as one philosopher has expressed it.

To the businessman, automation presents something of a contradiction. He has heard much of its wonders and of its fantastic potential. Yet when he looks about him for specific cases, he sees more promise than payoff. It is about this, automation as a business problem, that I want to address you this evening.

I have been asked to anticipate the nature of industry in the automated future, but before adding to the all too frequent speculations about the future, I should like to concentrate on some of the mistakes that are being committed in thinking about automation, and in applying it. The future depends upon the successful solution of the problems that face us today in understanding and applying automation.

To begin with, there is much less concrete achievement than talk. We in business have found the application of this new technology a much slower process than might be assumed from the many newspaper articles that have appeared in the past few years. In many cases individual machines or devices have been applied, but not automation systems. Consequently, only a fraction of the potential benefit has been realized. In the area of automatic data processing, for example, there are well over a thousand computers already in operation, but only a small fraction of them are functioning as more than punched card calculators. As a result very few have produced real savings, or even the singularly important advances in the level of management control which has been a rationalization used to justify the dollar savings that have not appeared. This is true not only of office automation - thus far the most advanced area - but also of industrial or factory type automation.

I should like now to discuss the managerial problem responsible for this situation. If we are ever to achieve the benefits of increased production and greater leisure that automation holds out as a promise,

We must concentrate on the practical problems of the ideas and techniques of automation just as we must be alert to the many social, economic, and human problems of a changed society.

There are many problems that have handicapped a full realization of the potentialities of automation, but on the managerial side I think that the problems reduce themselves to two.

The first mistake is made when the businessman concentrates his attention on the hardware or individual machines of automation rather than the system.

The second major error is that because the businessman has been impressed into thinking of automation as a scientific or engineering problem, the important decisions have often been delegated to technicians, rather than dealt with as essentially managerial problems.

A whole chain of subsequent problems results from these two initial errors.

To begin with, there is the Electronics Committee. Countless times I have heard otherwise responsible executives state, when I questioned them about what they were doing with regard to automation: "We have formed an electronics committee." And they have stated it in a manner implying that this takes care of the problem! In practice this often means no more than that the committee spends a year - or in one case I know of, three years - wandering about the country attending manufacturers' schools and visiting computer installations. This experience is somehow supposed to be sufficient for making critical decisions about the highly detailed process of automating. In no other area of business activity, with the possible exception of advertising, would any manager have this confident a feeling of solution for a problem that would allow him to sleep at night after he had delegated such a crucial problem to a committee.

All too often the electronics committee has been a device, whether intentionally or not, for creating the impression of doing something about automation while at the same time avoiding any action that could possibly backfire. I know of one case in which the electronics committee of a major oil company actually presented the final equipment choice, after more than a year's study, to the president of the company and asked him to choose between machines of two different manufacturers!

The training received by the committees at manufacturers' schools usually gives the members a pseudo scientific appreciation of the equipment, and a bias toward whatever specific equipment they have studied. They return filled with technical phrases and parrot the sales arguments of the equipment company.

While the scope of the automation problem encompasses virtually all areas of the business organization, the nature of the analysis and the decisions that must be undertaken, in short, the detailed work, does not lend itself well to committee organization - they are operational problems and should be treated as such. As has often been cited, an administrative board has the same characteristics of any other board -

it is long, narrow, and wooden. It can be useful for insuring company wide understanding and cooperation but the problem of automation should be specifically assigned as the responsibility of an operating executive, preferably not a management eunuch - one who knows exactly how something is done but can't do it himself.

A second major area of management trouble arises from the assumption that you must have an engineer or a scientist to handle the automation program. This has created a mad quest for skilled scientific personnel. I think we should accept the fact that as yet there are very few competent people trained to handle automation in the office. At the same time, a large group of job hoppers has come into existence. This group would be considered "floaters" in any other field, giving themselves impressive job titles - rarely true job descriptions - and going through several employers in a few years. These floaters are disruptive in any organization. Introduced into a company structure on the ground of a need for specialists over the cries of good personnel people, they mean trouble.

