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The training and retraining of personnel

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ABSTRACT

The introduction of automated machinery in industry and the new technological advancements have caused in the United States, as well as in other countries, a considerable percentage of the labor force to abandon their working areas, due to the lack of skills. The problem lies in the fact that although new equipment has created new jobs, the working force has not been prepared to undertake them. It is here where training and retraining acquires its meaning. The attempt of this thesis has been, to indicate that one of the functions of the industrial engineer is to direct, select, and evaluate training programs, in close collaboration with other departments. This inter-organizational conjunctive cooperation is what permits the industrial advancement, considered in essence as: the available employees, with proper skills.

The selection of the proper individuals lies among the tasks of training. The appropriate teaching methods as well as qualified instructors, are important factors. Training merely begins when proper selection, task performance and qualified instructors are combined. Cost enters into the picture, once the necessity for training has been established. Industry revolts around costs, consequently pertinent analysis are to be made, taking into account the various methods of training, each one offering a different cost figure.

Training evaluation is one of the most important achievements sought in carrying out these programs. This evaluation is difficult, becoming more so, the higher we go in the orga-

nization's echelons. At the un-skilled, semi-skilled and skilled levels, work is always measured by units of productivity, as opposed to the managerial spheres and the technicians, permitting us to observe the differences and difficulties in the measurements between the categories.

The proper solutions to the problem of training and re-training are difficult to device, mainly because of the variety of jobs. Nevertheless, an attempt is being made through the collaboration of the Federal Government and the individual concerns, expecting that the degree of unskillness will decrease as time goes by. A great consideration is given to the older groups who do not want to acquire new skills, attention which is also directed toward the unprepared school dropout, who cause a high degree of "disemployment." Industry is faced with these and many other problems related to this topic, being unfortunate that the literature, in general, deals only with particular aspects of the problem at one time. Consequently an attempt has been made to group all these experiences and requirements of effective training programs, emphasizing the interrelation of education and training, without forgetting the requisites and types of adequate training methods.

The
Training and Retraining
of
Personnel

by
Jorge de la Mora

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Presented to the Graduate Faculty
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This thesis is accepted and approved in partial fulfillment of the requirements for the degree of Master of Science.

May 20, 1964
(date)

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Preface

The Industrial Engineer has dedicated himself to analyze jobs in the greatest extent possible, neglecting to a certain degree the human element involved. This has occurred mainly because of the tremendous subdivision of jobs within the company's organization; the especialization which has taken place during the last decades. Training of personnel is a task which involves an Industrial Engineer, but somehow he has been set aside by the personnel department, the latter sustaining that it is their task since they are the ones concerned with the human element within the company. This may be true, but more has to be said toward a clarification of the issue.

I consider that the Industrial Engineer is the man who may perform a great deal in the training programs, since it is he who is concerned with the analysis of jobs, which means he has to evaluate what men are able to do and not to do on a particular job. The methods involved in achieving a good training program also belong to the Industrial Engineer, since he has been educated to discover the most appropriate forms of job performance. When I refer to analysis and methods, I am emphasizing thorough techniques. Furthermore, it is the Industrial Engineer who is concerned with setting rates, standards, making motion and time analysis, being all this part of a good planning before and while carrying out a training program. It is my impression that the Industrial Engineer is identified so closely with the stop watch, that he is no longer regarded as a human element, but merely as a rating element; being this one of the possible justifications to leave

him out of these tasks.

It is my intention to cope with the problem of training and retraining of personnel in order to do justice to the Industrial Engineering Profession. By the end of this study, the reader will be able to disprove or ratify for himself, whichever suits him best, that the Industrial Engineering Profession is very capable and should be the one to direct, select, and evaluate the training programs, being the collaboration of other departments a factor which is always welcomed by the broad minded Industrial Engineer.

How Training Fits into Industry

The past decade has seen a considerable rise in the number of unemployed citizens in the United States. This phenomenon has occurred side by side with a great industrial expansion. Although at first this situation might sound incongruent a closer investigation will reveal a completely different picture. The unemployment problem seems to be rooted on the fact that a considerable percentage of the working force is unable to acquire the skills necessary to keep up with the advancement of technology, and with the speed at which automation is being introduced into the industrial setting. In order to cope with this situation a series of alternative solutions may be considered: training and retraining on a local basis through the efforts of individual industries; on a national basis led by the Federal Government; and, a combination of the above mentioned.

Our first step will be to consider the factors which motivate the individual companies to engage in training and retraining programs. It is an accepted fact that proper utilization of materials and equipment is influenced directly by the performance of the employee on the job, therefore, one of management's vital interests is to seek for the most effective way of using its manpower. In order to fulfill this requirement management must update the knowledge and the know-how of the employees. The company's failure to consider retraining has grave consequences. Among them is the frequent appearances of layoffs; it is obvious that the individuals will render to the companies much less of their normal capacities if they

know that one day, completely unexpected, they will be handed their "discharge slip," ("Your services will no longer be required"). Industry is aware that the situation of morale among the individuals is very important, having given deeper consideration to the problem in the past ten years. These, among other factors, have led the companies to engage in training programs, as Bowles puts it, "in the hope that it will solve such problems as sagging morale, heavy turnover, frequent absenteeism, excessive grievances, and low performance."¹ If these factors are improved, with little doubt, the worker's contribution to a higher production will be manifested.

In order to improve the above mentioned factors when establishing training programs we enter into one of the problems, if not the most important, for the industrial concerns. The cost of the training. Cost is the prime factor which reveals whether or not training has been efficient, because it is expected that the costs will be lower when the program has fulfilled its purpose and disbursements have been kept at a minimum. There are costs which are obvious such as those of the instructors, the difference of wages paid to the learner while training and the "value of what he produces."² The purchase or rental of training equipment is among those costs that may be known before beginning the program. There are other costs which are not so notorious, they are hidden costs. In order to avoid them, it is necessary to analyze in detail who is going to be trained, why he is going to undergo the program and how

is the program going to be conducted? When it involves professional such costs as transportation, texts and in some cases living expenses will be added to the total cost involved in training. Mc Namara developed a comparative experiment in which he found that 33 % drop-outs occurred in the experimental class, while only 4 % drop-outs in the regular training course.³ This difference is indicative when there is an attempt to consider the costs incurred. We shall review later on this experiment in detail. These points mentioned should not be a discouraging note, because we are to remember that in most cases training is worth while even if it represents quite an effort on the part of management.⁴ The other point which is important to bear in mind is that "training is a long term investment which takes time to show results."⁵ Although some authors attempt to indicate that costs are important, I consider that industry has rarely been frank enough with its employees when facing the problem of unemployment due to the lack of skills, and to the advancement of technology. Do most companies engage in these programs because they are moved and feel responsible toward the individuals, or because it is costing them money to have improperly skilled operators; a reasonable amount so as to consider this a problem? I should also make quite clear that this, in general, is a hidden point, meaning that it is not publicized. The aspect which has bothered us, is that the companies engage in training programs, stressing the point that it is for the purpose of helping the individuals, and avoiding as much as possible what we consider the real

reason, i.e. cost. McGehee is one of the few authors who ratifies my point from another aspect. He states that the companies in general have kept a very poor track of the costs incurred in training programs, consequently permitting the supervisors and training directors to have a freer hand, achieving a higher efficiency without too much pressure.⁶

There has been an attempt to consider training as something completely separated from education. I believe, however, that training and retraining is one more function of education, although it has not been "backed by tradition, as are schools which dispense general education."⁷ If training is related to education by the industrial concerns and by the public in general, I think more would be achieved. I uphold that the term "training" does not convey to the world the tremendous problem that it involves. Quite on the contrary, "education" makes humanity consider to a much greater extent the problem of man and his obsolescence. This is one of the reasons why training has to be conceived, organized and formulated under a new perspective coping with our modern industrial society.⁸ We are to set among the purposes of training the possibility of permitting the individual to adjust to the problems of every-day life in order to maximize his functional adjustment.⁹ We are not to forget the immediate satisfaction which is given to the individual "through the development of appropriate attitudes and action, knowledge and skill."¹⁰ From the government's point of view, we may say that their programs in training apprentices have :

been led by the "Manpower Development and Training Act" to help in the problem with which the nation is confronted due to automation, providing with better skilled men in many affected areas of the country.¹¹ Further examination will be presented in Chapter VIII.

Among the many versions leading to a solution of the problem of unemployment, the combination of efforts both by management and government is among the most popular. The engagement of management in this task may be viewed as two-fold. First, it is to their interest to continue on good terms with their particular unions, accomplishing this by maintaining the same working force they now have. The second phase involves the task that management has to go through when retraining men, in short or long periods depending on the nature of the work, even if these men are picked from outside of their working force. Consequently the most intelligent move on their part is to retrain their own working force, incidentally acquiring greater popularity in the process. The problem may be stated in this way: Management has to be honestly convinced that if training is "efficiently and economically organized, it is well worth while."¹²

The importance in training lies in the possibility that it represents to our society to continue the industrial progress. It means that the men who direct our industry as well as those who are in it are those who have to be convinced of the value of training.¹³ The other aspect which we are

not to forget is that it is very important for those individuals who have been working in industry for many and who feel are no longer needed, will be offended unless training schemes are provided for them. ¹⁴ We shall see later on, that there are many authors who sustain the theory that we are to concentrate on the young generation and abandon the older generation, those who actually built the mechanized world of today. They sustain their point on the basis of the facility for young people to learn new tasks, forgetting completely the human problem involved.

Since World War II we have had the tendency to develop our functional lives strictly based on the present, disregarding completely the future. This has been a way to avoid responsibilities by the fact that no preparations have been made. ¹⁵ This leads us to believe that the problem of unemployment and its possible solutions, training and retraining of personnel, which are now an acute problem, will be even worse if no immediate solution is implanted.

The absolute need for training programs to be installed is due to several facts. Among the most important we may mention the development of new techniques, which have led to new equipment requiring different skills. Changes in product have made men who were adequately equipped to handle old techniques and simple jobs, "inadequately equipped to handle more difficult jobs." This shows that companies are confronted with upgrading within their organizations, due to this fact of obsolete

practices persisting. ¹⁶ It is also important to note that the average worker of today is required to handle much more advanced concepts of technological character than those encountered by his ancestors. Behind this, we find the modern aspect of team-¹⁷ work, when handling more complex jobs.

Once we have recognized the problem, our questions lead to the method of solution. If training is to be developed in the plants, and it is to be coached by the upper echelons of management, then we may ask, is management in a good position for coaching? It may be said that while there are many individuals in the organizations who are perfectly capable of pushing a coaching program ahead, there are others who do not know how to perform this duty. To sustain this point we may refer to the study done by Mann and Dent, for the Institute for Social Research of the University of Michigan, under the title "Appraisals of Supervisors."

In this study all supervisors evaluated highly by their superiors are "very sure" they know where they stand (but more through day-to-day relations than being told where they stood as the result of appraisal). Yet only a little more than half of the low rated supervisors are "very sure" where they stand even after ¹⁸ appraisal interviews with their superiors.

As it is shown in this article, the superiors are only able to convey their technical ideas, without being able to show the individuals how other individuals see them, being unable "to help that person work out the means for his personal growth."¹⁹

The effects of coaching have been declared by skilled executives as successful with regard to technical matters, and unsuccessful when they try to change the individual personalities, philosophies, attitudes and values. ²⁰ Many industrial social psychologists have dealt with the problem of the resistance to change, discovering the rules and motivations behind it, but encountering difficulties in solving such problems because of the personal element involved, in general charged with emotions. Let us criticize the theory behind coaching by pointing out that it is an erroneous approach to seek a radical change in the principles of an individual, by the mere fact that he has engaged himself with a company. This is a delicate point because we do realize that if the individuals were "company oriented" they would be more easily indoctrinated and theoretically they would perform better on their jobs. Those who uphold this theory also add that industry would progress much faster and more at its will if the individuals were all in absolute conformity with everything the company performs.

We tend to believe that the American tradition has always opposed the concept of strict conformity. Were it not so, the United States could have never become the melting pot of culture, languages and attitudes which it is today. In the spectacular development of industry, which this country has witnessed, there is no one factor which we can consider as completely responsible for this achievement; but rather there is an interacting degree of responsibility.

We tend to feel that individuality has been one of the major factors for each new man who becomes a part of industry. Such an individual brought with him different ideas, different approaches to old problems, and industry was able to incorporate these thoughts into their policy and move ahead. The goal of success was shared by both, and thus each one was willing to give and take in order to reach it at the maximum speed.

Perhaps today, when success has been reached, industry no longer feels the need for individuality in its workers, and has, therefore, tried to impose an artificial group conformity. This can have extremely dangerous results, for a stagnant situation might be the fruit of this effort. If the worker is forced into preconceived norms, he will lose his individuality, his resourcefulness, his originality; and industry will have to bear with the loss.

We now turn to the considerations of the satisfaction of the individual performing his duties while in the industrial environment. This aspect should never be neglected since the development of employee attitudes is as important as permitting him to acquire new technological knowledge. McGehee has referred to this aspect as "the organizational climate" within the industrial environment, being this:

"the sum of the attitudes of all employees, management, supervision and production employees toward each other, toward the work required to achieve these objectives."

He further states that it is very dangerous to engage in a training program if there are individuals who have manifested negative attitudes, since they will perform, as a consequence, their jobs very poorly. I consider that if the proper attitude is carried out by the employees their personality will be less lost, at least in the individual aspect, being able to perform satisfactorily. To make this feasible, an effective training should "include employee counselling with a view to controlling avoidable turnover."²² Turnover is a reflection of dissatisfaction, thus the importance of taking it into account and keeping close surveillance of its occurrence. It is suggested that if an efficient training is carried out it will help the company economically since there will be an increase in the vertical expansion. That is, the employees who are promoted will require less training.²³ Stevens also sustains the point that training will help the company to have less turnover and side of this factor it will help create good employee morale.²⁴

What training represents for the individual and for the company is sometimes difficult to measure due to the fact that it is intimately tied with other personnel areas such as recruiting, job analysis, evaluation and placement, and communications. When we realize how big the informal communications are in most of the existing companies, we tend to think that if grievances or misinterpretations appear, it has been due in a great extent to "gossip", technically denoted

as informal communications. If the companies would worry about this problem, they might begin to think that a good informative course, an aspect of training, would help them reduce their grievances. If plant-wide training courses are given to foremen, supervisors, shop stewards, and others, interpreting for them the actual operating situation, clear information would be spread, and many "private" interpretations would be avoided.²⁵

Before concluding this chapter we should enter into the consideration of the basic factors which make a training program of any value. The most important points may be related to the extent and to the need of training, emphasizing the aspect of how far this need has been demonstrated. In order to avoid hiring new people, which is an alternative to training, the objectives of the training program should be carefully²⁶ set up, searching for the most efficient way of operation. It is wise to bear in mind that training programs are not established overnight; they require to be planned, organized and set up by very competent people.

Need and Objectives of Training

Reviewing the most interesting training programs during the past twenty years, our attention is caught by the "biggest industrial teaching job," performed during World War II in the United States. This massive educational program began with four men who after a period of five years had trained 10 million men. It is worth while to consider how this program was carried out. The program in itself consisted of three basic courses: the JIT (Job Instruction Training), the JMT (Job Methods Training), and the JRT (Job Relations Training). The titles of these programs indicate to us that although these are just three fields, (Instruction, Methods, and Relations), they are very important within any factory which is seeking a good industrial development. The topics are broad enough to be applied to almost every type of industry. In our days such a program would probably be unsuccessful, because industry has advanced very much in technology, and the methods vary greatly from plant to plant, to such an extent that a generalization of this nature could not be applied. Four national directors trained 22 field representatives, who trained 200 T.W.I. Institute Conductors. These trained 23,000 trainers who trained 1,750,000 supervisors in 16,500 plants and agencies, and who trained some 10 million war-workers. ²⁷ This colossal program succeeded in many plants, showing management how to apply the programs. A number of flaws were deliniated by J.J. Schwartz, a training director at Lockheed. He pointed out that there was in the programs excessive "reliance on films and lectures," lacking the show of actual practice. He also mentions that the programs were taught

by "poorly trained instructors," remarking that production men were not used in this teaching chain. The fact "that too much training associated skills not needed on the job" was being taught, and that there was a great "tendency to imitate procedures in other aircraft plants," were among others of the points mentioned. As a final point he indicated that there was a "failure to follow up with refresher courses." We tend to agree with all these points mentioned, although we think there is a great value in this massive attempt which should force us not to be so hard when analyzing the program. As positive results from this program we may mention that Eastman Kodak continued after the war with the JIT and JRT programs as "a regular part of its supervisory training program."²⁸ The Esso Standard Oil was engaged during the war years in the JIT program, but there was little emphasis placed on it. After the war they found out that many of their foremen did not know where training had to be carried out in their departments. This led them to prepare an extensive training program at all levels within the company. As a conclusion it is pointed out that the JIT program helped them in analyzing "whom to train and what to teach."²⁹

It is interesting to bring out another training program which took place during the recession years of 1957-8, in which instead of three general areas of training there were seven different types of courses. There were 1,761 persons enrolled, out of which 884 completed the training program, and 741 got jobs. The ironic aspect of this training program is that at

that time there were 500,000 unemployed in that particular state. ³⁰

The introduction of automated equipment has created the problem, or potential problem for those who still have not done so, of causing a surplus of industrial personnel, because of their lack of skills required to handle new equipment. There are two basic questions to this problem. On one hand, we may ask if the present employees may be trained in sufficiently large quantities as to meet the required demand. On the other hand, the question lies in the abilities of the employees. Do they have sufficient abilities as to not cause any difficulty in training them? ³¹ I think that both of these questions may only be answered by the individual companies, leaving us only with the possibility of indicating the expected future trends, analyzing thoroughly, as to aid those who will be weighting the problem. The popular theory is that there are sufficient jobs for all those who require them, being necessary only a redirection of the individual abilities. ³² There are others who believe that the solution lies in leasing individuals, indicating that young men are apt to perform these functions, while the older men are just "slowing down." ³³ The idea behind this is that the older generations are incapable of using retraining, leaving them with no other choice than to move out of the industrial scene. It is here where one of major concerns lies. Where are we to set the limits of individuals who are capable of being retrained; are we to consider them old at the age of 45? We have to seek for a form of permitting the employees to set their standards of

of living as high as possible, and as a consequence we may not permit that a large portion of the population, (those of 45 years of age and above), to sit back and receive the unemployment compensation without having any other choice.