When you come right down to it, one cause of the trouble is that the hardware of automation is being shipped faster than competent people can be trained to operate it. IBM, for example, is shipping about two million and one half dollar machines a week and close to two medium scale computers, \$50,000 a year rental, a day. But the answer is not to go into the job market for specialists. Good ones are exceptionally hard to find and money is no longer an incentive for the already highly paid - \$18,000 to \$30,000 a year - experienced men. These men are looking for very specialized kinds of opportunities. You cannot count on the loyalty or the stability of the job hoppers, and you are bound to disturb your regular organization. The consequences are, of course, none other than you would expect to find after violating any other sound personnel policy.

The solution is to train personnel from your own organization. Business is beginning to realize this. I find that my own firm has been spending an increasingly large amount of time training client personnel. We have come to realize that the training of personnel in analytical procedures, machine operation and programming is one of the most critical problems of a successful automation installation. Indeed, as I will discuss more fully later, education is the basic problem of automation. This is but one example.

A successful installation of automation equipment cannot be made in business unless a thorough understanding of the business itself, and the functions and needs of its operations, underlies the installation. While the businessman may regard the specialized knowledge of the engineer with something approaching awe, the engineer all too frequently regards the unfamiliar processes of business as something that can be mastered in a few months. Glenn White of the Chrysler Corporation has remarked out of the experience of his company that:

We are satisfied that the way to put together a team of people to work on electronics is to take somebody who has a good knowledge of how to run your business, a good systems and procedures man, if you please. They can be trained in electronics much easier than somebody who knows electronics can be trained in how to run your business.

The problems arising from the delegation of authority to make decisions about automation to a technical group unfamiliar with the total business environment are perhaps corollary to the basic mistake made when businessmen approach automation from the standpoint of technology or hardware. There has been an unfortunate preoccupation with the machines of automation and an unfortunate eclipse of the more significant techniques of automation. The senior partner of the one of the leading public accounting firms, which has widely touted data processing as the solution to all sorts of chronic business ills, recently made the statement that the first step in applying automation to the office is selecting the machines. Nothing could be more erroneous.

Computers are actually being ordered with such homely phrases as, "If you are going to make a rabbit stew, you had better begin by getting yourself a rabbit." The very phrase, "feasibility study", so often used in connection with the study preceding installation of a computer, frequently serves to imply to those conducting the study that they are trying to find an application for a computer. Their objective should be to design the best possible information and communication system for meeting the needs of the organization, whether it relies upon a computer, a simple manual and machine system, or entirely upon humans.

A phrase that is often heard in this field is: "We are taking a step by step approach to automation." This, as intended, conveys the impression of caution and proper business reserve. But the fact of the matter is that it often means that another uncoordinated misstep is being taken into automation. What is so misleading about the 'step by step' approach is that while caution is a desirable thing, the whole concept of systems analysis and design, which is basic to automation, requires a careful and detailed plan for the entire organization if the benefits realized are to be more than marginal.

Following a step by step approach has all too often resulted in throwing out the previous step and redoing a great amount of work in installing the procedures and equipment associated with the new steps. The result is a continuing state of potential saving - always just ahead, after the next step.

In much of the work that my firm has done in this field we have been confronted with situations in which prior to our arrival the application of automation to the office was simply thought of as adding a new IBM machine to the tab room. I know of several firms that are installing major machines on just this basis. In reality there is an enormous opportunity for viewing and analyzing the entire organization as an integrated system, and we always insist that this precede evaluation of equipment. You begin with the system, not the machinery. In viewing the entire organization, great improvements can sometimes be made without recourse to automatic machinery. It is very unlikely that the reverse is true.