One of the phenomena of our modern society is the tendency to underestimate the engineering and technological professions, due to the glorification of the purely scientific field. This development must be analyzed and corrected; we can not allow large segments of our society to perpetrate such a distortion of facts. The role of the scientist, is to deal with the physical world under no pressure for time; on the other hand, the engineer or technologist, making use of the discoveries of the scientists develops them into practical items, being always restricted by economical factors. We shall delineate, by means of three examples, the difference between the field of the engineer and the field of the scientist. The first example deals with the atomic energy, which after the war was considered as very useful in the field of electric power generation. The postwar years were completely dominated by the new developments brought to light by the scientists, given no credit to the engineering implementation of the known scientific principles. At that time no consideration was given to the economic factors involved in the developments, at least not properly evaluated. It is now that proper credit is being given when the questions of arrangement, size, heat transfer, problems of pressures, the metallurgical aspects and others, are discussed. These are functions of the engineers, who properly trained ha-

ve mastered the required techniques to solve all the above mentioned problems. The culmination is that the competitive atomic energy has not been achieved because the engineering and economical problems have been too complex, rather than because of scientific ignorance. Let us deal with ^{the} second example, the conversion of sea water. The scientific principle behind the conversion of sea water is very old in history; the distillation of the waters of the sea is performed without any trouble. What has caused a delay in the application of this scientific principle has been the cost involved. It has been the engineers who have made possible the use of materials of low costs to improve old methods; they have dealt with the problems of corrosion; with the temperatures involved in the processes; and last but not least, the problems of power generation. The third example pertains to the problems involved in the magnetohydrodynamic (MHD) generator. It has been more than 100 years ago when Michael Faraday conceived the above mentioned generator, and since then the basic principles behind it have been understood. It is now a question of engineering design, especially in the areas of high-strength and magnetic fields, which has to be carried out.³⁴ The training and retraining of the engineers in the complex discoveries of our days, is what will permit us to continue in our technological advancement.

We are now to examine the labor market, the personnel changes which are to be expected as new equipment is being introduced in the industrial settings and the possibilities of retrain-

ing in the years that lie ahead. Let us begin by examining the supply side, which is the nature of the work force. As a consequence of the numerous births which took place after World War II, it ^{is} expected that a large number of people will be available for employment in the 1960's. This means that the 800,000 people who increased the labor force during each year during the past decade will now be doubled during the 1960's, raising the labor force to something between 12 and 14 million workers, which means an increase of 50 % as compared to the 1950's. Forty percent of this increase will be comprised of women, who will be supplementing the families income. The young group, composed of those under 25 years of age, will be substantially larger as compared to the group of those of 25 or ³⁵ more. The most important fact is that there will be a great decline in the workers whose ages range between 35 and 44. This is worrying because it comprises the middle-age group which now holds most of the supervisory positions and in general are those who are highly trained and best prepared to handle the industrial affairs. Consequently, there will be a high demand for those who are well trained and skilled. There is an estimate that the young-age group will be 46 % larger in the 1970's as in relation to those in the 1960's. The estimate also indicates that despite early retirements, there will be a considerable augment in the working force of age 45 and above. The women, as a consequence of the reduction in the middle-age working force, will hold positions which up to now have been traditionally held by men.

From the demand side it may be said that high skills will be what the employers will be seaching for. There will be considerable less need for unskilled labor. The United States Department of Labor has made the estimate that there will be an increase of 40 % in the professional and technical spheres; 25 % in the area of skilled production labor and 20 % increase in the semi-skilled production workers. In order to complement the above figures the chart below indicates other estimates, which are not as accurate but show just as well the expected changes.

The Rising Demand for Skills
 Percent change in employment 1960-70

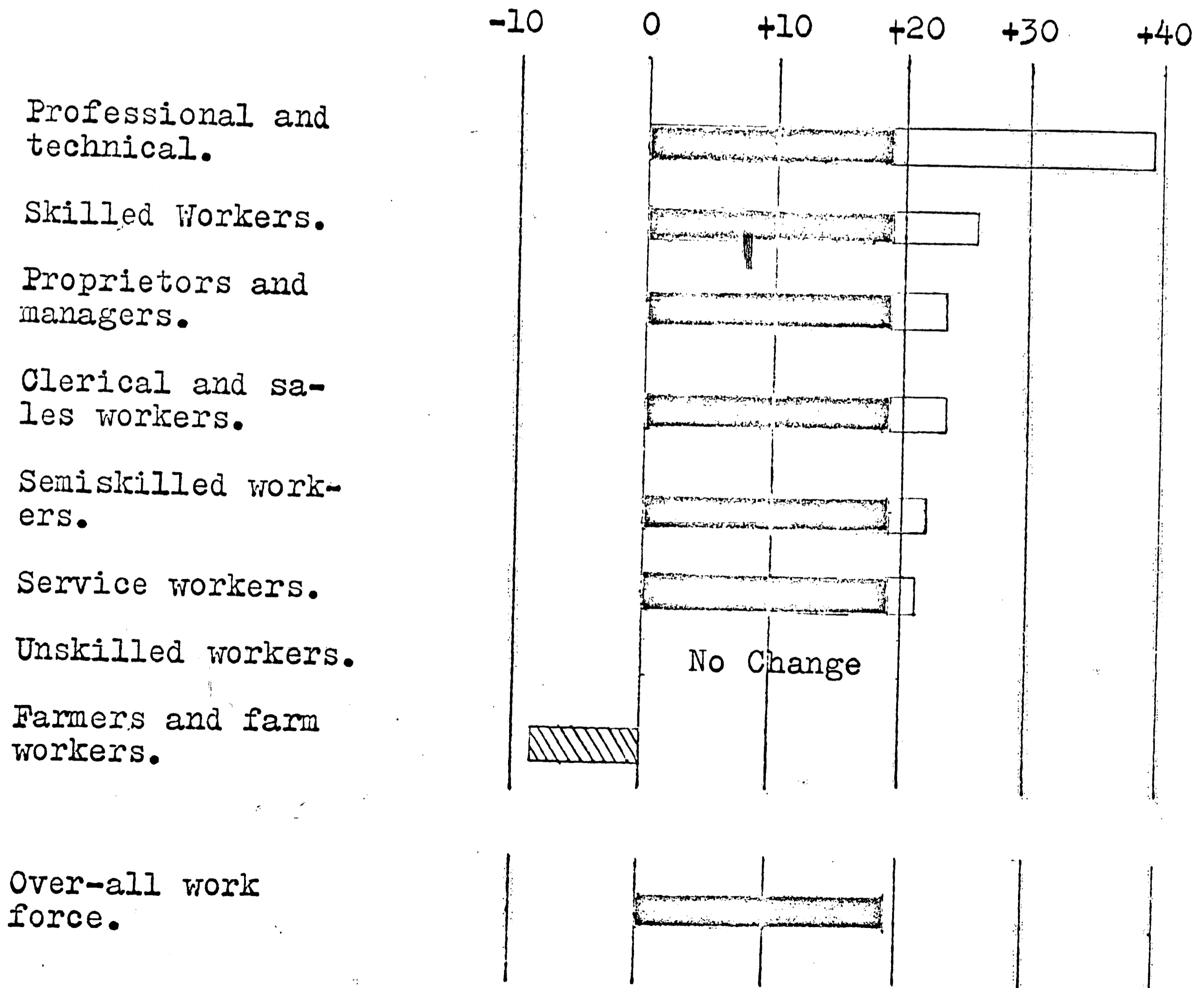


Chart No. 1

The significant problem is that no change in the number of unskilled workers is to be expected during the 1960 decade, plus a 10 to 15 % decrease in the farm workers. The problem of retraining will be to upgrade a large portion of the mid-20 age group so they may occupy some of the middle management positions, being many competent females eligible to carry out the programs. There will be a reevaluation of the policies now carried on with respect to the discrimination of older workers since it is being realized that valuable manpower is being wasted, which could be used successfully in other areas.³⁷

This brief analysis of what is to be expected in the next ten years, permits us to realize the emphasis which will be placed upon all the working classes, while undertaking training and retraining programs. It appears to be that the unskilled youth will have to disappear from the labor market, since there will be no demand for them. Later on we will analyze the education problem, where we will indicate a series of trends which are now identifiable with the young generation. It is important that we stress the change in the role of the women, mainly because it is a major break within the traditions of the industrial enterprises. In general women have occupied jobs as semi-skilled and skilled operators, being very few the ones who acquired positions within the higher ranks of management. The factor which has to be realized is that they will not be displacing men from their jobs, but quite on the contrary, occupying the vacancies available.

Education and Training. Its Evaluation

Training is highly correlated to education, consequently a brief review of the "need for formal education, which has arisen from the complexity of modern industry,"³⁸ is always welcome, since it has led many educators to consider how men who are going to be involved in business should be trained. The introduction of the computers into the area of engineering has^{been} two-fold. For those who acquired sufficient training as to use these machines profitably, there has been no problem; but for all those who were never trained in the procedures of programming, it has been a major cause of obsolescence. As a consequence they have had to seek retraining, in a curriculum which emphasizes the use of mathematics and sciences.³⁹ With this new^{emphasis} and having time as a decisive factor, engineers have had to narrow their field of vision. This has created great controversy, being Sporn one of the authors who sustains that this attitude is correct if we are to have people who will be limited to solve just the problems which will take within their narrow, but highly skillful scope. Quite on the contrary, he continues, if the purpose is to look for engineers with an integrated view, being able to cope with the social, political and economical aspects, then the programs are not sufficient, and some revisions are required.⁴⁰ Kirkpatrick says that while there has been an increase in the long-range planning, at the same time there has to be an increase in the attention given to the "basic human drives, and the perplexities of all interpersonal relations." He mentions that the concept of career has to be abandoned, because the training received by indivi-

duals should be to provide them with a number of skills and facilities which will permit them to move in more than one direction. His conclusion is that education should be guided in a broad manner as to allow the employee to be able to handle problems which are not yet identified.⁴¹

The lack of basic education, aside from the problem of the unqualified skills, is also a major contributing factor to the unemployment situation. It is carefully pointed out that when an individual lacks the fundamentals, future training programs will be of little or no use. It is here where the problem of the dropouts is of importance. The amount of students leaving high school before completing the required curriculum has arrived to worry the Labor Department. They have estimated for this decade the discouraging number of 7,500,000 dropouts.⁴² The amazing fact is that England is suffering a similar trend; in the year 1962 there were 720,000 school-leavers, boys and girls.⁴³ This is what has led Sporn to indicate that there are not enough talented youngsters to enter the engineering schools, being of absolute necessity to reorient "both the character and the tempo of training" in the centers of secondary education.⁴⁴

Being foreigners and coming from a country where education is one of the primary concerns, this so called dropout tendency has called upon our attention. What does it mean? Is this youth satisfied with just the basic principles of arithmetic, and with a vague idea of what reading and writing represent? Be the reason what may be, there is even a larger problem which

puzzles us. Does a highly technological society, as is the case here, tend to eliminate all the desires of education, under the pretext that high automation will carry on? Although this is not our theme, we may stop to think whether or not it will be one of the most contributing factors in the unemployment situation.

If we are to consider the training of the apprentices, the definite requisite is a program which will combine both the work experience and the classroom training. In order to carry out such a program to a high degree of satisfaction it is necessary to keep detailed records of how the apprentice has been performing.⁴⁵ This is required so information may be always on hand, and if promotions are involved it is a good way of determining the potentials of the individuals.

Let us review a few examples in the industrial setting which may help us to clarify the relation of unemployment and the need for training.

A well publicized case has been that of the Armour Company which for the past years has been forced to close seven of its plants, and when they closed the eighth in Oklahoma City a retraining program was set up. There were 5,400 workers affected in the close-up of the seven plants. They were all given a very reasonable "90 days notice and up to a full year's severance pay." The employees in the Oklahoma plant were offered a training program. Only 170 of the 433 men applied.

Out of these only 60 were judged as acceptable after taking some aptitude tests set out by the Oklahoma Employment Service. Of these 60 some were trained in typing, upholstering, beauty operation and auto mechanics, and when they went to find work, there was nothing for them. Others who were more lucky and did find jobs had to take great cuts in their pay.⁴⁶ One of the most frightening factors is that 35% of the employees were rejected merely on the basis of the aptitude tests. The committee in charge of the training program found out a series of helpful factors, but not much appreciated by the employees. They mention that the workers are very disillusioned after they go through the training programs and find out that there are no jobs available for them. This factor is not completely surprising, due to the fact that the areas where the plants closed were areas of high unemployment. They also found that the public employment services were of little use and that the severance pay was seldom used to look for a job, but, quite on the contrary, was used to pay debts. An interesting point that was mentioned is the fact that only 4% of the employees requested a job in another of the company's plants.⁴⁷ It is important to note that the amount that was spent in this retraining program per employee was only \$150.00 which, as we shall see later, is quite insignificant, if there is a desire to be successful. A curious phenomenon that might be noted is the fact that employees prefer to be on relief than to move to other parts of the country. This may be due to the fact that most of them have their own homes and have a set way of life.

This leads us to another interesting retraining program set up by G-E in Schenectady, N.Y. Their plan called "Job Opportunity and Income Extension Plan," offered retraining well in advance of layoff, and had a generous separation pay. "An employee with three or more years of service gets 95% of his prior pay for as many weeks as he has years of service." They obtained 1,700 men that would fit into the retraining program, and the result was that almost every man decided to go on relief instead of taking the training program.⁴⁸ This has led Mr. Earl S. Willis of G-E to say that "any attempt to improve retraining on a national basis would be so complex as to be impractical." It is shown that training should be held at a local basis only if jobs are available, because if there are no jobs "retraining is a waste of time and money." The other point that is mentioned that is worthy of attention is the fact that there is security for the employee without a job, leading them to be less responsive and adaptable to new jobs.⁴⁹

Ford, in their assembly plant in Chester, Pa., were faced with the same fact that a great number of the employees that were laid off didn't accept the company's offer to transfer to another plant in New Jersey. There was a working force of 1,243 auto workers who were expecting to learn new skills with the hope of being hired in the nearby area.⁵⁰ Nevertheless Ford has not kept retraining away from their plants. In the year 1961 they retrained 3,000 employees to work with advanced

hydraulic and electrical equipment. General Motors retrains approximately 7,200 employees per year. ⁵¹ Xerox Corporation in Rochester, N.Y., offers quite an exclusive retraining program because of the fact that they train personnel for jobs that are not yet in existence, but that they expect will be available by the time the employees finish the training program. It should be mentioned that the company invests an estimated \$ 1,750 per man. There have been, in the year 1961, a total of 68 men who were offered a six week training period. IBM is another good example of high scale retraining. They retrain 100,000 workers for other companies per year so they are capable of handling the machines they sell and lease. While mentioning the fact that if great amounts of money are not invested in the retraining programs they will not succeed. we may take a look at the United States Office of Vocational Rehabilitation, and having present in our minds that this organization only retrains handicapped people, nevertheless they spend an average of \$ 2,000 in counseling, training and placing one man. There is another important fact to be mentioned in this relation of unemployment and training. The age of those employees that are offered the training often constitutes a prejudice in the management spheres. That is, if the employees are over 45 years of age, this mere fact will be sufficient to reject them. There is also another theory with respect to middle-aged personnel, and that is that they do not learn as well as young individuals do. This has also been proven false. The elder employees take more time in learning the job, but

once they know how to perform it, in general they overcome
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the younger employees.

Among the difficult things in the training programs is the evaluation of such courses. We shall first consider an experiment used for the purpose of evaluating skilled personnel at the IBM Corp. In 1957 the first initiation of training individuals to test the computers manufactured in the plant was started. The high rate of success of this initial program led the company to install in 1959 a regular training program for the purpose above mentioned. The course length varied from period to period, but in general it consisted of sixty working days, with an average of 24 men in each class. The range of topics covered were mathematics, electronics, computer circuits and organization, transistors, and printed circuits. The trainees were selected on a basis of their interest, first, the willingness to submit themselves to a battery of tests; second, obtaining satisfactory grades in these tests and obtaining a recommendation from their manager. The requirement of having a high school diploma and some knowledge of algebra was indispensable. At the end of the course, examinations were given with no final grades established. The course completion permitted the individual to be qualified for on-the-job training. In order to measure the effectiveness of the course, the relation between the number of employees enrolled and the number of dropouts was established. It was highly satisfactory to find that 94.5% of the selected individuals completed the course. In

spite of this success, an experimental class was established "to determine the feasibility of training plant employees in a general rather than a selective sample." The new course reviewed the same fundamentals which were normally covered, adding more time to the course, so arithmetical fundamentals could be reviewed. The selection of the trainees was exactly the same as for the regular course, with the only difference that the selected individuals were below average on the test data, opposite of the normal policy carried out. The most relevant factor which was discovered was a high rate of drop-out permitting the company to determine that such a program would cost them approximately 50% more than in the regular course, (cost per student). Among the satisfactory discoveries it is mentioned the fact that many employees who had been disregarded for training programs, were eligible. The limiting factor is the background of the employee, specially in the fields of mathematics and technical subjects.⁵³ This evaluation program is merely a ratification of what was established in a previous chapter, that manpower is being wasted because of the lack of proper evaluating systems to determine their eligibility for retraining.