One of the reasons dollar savings have been so disappointing in existing computer installations is that by treating the computer as just another tabulating machine and not integrating it into the business system, high costs of data preparation are encountered and often seriously negate the dollar savings of automatic processing. On virtually every project my firm has worked one of our principal sources

of savings has been the automatic derivation of data from a process as a by-product and the elimination of extensive key punching or other data preparation costs encountered when the computer is treated as just a newer, faster, and more automatic addition to the tabulating room. It is through just this process of reaching out into production and other business processes for automatic collection of data that the office and factory are gradually being drawn more closely together.

So many examples of poorly used computers exist at this time because initially machines were bought with the obvious intention of applying a simple machine. Too much has been left to the sales representatives of the equipment companies. These firms simply do not have the experienced people necessary to do the application work for the new, highly complex machine systems. The top managements of companies are the first to admit this. What happens is that the unstudied system has been embarrassed with the wrong machinery.

Before we can insist that in a system study we concentrate on an analysis of the separate parts, joining these parts into an effective and functional whole, we must be sure that there really exists equipment which can be ordered to fit the needs of the system for automation at a given point. Thus far I have stressed the fact that management has concentrated on hardware rather than the systems concept of automation. I want to make clear that there is at one and the same time too great an emphasis on the hardware, and too incomplete knowledge of the hardware. To manage successfully the conversion to automation, it is necessary to be familiar with the hardware that is available. Nothing that I have said thus far should be interpreted as implying the contrary.

Just as the first step in automating the office should be a systems study, so the basic step in industry is viewing the production process - from the introduction of raw material to the completion of the final product - as an integrated system. To me, this is the distinctive fact about automation. It is no longer a question of thinking in terms of individual machines, or even groups of machines. It is a new way of organizing and analysing production, a concern with the production process as a system and a consideration of each element as part of that system. It is something of a conceptual breakthrough, as revolutionary in its way as Henry Ford's concept of the assembly line. Indeed, it may in the end have an even more widespread effect on business and industry, since it rests on an idea rather than on a method or particular kind of machine and is adaptable to many different kinds of operations, office work as well as factory work, small concerns as well as large.

Integrating all the separate stages of the production process into a single smooth-running system - the first step in industrial automation - cannot be done by designing a machine to help a worker do his job more effectively. It can only be done by questioning each stage in the production process and finding out whether it really is necessary, whether it must be separate from other stages, and whether it can be performed without the help of a human operator. R. H. Sullivan, Vice President of the Ford Motor Company, has stated:

I don't mean that our factories had no automatic machines. We found, for example, that it was fast becoming impossible to utilize the full capacity of up-to-date machine tools, because men couldn't load and unload them fast enough by hand. The trouble with our manufacturing methods was that, like Topsy, they 'just grew', and nobody had taken time out for a long view. What we needed was a complete rethinking of the problem - a whole new philosophy of manufacturing.

So much progress has been made in the application of automation systems to the automotive and related supply industries that an unfortunate stereotype has arisen to the effect that automation is limited to companies with large dollar resources and exceptionally long runs of product. This is not true, but the reason the impression has grown is easy to understand. The kind of industrial equipment used in the automotive industry, for example, is very specialized, made for the requirements of a particular product. It also costs a lot of money. But it is simply one manifestation in hardware of the technique of automation applied to a particular type of industry. The large transfer machine complete with loading and unloading device is well suited for the automobile industry where literally millions of identical parts pass through a line before new equipment has to be considered.

It is not so well suited to the estimated 80 per cent of American industry that produces in lots of 25 or fewer identical pieces. Nor is it well suited for industries that frequently redesign their products, since any major change in design means costly readjustments at best and may even mean scrapping these expensive machines. But the new technology of automation that deals with feedback and control systems is producing a new family of machines guided by magnetic or punched paper tape that makes it possible to obtain the benefits of automatic production yet retain the flexibility of operation essential for job shop production. These machines are only beginning to appear. Some forty different prototypes can today be found in the shops of machine tool manufacturers and during the next few years they will begin to have an enormous impact on the small lot producers of this country.

A second stereotype that I believe exists in the public mind with regard to automation is the impression that the ultimate in automation can be symbolized by an oil refinery or any other highly instrumented process industry. Nothing could be further from the truth. In fact, although automatic operation has been achieved in these refineries, they are only beginning to feel the full impact of a second, and more significant, stage of automation.

The intricate controls that run a refinery almost by themselves are far from being the ultimate in automation. Feedback, after all, only makes it possible to maintain a variable at a desired value without human intervention. The value itself must still be selected, and the control instrument adjusted accordingly. In many cases, it is not possible to determine the relationships among variable that will hold true throughout an entire process. This means that the operator cannot simply set his controls and go home. He must reset them every time a

test of the product during processing shows that changes are needed. And making these adjustments is not as easy as inching up the dial of a thermostat, for example, and seeing what happens. Indicators and recorders have multiplied in such bewildering profusion that they have had to be greatly reduced in size to allow for ready comprehension of the entire process by a single operator in a single control room, or even a number of operators. Even so, the panels of miniaturized instruments schematically reproducing the operations of a process often cover all four walls of a large room.

The result is that even such a highly automated industry as refining works most of the time on a trial-and-error basis. A refinery may not be operating at optimum for more than a few minutes out of its entire twenty-four hour operating day. Genuinely effective control, it is estimated, could increase yields by as much as thirty per cent. In the case of some of the newer petrochemicals the question of effective control becomes vital. Polyethylene, for example, the plastic that has become so common to us in the form of squeezeable containers, turns to a useless wax unless an exquisite balance is maintained among a number of rapidly fluctuating variables.

Thus, in spite of the impressive and numerous dials on the control panels of a modern process plant, the actual control of the process is still in a primitive state. To achieve the kind of control that is required all of the individual controls will have to be integrated into a single, coordinated, self-regulating system. Just as a single machine designed on the feed-back principle notes and corrects variations in its output, so an integrated self-regulating system will note and correct variations in the end-product of an entire plant, making precise and instantaneous adjustment whenever the product itself shows any variation from optimum quality. Since the control of a number of variables to produce the desired end is essentially a calculating operation, the integrated operation of the process plant of the future will depend upon an electronic computer to analyze, correlate, and correct the operations of the individual control devices.

At present, however, we simply do not know enough to use a computer in this way and, although we are very close to achieving one, we do not possess a computer that is reliable enough to operate suitably in an 'on line' capacity for long periods of time. We do not yet have instruments that can measure reliably, accurately, swiftly and continuously enough all the variables of refinery operation, and we do not yet know how to measure, relate and reduce to equations that a computer can handle, all the process conditions that determine the quality of a given end product. The most limiting problems hampering the development of automation in industry today are technical. In the office they are managerial. And so far as automation in the office is concerned, if all technological development were to stop today, it would take us many years before we would find that we had fruitfully applied and made proper use of the machines and techniques we already possess.

A British spokesman remarked recently that whoever wins the automation race will have won the cold war. This may well be true. A fact that is not generally known in this country is that the Soviet government recently created a Ministry of Automation headed by a minister of cabinet rank, Mikhan A. Iesechko. A large part of the current five

year plan is devoted specifically to automation.

This is not entirely surprising. Russian computer work, for example, has always been conducted under a high security classification. Several years ago all development work in this field was withdrawn from the satellite countries and confined to the heartland. Nevertheless, many Russian mathematical texts and journals reach us and it has been obvious for some time through the type of problems they are concerned with, and the methods of solution they propose, that there must be access to enormous computing capacity behind the iron curtain.

When you consider the fact that General Electric was recently awarded a jet engine contract because their company was four years ahead of the field in blade design, having used a computer to shorten the immense labor of simulating blade designs in pre-construction "drawing board flight tests", you can begin to appreciate that Russian concern with automation goes far beyond a desire for reduced production costs.