As we go higher in the echelons of personnel the evaluation of training programs becomes more and more difficult. Mosel and Tsacnaris developed a study to determine whether or not management is in the position of stating that they know that the program helped the supervisors. They state that there

is a great tendency to arrive to the meetings and spend a lot of time discussing the how do you train, instead of the how do you know you train. ⁵⁴ They also mention a very important general belief. When a training program has been presented and the supervisors have completed the exposition of the principles of supervision in a satisfactory way, there is a tendency to state that his thinking and behaviour have improved, this being not necessarily true. The references given in the study are sufficient to permit us to generalize and say that the human relations of the supervisor is the factor that has the most influence on the morale and productivity of the employees. The report attempts to "evaluate the effectiveness of a supervisor training program." The procedure used two groups, one as a control group, the other as the training group. The control group would not receive the training program. Since the researchers were seeking to find just the improvement of the training due to the training program itself and not to other side factors, the control group was of extreme importance. They used as ^a measuring device the "How Supervise" questionnaire, ⁵⁵ which consists of two sections, A and B, to be handed out at the beginning and termination of the six week training program respectively. The results are best shown in the tables on the following page.

The questions that were raised in the discussion section were mainly concerned about whether the human relations section should be left as part of the training program on behalf of

Table 1.

	Before	After	Gain	Critical Ratio
Trained	46.70	53.61	6.91	1.2 ($p > 0.05$)
Untrained	46.52	48.11	1.59	5.0 ($p < 0.01$)

Net gain : 5.32

Critical Ratio : 2.2 , significant at 0.05 confidence level.

Table 2.

This table indicates how the range of individual differences among trainees was modified by the training.

	Before	After	F-ratio of difference
Trained	10.25	8.05	1.6 ($p > 0.05$)
Untrained	9.16	9.09	1.0 ($0.01 > p < 0.05$)

the results, which indicated a small but favorable improvement. They concluded by stating that the evaluation of the training programs must take into consideration many side factors, "or perhaps all of the organization in which the training takes place."⁵⁶

The purpose of the presentation of this evaluation program has been to indicate that training programs are difficult to measure per se. They produce favorable results, in general, but as indicated many side factors may influence this positive result. This by no means is discouraging research since it

has brought to light the complexity that is involved in any training program, simply because of the personal nature of such a program.

Our next interest lies in the problem of training research scientists, technicians, and professional employees. This is a group of highly specialized men in which the required "updating" is of prime necessity. Part of the training and re-training of these men is achieved through their own research through reading the latest advancements in their particular fields, by assisting to conferences, by forming round tables and many other communicative sources. In some cases there is an attempt made so the training programs may become tailored for each individual situation,⁵⁷ with the purpose of making the engineering graduates as productive as possible, in the least amount of time.⁵⁸ The scientist and the professional man are two classifications that are well defined, but the technician's role is not so clear. We may say that they are a group of individuals, semi-professional, who aid the engineers in several fields, such as design, process improvement, testing, research, etc...⁵⁹ On several occasions we have heard that for every engineer there should be two technicians to aid him. We have found no valid support for this rumor. The training of these men is performed in different ways, varying to a great extent from company to company.

The following interesting details with respect to the training of scientific, technical and professional personnel

are extracted from "Management Review."⁶⁰ Seventy-five per-
cent of the companies responding to the survey that was ad-
ministered indicated that after the men were hired they under-
took some kind of training program. Most of the programs are
on-the-job training programs, in which ^{of the respondents} 40 % indicated that
only informal programs were administered; another 40 % indi-
cated that formal and informal programs were administered;
and 16 % indicated that they conducted "wholly informed pro-
grams." Among the research that has been done in this area
of training we have found that among the firms that have from
"100 to 499 employees, one fourth have management training
programs and approximately 10% have programs for professional
and technical employees." From the 228 replies from the small
firms, "approximately 30 % of these firms had management trai-
ning courses and 8 % technical-professional courses."⁶¹

It is interesting to note how the immediate supervisors
react to further educational training. From a study performed
in the Pennsylvania area 36 % of the supervisors stimulated
them; 53 % took the position of non-committal, this high per-
centage was indicated by the engineers questioned as a reaction
to the lack of knowledge which many supervisors profess for
their subordinates when related to their fields. Only 1 %
of the supervisors discouraged further training programs.⁶²

From the research which we have extracted from "Management
Review," indicated that 50 % of the companies use colleges and
universities, while another 50 % hold their programs within

the plants. "Fourteen per cent of the firms using in-plant training programs maintain their own special training facilities." The encouragement on the part of the companies to send their men to obtain higher degrees is certainly demonstrated; eighty-three per cent of the companies provided educational aid, out of which 50 % pay the entire cost and 30 % pay only half of it. The companies also encouraged their men to belong to professional organizations, providing them with the cost of the fees and in some occasions permitting them to take time off to prepare for the examinations required. Sixty-six per cent pay membership fees. The other aspect, which was mentioned earlier, the assistance to conferences and conventions, is supported by 92 % of the companies, out of which 80 % pay for the expenses incurred. According to the results, it is stated that there are three main requirements that should be met if there is a desire to keep the men satisfied: Salary, 75 % of the companies; Recognition, 74 %; and opportunities for promotion, 73 %. Aside of this it is mentioned that on many occasions scientists and professionals complain that the high salaries are given to individuals in the managerial positions. The use of parallel lines for advancement is offered as a possible solution to this problem.

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Let us review the so called communications development training program held by the Bell Laboratories for the purpose of training technical staff basically in the areas of communications, both in the scientific and technological aspects.

The purpose of the program is to fulfill the need of the company with regard to the achievement of high caliber employees. The communications technology has advanced to such a degree that it has made it necessary to install advanced training in order to keep up. It is unfortunate that the number of graduate students is not sufficient to cope with the jobs available. In addition Sporn mentions that the students of this decade are not being taught what they will be performing ten years from now, but quite on the contrary they are limited to the actual knowledge. It is very difficult to foresee the education branches which are required but a great ^{er} effort must be made towards this goal. The other factor is that the rate of knowledge is expected to double within the next seven to ten years, and since the number of graduate engineers has been decreasing it will be expected of those who do remain in the profession to be highly skillful, and to have a strong professional motivation to keep up with the rapid technological changes. ⁶⁴

The CDT program is done in combination with the New York University and in general it requires three years for its completion, covering fifty-five to sixty semester hours of course work and three months laboratory practices in the different technical departments. The program has been set in such a way that the Bell Co. provides the classrooms and N.Y.U. the administration and faculty who operate the teaching center. During the first year the trainee assists to classes three days per week covering a series of courses which are part of the require-

ments for the acquisition of a Master's Degree at N.Y.U. and partly the judgement of the Laboratories for courses covering the electrical communication area. During the second year the attendance is reduced to two days per week in which there is more freedom as to the election of courses, but the choices are required to be consulted with the trainee's department head. Complementing are a series of courses denominated Bell system I, II, III. These courses will introduce the student to the techniques and nature of the telephone company. It is of particular interest the third course since it deals with three aspects; first, material which is not available in the current courses at the universities; second, material which is available in several campuses but the company prefers to teach them so the company's flavour may be introduced; third, material which is specific to the Bell system's operations. ⁶⁵

The Southern Bell Co. has also required to use a campus type training program, with the aid of Clemson College in South Carolina. They required this program because of the decentralization of all the engineering activities around a vast area of nine states, causing the transmission engineers to carry on far more complex and responsible positions. A particularity of the program is that the instructors selected from the college are given by the company the material on which they are to lecture, giving them absolute freedom in the supervision of the class. In this program no laboratory work is stressed, supplementing this by an emphasis on demonstrations of certain theories.

It is interesting to note, that the company has permitted not only the qualified engineers but also all those who wish to attend the courses, from the transmission, maintenance personnel department.⁶⁶ Although it is not indicated I believe that the introduction of less qualified men in this program is merely an alternative for the future, when they expect that the qualified engineers will be scarce, having this way retrained personnel within their company.

Among the interesting cases that I have come across in the training of professional employees, it is worth while to dedicate some of our attention to the program that is carried out by G-E in training ten of its engineers at the Rensselaer Polytechnic Institute. To begin with, this group includes a man who has been out of college for 27 years, and at the same time another who was there only three years ago, noting well that the latter left it with a Master's degree. These ten men are engaged in three different fields: industrial analytical engineering, metal rolling and processing, and in process automation studies. As a consequence the courses offered have quite a variety, from sampled data control systems to operations research. These courses will extend for a period of two and a half years, during which the engineers will assist for four hours twice a week, tuition paid. It is interesting to note that the company considers that no more time can be devoted to this retraining program due to the fact that most these men travel all over the country, at unspecified times.

The psychologists have had a word in setting up the retraining program. They suggested the morning hours, contrary to the general procedure, because they consider that for these complex courses the individuals are better off if the full day's is not with them. They considered that this retraining system was the best, and in the words of Mr. Rothe, the senior student, "this schooling is really an effort to update the education and working knowledge these men now have. Things are moving too fast in this field. We had to find a new way, a better way, to update our engineer's knowledge."⁶⁷

The high demand for automated production has groups like the ones mentioned to retrain. "While control theory is still being refined, and techniques developed, industry is already demanding process automation." "This is a deadly competitive race against time, knowledge and other companies developing and selling process automation systems."⁶⁸ Mr. Knapp, manager of systems sales and engineering operation, says that this "an investment not an expense."⁶⁹ So far this has been the most interesting and detailed explanation that we have encountered in the retraining of professional employees. It is an expensive job which requires patience, but should update these engineers as quickly as possible. The entire program shows a very satisfactory push and encouragement on the part of the company, creating, we suspect, a good atmosphere among the professional rank.

There is just one small detail that lead us to doubt whether or not this program is as effective as it sounds: too few people participate. We may now turn to the study recently completed by Careers Incorporated, which shows us some alarming figures with respect to technical and professional manpower. William A. Douglass, the president of the firm, indicates that there is substantial data showing a numerical shortage of these types of men. He also mentions that many are not correctly employed, demonstrated by the fact that there were 17 % unemployed at the time they came to Careers. He goes on to say that the concept of retraining professional men is still not a very popular one. Gordon S. Brown, M.I.T.'s Dean of Engineering, mentions the fact that thousands of men now in their thirties and forties who studied the curriculum of the post war years, are now in a position which does not permit them to enter into any of the new areas of engineering. The Alfred P. Sloan Foundation has provided a fund to the Massachusetts Institute of Technology, of five million dollars, for the purpose of creating a center that will update engineers. This shows one sector in which an effort has been made to avoid very capable engineers who are not able to perform a satisfactory job, to come in contact with the advancements of technology, once they have been properly retrained.

The proper retraining of professional personnel is very costly, when we are referring to large numbers. Although,

the companies aid tremendously in different forms, be it paying for the instructors, or covering half of the cost incurred by the engineers, it has been demonstrated that is not sufficient to cover the incurred costs. The grants, such as the one mentioned in M.I.T., have to increase. Added to this is the fact that we lack of the required personnel, as was shown. I tend to foresee that the technical nucleus will close more and more as the years go by, and if this is so retraining will be in vogue among these people. We consider that the data presented by Barends, although limited to 2291 engineers interviewed gives a clear picture of how this nucleus is forming. The number that indicated desires to pursue further education is large, 1186 (51.8%); but when reality was questioned, that is, the actual number of those enrolled in an engineering degree, it was found to be a disappointing 18% or 411 engineers. The intentions within this group are high, because 4% desire another Bachelor's Degree, 82 % seek a Master's Degree, and 13 % a Ph.D..⁷¹⁻ The contrast is clear. To further substantiate the reduction of personnel in these technical areas, and to stress how they will require to enter more and more into the entire managerial picture we bring up the concepts indicated by Murdick, in which he states that co-ordination among the managerial spheres and the technical personnel is a requisite in order to keep everybody informed of the fast changing commercial objectives permitting, in this manner, the keeping of engineers up-dated.⁷²

We have made earlier mention to the waste of manpower in the so called "old age bracket". We have also indicated that it is expected a re-orientation in the functions of those who retire. One of the most exemplifying cases has been the creation of the Training Advisory Committee (TAC), which deals with the teaching of apprentices by engineers of the above mentioned bracket. A so called regional engineer holds close control over a group of apprentices advising permanently on technological problems and aiding with human aspects of the training programs. The group engineer, is the actual man who is always in contact with the apprentice, they are all professional engineers with a vast experience. This experience they have used to gain over the apprentices, their parents, and the management involved. He serves as a liaison officer between the technical schools and colleges, and making use of the "Engineering Industries Group Apprenticeship" (EIGA) syllabuses he conducts effective training programs, on an individual basis. He is liaison between the colleges where the apprentices work and the training programs they follow; and when they transfer between firms is to take place he always keeps records of his pupils. Progress reports are used as an aid in producing qualified tradesmen. His mission does not end in the working environment, it goes beyond, it goes into the house, into close contact with the parents of each apprentice in order to make the parents and the student realize that he is being treated as an individual, for whom the maximum is to be given.

The most outstanding points in the above mentioned training program are, first, the use of the well experienced engineer who in most cases is very willing and capable of performing the difficult function of trainer; second, the person to person relationship which is carried on between the engineer and the apprentice, without forgetting that the support which is to be received at home, has a great bearing on the performance of the individual. I consider that such programs can easily and inexpensively be created, being certain that if this has been an example at the skilled and semi-skilled level, it is also very possible at a higher echelon.

Let us examine another retraining area which although has great possible potentialities, is not being taken advantage of mainly because of the difficulty of measuring its value. We are talking about the retraining of managerial personnel, understanding that the basic principle which has to back such training has to flow from the top management. There have been some attempts to send management personnel to take courses during the summer at various universities, in order that they may acquire facilities and knowledge so they may hold, in the future, positions of responsibility. ⁷⁴ Before we continue we are to distinguish an important fact that sometimes might be misleading. The term "management" and the retraining of this group of employees does not go hand by hand, because there are many senior officers who do not perform direct management functions. As a consequence we shall limit the explanations to

those that are engaged in the development of a policy, or its execution.⁷⁵ It is pointed out by P.F.R. Venables that if an efficient and better administered industry is to exist, the education of management is an absolute must, especially because of the speed at which industry is growing.⁷⁶

There are a number of ways in which management may be retrained. Tickner suggests that there should be a set of three groups of courses, covering introductory subjects, background subjects, and finally an indication of the tools of management.⁷⁷ The Hagan company gives us a more detailed list on how to proceed. They developed their "Cadet Engineer" program. This title might be misleading because of the use of the word "engineer", but as is clearly pointed out the program is developed in such a way that after it has been taken, the individuals may be assigned to any work in the division. The training is carried out in both technical and non-technical fields. There are two systems. First, if an employee has been with the company for some time they remove him from his job before he becomes too specialized. They assign the employees to positions in which they may sense a complete company view, in a very broad manner. This way they believe, will build up the employee's loyalty to the company. Second, if they are hiring the individuals, using the policy of getting men that come right out of college, they will assign them to the field in their home areas until formal courses at Pittsburgh begin. They first travel ac-

quiring a broad company's knowledge, its methods and equipment. At Pittsburgh they are given courses for a period of two months. They are transferred to this training area with their families, at company's expense. What they believe to have achieved is a set of better-placed and better-adjusted employees, by this system of broad training. 78

We observe that this system of giving the employees the opportunity to be in almost every area of the company is very beneficial, due to the fact that the employee acquires a very broad knowledge -- but at a very high cost. We might consider simplifying this program and turning more toward the plan that is carried out with the already engaged employees. Moving into different areas of the company, as the years go along, achieves the same purpose with the probability that the employees will know more in detail the entire structure of the company. This would be called a rotating program. If all this general information is given to the individuals in their first year they are likely to forget most of it after a period of time. This will not occur with the rotating system, because the employee will most certainly remember where he has worked in the past years, especially if he has been deeply engaged in all the departments. This type of man is more likely to be a good executive in our opinion. Nevertheless it is a good program if we keep in mind that what we are looking for is a training system which will "promote flexibility and adaptability of skills and attitudes." 79 There

are other methods in which management can be trained, such as conferences, junior boards, etc., which shall be treated later on.

We are now to consider the systems used to evaluate the managerial training program. Although it is difficult to carry on such an evaluation, the approach of asking the students when they return from their courses to answer a series of questions rating the program, causes the student to think in many occasions on the way his superiors would want him to answer, and thus this method does not convey a true story. Furthermore, it is very unlikely that the student can give accurate evaluation on a course which he has just taken, mainly because he has not been able to prove for himself if what he has learned is of any use.

Other approaches to assess the benefits deriving from managerial training programs may be, simply asking the student on the day he returns to work if he achieved something of value; being this approach carried on as far as to ask did you "enjoy your holiday?" This "hurly-burly" approach does not lead to anything positive. A more substantial system may be to ask the superior of the student if any change has been observed in the performance of his work after the completion of the course. It is unfortunate that in many cases this method of evaluation is turned into a mere formality without any definite effectiveness, since such questions thrown to the air receive very superficial replies. Requesting the teachers to present a report

on the performance of the student during the course, and asking him to estimate the possible benefits that the student may have drawn from the course, is also an invalid evaluating system, since in most of the cases the professors do not get to know much beyond the class communication performance.

This seems to indicate that an actual evaluation of a managerial course is quite insignificant, and we might have the tendency to simply forget about such evaluation. Both Ford and a Management Association report that in the United States one third of the industrial concerns do not bother, nor attempt an evaluation. Nevertheless, we consider that a possible solution may be to keep track, close track, of the employee's performance as time goes by, in order to be able to observe any possible benefits which the student might have drawn from the training course. This will be the only tool to justify a training budget.

A brief mention should be made to two widely known attempts of management courses evaluation. One was conducted by the National Institute of Industrial Psychology (NIIP), in 1956. There findings were positive since productivity increased 8% during a period of six months, while that of the control group which was used, decreased. Satisfaction, labor turnover, and other factors along this line did not show any remarkable change. Since in this particular firm there had been no previous attempts to introduce training on a controlled basis it was found, as one of the main advantages, the fact that managers

and foremen were brought together permitting them to express their different points of view with absolute freedom.