For example, the Russians are well aware that Douglas Aircraft was able to get the DC-7 into the air six months sooner because of a giant IBM 701 computer. They know, too, that our atomic energy program would not have been possible without high speed computing facilities. It would be folly to underestimate USSR ability in this field. The Russians have always been a highly capable people in the field of mathematics, and this discipline, after all, is the basis of success in the field of computers. No one interested in business, industry, or education is unaware of the fact that the Russian government has an effective and extensive program for turning out thousands of engineers and technicians each year.

I don't think that these facts are matters for hysteria or fear, but I do think that they are conditions on which our survival rests. I think that we must realize that automation will play a crucial role in determining whether we can maintain the high standard of living we now enjoy in the future. This standard of living which is based on our magnificent productive achievements is one of the sources of our freedom. In the past few years much attention has been given to the potential threat of automation. Perhaps some attention should now be given to the fact that we are not automating fast enough.

In the autumn of 1955, when I presented the opening testimony at the first Congressional hearing on automation, I proposed that an unbiased and objective study be undertaken of the true economic and social effects of automation. At that time I stated that:

The problem, in assessing the economic and social impact of automation is that we do not have the facts. If there is concern over the effects of automation, it seems to me highly desirable that we get these facts in the most expeditious way possible: through a thorough analysis of automation, based upon a complete, factual, industry wide investigation. Such a study would provide, for the first time, a realistic basis for planning on both a national and a private scale. With the broader perspective such a study would provide, industry could

plan automation policy with a finer regard for the consequences. National policy concerning education and training programs, retirement benefits, and unemployment compensation must be based upon such a factual and intimate understanding of the subject.

Since that time my firm has completed a pilot study for a committee of the National Planning Association. This study outlines a plan for an objective program of exploration of the social and economic consequences of automation, based in part upon a series of case studies in different industries. I believe that such a program would do much to clear the air as to the real effects of automation. It is on the facts rather than conjecture that we should plan action.

I think that the most important question of all is: How shall we go about educating ourselves for an age of automation?

The question of education goes far beyond better training for work in specialized fields. Many of the new jobs that automation will create will require an increasing ability to think and to judge, increased understanding of logical methods, in short, increased education in the largest sense of the term. Management will need these abilities on a higher level. And all of us, if our increased leisure is to mean something more than just another day when we can sleep late, will need to develop some of these qualities. In view of these needs, one of the greatest mistakes we could make would be to concentrate all our attention on the specialized problems of educating scientists and technicians.

A hundred years ago, when it was necessary for most people to put in 60 or 70 hours a week in miserable factories, just in order to survive, the question of what to do with non-work - with leisure - never presented itself. Today, with our forty hours of work a week, we are already facing the two-day weekend with something of a self-conscious attitude. When leisure time spills over from the weekend to Monday and Friday, when a man leaves his desk or his station after six hours of work, still fresh and full of energy, then, for the first time in history, we will really face the problem of what to do with leisure time.

Like the pioneers of the Industrial Revolution in the 18th century, we face a world in which only one thing is sure: change, fundamental change.

Instead of fearing change, I think we might do well to think about these words that the great philosopher and teacher Alfred North Whitehead wrote more than twenty-five years ago:

It is the business of the future to be dangerous; and it is among the merits of science that it equip the future for its dutiesIn the immediate future there will be less security than in the immediate past, less stability. It must be admitted that there is a degree of instability which is inconsistent with civilization. But, on the whole, the great ages have been unstable ages.

Today, we are leaving the pushbutton age and entering an age when the buttons push themselves. We should greatly benefit from it.

Farsighted and aggressive managements see not only the possibility of decreasing operating costs, but also of entering the field with new products and new services. Entirely new markets are coming into existence, and alert businessmen are already seizing the opportunities they see before them. I think it fair to say that automation offers as great a challenge and reward as any industry has ever known.

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