The second investigation took place in 1957 directed by Professor E. Night Bakke of Yale University, who was invited by the Administrative Research Foundation at the Norwegian School of Economics and Business Administration, with the purpose of obtaining an evaluation of a managerial course, which was given on a yearly basis. The project was limited to a series of interviews held with approximately 100 men, to whom questions of two sets of criteria were asked. The first set attempted to discover if the superiors of the students, and the students themselves, were satisfied with what had been derived from the courses. The second set was looking for changes within the individual and seeking to learn if any changes had been manifested with respect to "organizational effectiveness". It was found that the students considered the course very valuable, stressing that the major factor was that they gained personal confidence and trust. Furthermore, there are two significant discoveries. Professor Bakke indicates that the students had not received the expected support from the higher echelons when they had returned to their work, consequently being unable to determine if the company had a genuine desire for such courses. The second discovery is that any managerial course has direct benefits upon the human relations consequently, being difficult to asses.

We have attempted to pursue a line of investigation begin-

ning with the school drop-outs, and the possible repercussions which may be felt during this decade. At the college level we encountered a significant decrease in the engineering enrollment, and how the new technological developments have made an apparent necessity the introduction of mathematics and sciences in the university curriculums. As an immediate consequence of the required high skills of the engineers there is the detriment of a vast knowledge, for a more narrow but highly specialized field. Later on we attempted to show, by a series of well known examples, how the actual training of apprentices has been carried on, giving special emphasis to the Armour Co., General Motors, Xerox and others. We have seen that the regional employment services have been of little or no use, specially if the jobs have not been available after the retraining programs were undertaken. The retraining of employees, has been demonstrated to give personal security and possible interest in unknown skills. Evaluation of skilled employees, of supervisors, of scientists, technicians, professionals and top management, has been shown to be difficult, the further up in the hierarchical structure of the industrial enterprise. Some have proven to be successful while others indeterminate; but from we have been able to perceive valuable human relations aspects. We have mentioned the relation of the colleges, their services; the desire of the professors to contribute to the betterment of technology, relating the cost involved when carrying out such retraining programs which make use of these contributors. We are not

to forget the contribution which has been given by the retired engineers, who feeling capable of giving to younger generations some of their vast knowledge, have united in training programs of great merit. This example is perhaps one of the possible solutions when attempting to search for instructors who will conduct in an appropriate form the training and retraining programs.

Requisites for an Effective Training Program

We are now confronted with another aspect which is of prime concern when attempting to carry out a training program. This is the actual training of the instructors. This task is usually carried out by the personnel director or the training manager, if training has already been put into practice in previous occasions. He is to be capable of determining what the company requires and as a consequence may visualize the capacities of the trainer. It is his function to evaluate possible training programs to be carried out in training centers, when such centers are available. In England they are very popular, as well as in other countries in Europe as we shall see later on. The courses which are offered by these centers are his prime concern, since he is attempting to fit the needs of his company by the use of these. When selecting his instructors he is to note carefully that it is not sufficient to have a college degree to become a qualified teacher.⁸¹ On many occasions the instructors are chosen from some position in management, or from a technical position. The fact that the individual has been in a high position in a particular outfit, does not qualify him to be a good instructor. For those individuals which are constantly dealing with the application of engineering techniques, it becomes much more difficult to teach than to those persons "experienced in teaching". This is one of the reasons why the Southern Bell Co., in the program mentioned earlier, used the advantageous program of making use of professional teaching.⁸² Aside from the capacity of teaching the trainer should be able to conceive

in his mind as clearly as possible his objectives, and the requisites and limitations of his subordinates. It is important that he remembers that his objective is to obtain the maximum "production through them" his subordinates.⁸³ In general, the lack of practice tends to make the instructor nervous, and as a consequence the students are more likely to be distracted and are not going to achieve the best out of the training session. Consequently, it is absolutely necessary for the instructors to acquire practice under guidance. There should be two principal ingredients in developing a short course to train instructors. First, there should be a thorough analysis of the methods that are going to be used with the students. The use of films, group discussions, diagrams, techniques for asking questions, etc., should all be covered. The second aspect of the training of instructors should be the actual practice among the instructors taking the course. The balance between the practice and the theory should be in a ratio of two to one. The instructors must learn to analyze why, how, and how many people are likely to learn in a set period of time.⁸⁴

There is an interesting relationship between the industry and the college professor. It has been more than 30 years since a company initiated programs in which during the summer months the professors would work in industry. Clyde E. Work reported that during the summer of 1959, there was a total of 73 firms that were going to employ 531 and 600 college teachers in their organizations. Forty-six companies said that the offer had been made to employ professors in

informal programs, while 22 industrial firms and 6 Army and Navy agencies were offering formal programs. The general attitude toward this program was that it was intended to give the professors a possibility of acquiring a broad understanding of the company's philosophy and operations, going beyond their individual job assignments. The informal offerings were much more interesting, because they left the professor with a supervisor to acquire the orientation necessary within the organization. It was intended that the professors would criticize constructively, ask questions, and operate freely. They were to "focus on reporting rather than influencing." With respect to the professor, it was intended that he should have a good look at the working environments in which he would eventually send out men. Also it might have brought some reputation for the school, without forgetting that some graduate students might enroll because of the same fact. Industry may also learn by relating itself to academic individuals. It is a good change once in a while. The teachings of the professors are benefited, because they have been able to match practice with the theory. ⁸⁵ A very interesting method of selection of professors is followed by Humble Oil & Refining Co.. It begins at a lecture committee where possible instructors are listed along with the courses which will be available. Then the technical personnel are permitted to suggest which of the professors will satisfy them as instructors during their summer courses. Once the preference list has been made out, a letter describing the courses

to be covered, traveling and living expenses, as well as local transportation, which are all furnished by the company, is sent to the professors in question. It is highly emphasized that each instructor will be permitted to teach at his pace and present the material at his will.⁸⁶ Since the professors are permitted to examine and coment upon confidential material of the company, it is not said, but may be derived, that suggestions will always be welcomed. This emphasizes the relationships between the college professor and the industrial concerns.

There are other types of men who have helped training develop, especially with respect to actual physical things such as environments, space, lighting, recognition of the great differences among the trainers, and so many other aspects that enter into training. These groups of men are the industrial training managers and the educational psychologists. They have helped management to spend its money in wiser methods so as to obtain the most beneficial training.⁸⁷ The use of these men has led us to think that industry appeals more and more to the human aspects of the individuals in order to extract their full worth. The psychological move -- that is, finding out the different ways in which the individuals work with greater satisfaction -- has been an achievement of this type of men helping industry to perform a more sensitive, humanly oriented training. Haire points out that it is very important for the leader of the training program to associate himself with the trainee, with the purpose of helping to overcome the

resistance to change, if this factor is present. Also, he stresses the importance of conveying to the trainees a sense of security.⁸⁸

There is another problem with which we are concerned before we develop a training program. This is the problem that involves many personnel managers. It deals with the aspects or forms of the training places. The work environment should always be appealing to the men that are going to undertake a training program. It is interesting to note that as far back as 1885, there were studies made of those individuals who would enter a job for the first time, and they were seated beside the trainer in order that they would learn more quickly. Also interesting is the fact that as far back as the turning of the century, we had the first learning curve.⁸⁹ This denotes that training has been on the go for quite some time. What has not been on the go for too long has been the fact that this person-to-person training is no longer possible, at least in most cases, due to the fact that in our days there are masses of people who have learned the same amounts, have the same skills, but who are suddenly displaced by new techniques.

The selection of the trainees is another delicate aspect of training, if we are to make training worth while, expecting profitable returns with the least waste of money. The basic factors which are to be examined on the employees are his capacity, his willingness, and his effectiveness. It is understood

as capacity "the ability of a person to learn". It is important that this ability be determined by the trainer with the purpose of avoiding to get a student who is incapable of learning a particular task, no matter how long he is trained at it. The factors which accompany this ability must be his intelligence, mechanical comprehension, and in general his body coordination. The willingness to undertake a training program is determined by the form on which he uses the above mentioned capacity. The trainer may judge placing the employee in the organizational climate, the relations among employees, as to work in harmonious manner. The effectiveness is also determined by the performance of the operator during his training program, simply examining the work produced. It does not necessarily follow that an employee who possess the first two characteristics is effective in his job performance.⁹⁰ Be it understood that these are not the only characteristics which determine if an operator is qualified to undertake a training program. In general the industrial social psychologists will be an unexpected aid for the trainer, since he is capable to determine the behavioral patterns of groups and individuals, and how one interrelates with the other.

Other aids which are widely used in the industrial environment as selection techniques, are the use of aptitude tests through which the company is able to determine how the applicant will fit into particular jobs.⁹¹ Furthermore, if the interests of the candidate are carefully examined it will

in the long run be very fruitful for the company's goals. A lot of time and effort should be placed on selection states

I. Harry Hyman, State Supervisor in the U.S. Department of Labor, Bureau of Apprenticeship and Training.⁹² When we referred to McNamara's experiment at IBM it was stressed that the trainee had to undertake a series of tests. One of these tests is the Wonderlic, which determines the I Q of the individuals. It is apparently sufficiently accurate when we are concerned with a distribution of the personnel available for a training program.⁹³ It was on the basis of this test that he determined those individuals who were to be in the experimental class and those who were to be in the regular course.

Planning training programs is a particularly difficult operation mainly because we have to foresee before beginning the program what we are to teach, who is going to teach, who is going to be taught, for what purposes is the training, which are the future benefits to be expected, and other considerations which will be brought up as we go along. We have covered the selection of instructors, including college professors, as well as the influence which the training managers and psychologists have upon such programs.

A typical example of planning has been carried out at Granite City Steel Co., when they realized that before training a large portion of their employees they had to be updated in the elementaries of high school, since most of them had not completed this phase of education, being unable to pursue the

training program. The company made the necessary arrangements to solve this problem.⁹⁴ I consider this planning because it reflects that a proper evaluation was carried out determining the knowledge of the employees before the program started. This means that the company was well aware of the requirements necessary, being this, in itself, one phase of planning.

Let us review a series of steps which will aid the planning phase of a training program. First, we are to know what we are to expect from the trainee at the completion of the course. We are to list the series of tasks which are required for the operator to perform once he has been trained. Then we are to subdivide these tasks indicating the manner in which the trainee shall carry on, that is, the specific way in which he is to perform these tasks. It is well understood that all the planning should be written in order to have at all times a thorough description of the training program. Second, we are to be able to determine if the trainee has progressed, measuring him during the training period. This has to be accomplished by comparing a set of standards which are to be established for each phase of the program, thus, permitting us to evaluate the trainee's progress. Third, the development of progressive steps which will guide the student as he goes along, should be set. They should be well organized and well distributed with respect to time, that is, they should not be too short nor extremely long. It is important to set the time required for each particular step, with a maximum

flexibility, permitting the necessary adjustments according to the facility of each individual. Fourth, proper spacing between the broad steps of training should be set. It appears to be that if the operator is permitted to practice what he has learned for a sufficient amount of time, when tackling the next phase of training he will be more at ease with respect to what he has previously learned, enabling him to be receptive to the following task. It is important to locate in the proper place rests periods to reduce fatigue and augment performance. Fifth, the teaching place should be considered in great detail, based on the requirements set by the particular task to be learned, as well as by the amount of money available to set up the training facilities. We shall consider in greater detail this phase in the following chapter, referring to on-the-job and off-the-job working environments. Sixth, the equipment to be used as well as the materials is a basic factor for the cost evaluation of the training program, decisive element for a managerial decision. Seventh, the length of the entire program should be left set before beginning, although proper leeway should be left for those trainees who are to perform at a slower rate than the general group. By all means, these are not all of the steps which should be reviewed, but, at least the main principles have been said.

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As a last word with respect to setting up retraining programs it must be emphasized that each learner is an individual

and should be treated as unique, although some behavioral patterns might be identifiable with the group. There is a tendency, when carrying out programs in vast numbers, to consider each apprentice as one more type of equipment, disregarding completely the human element. It is never a mistake to give the apprentice the possibility of making human mistakes, and when this occurs he should be treated in such a way that the next time he will be careful not to commit the same mistake again, but if he does by any chance, he is to be reprimanded in a constructive way. In order to reassure the learner in the process of training it is sometimes required to use "many gimmicks and much window dressing", which should not be overstressed. Such gimmicks are just a small number of appropriate words (turn, stop, well done, etc.) which are to be used by the trainer at a pertinent moment, making the trainee feel that he is being observed and guided. ⁹⁶ These gimmicks, or reinforcement techniques are very effective when not overdone, since if this occurs the trainee will suffer a notable disappointment, hindering his progress.

Types of Training

It is fundamental that we insist on the use of proper rewarding systems, in order that the training programs carry certain stimulus for the trainees, aside of the mere fact of learning new skills. The standing in the group is very important, and the use of charts which indicate progress complemented with pictures and mentions in the bulletin boards, are aids to promote effective results.

Serve the above mentioned to be held in mind as we will pursue our deliniation of the different kinds of training methods which are widely used in industry. Before we begin to classify the different methods it would be wise to review some of the most important objectives and rules of an effective program. The first step is to be convinced that the programs will help in the betterment of labor turnover, of employee morale; also, costs of supervision will be reduced, friction and irritations among the employees will tend to diminish. These are some of the main objectives. In order to accomplish them the job descriptions should be carefully studied, so a sound approach to the program may be carried out. ⁹⁷ All the other points which have been mentioned in the previous chapters should be weighed, remembering that from the industrial psychologists' point of view the optimum spacing where the trainer should stand in order that the most attention is given to each of the students, and other similar considerations should be noted. ⁹⁸

If the training programs are going to be carried out within the plant, it is important to consider whether or not the

construction of a training-ground is worth while, with the object of easing tension among the employees who are training and those already skilled working normally.⁹⁹ It is pertinent to note a series of costs which will accompany the training program, adding or supplementing to those already mentioned. The utilization of machinery, plus the the cost of the materials used compose a great part of the costs. Others are possible accidents due to the inexperience of the operators, fringe benefits, etc.,.¹⁰⁰ As will be observed the costs vary according to the method of training used.

Let us begin by analyzing on-the-job type of training programs. It is one of the oldest and simplest methods of training. The individual is to learn directly at the job or working place, being helped out by the foremen, a trained instructor, or a skilled operator. This type of training may be informal, having only a few check-ups made to observe the performance of the operator. The possibilities of training under an advisor and working with skilled employees has a series of advantages and disadvantages which should be mentioned. When the employee undertaking the training program is placed among a series of experienced men in the field, he brings the inconvenience of making the task of determining who has been the responsible of lowering the effectiveness of the group, extremely difficult. There is another drawback. The training that the employee takes is "limited to specific classes of work," not permitting the individuals to acquire the proper

concept "of the job as a whole."¹⁰¹ Among the advantages to be found in this system, we may point out that interferences with the practical production work are almost at a minimum, and that the training is extremely direct in the sense that the employee is learning only that particular job for which he is being trained and nothing else. Using advisors in the on-the-job training programs has the following advantages: There is better opportunity to examine the individual results of the training; the employee comes in contact with heads of his department and with the work in it, without the creation of any conflicts of authority between the supervisors and the instructors. We may also point out that if the advisors perform their training duties under the regular supervisor, there is a great probability that friction will not occur, and finally the supervisor will be relieved of a considerable amount of work. Among the disadvantages of the system is the fact that in general the men who serve as advisors are not very competent men, being in general, necessarily drawn from their work in order to attend the training program. This represents a reduction of well-trained men available for the performance of other duties. Also the advisors are drawn from their work to teach only very limited particular types of production work.¹⁰²

Let us examine a foreman's training program on-the-job. When a new foreman is assigned to a department he is placed under an experienced foreman, being the newcomer relieved of

all type supervisory demands. His objective is to find the most appropriate forms of carrying out the supervisory functions, thus acquiring the required qualifications while at the same time familiarizing himself with the department. The objectives when setting up such program should cover four main areas; first: the new foreman should be placed in the area where he is expected to work once he has concluded his program; second: if the program consists of several parts it is advised that he be placed on-the-job training first so as to permit to acquire the tack in handling supervisory problems; third: the element of time should be carefully taken into account, in order to avoid the operator being bored, and as to permit the appraisal of several cases which may present; fourth: in order to make more profitable the training period, the foreman is to make notes of everything he considers pertinent. ¹⁰³ This method of training foremen is very satisfactory because there is no interruption of the normal routine, except when he addresses the foreman in charge to ask him some required doubt, concerning something which he has observed.

As a good example of a fulltime time training program we may mention the one arranged by the Laundry Industry Education Board. Their training program was to last for two years, which were distributed as follows: they begin with six months of work at the industry's research station, continued, fourteen weeks on business and personnel administration, and ending the program with fifty-eight weeks performing practical work at various

laundries. There were alternatives set up as follows: those who had had practical work were offered five-day courses in which they were taught to appreciate the elements of production control, in order that discussions could be carried out with the production engineer.¹⁰⁴

The on-the-job system of training is also used in training technicians. According to George L. Beiswinger, this type of training "is less theoretical than that received in formal classes," with one great advantage: it allows a lot of improvement and flexibility. He also mentions that this type of training, when applied to technicians, is in general supplemented by formal course which are usually narrow in scope, and as a consequence they do not permit the technician to enter into areas more essential for his education.¹⁰⁵ I consider that both could be complimented, and with respect to the courses I think it is required a course which be well fit to the abilities of those who are to undertake it. This is one of the requisites of planning a training program: to determine the qualifications of ^{those} to be trained and find suitable courses for them.

McNamara mentions that for the technicians that undertook the regular course, the topics of mathematics, circuits, and others, were made available to them. I bring this out to indicate that the course are to be given according to the qualifications of those to be trained. In this case it involved operators who were to deal with computers, being very appropia-

te the subjects presented.

The on-the-job training system is not limited to semi-skilled, skilled, and technical operators, but may be used quite effectively at the management level, where emphasis is placed on the supervisory nature of the courses, limiting the training course to foremens' conferences, quality control, reliability procedures, and other similar courses. ¹⁰⁶

There is a type of training called the in-plant training, which is a variation of the on-the-job training remaining in all essentials the same. The aspect that makes this training procedure distinctive is that the training equipment is set aside from the regular production line. ¹⁰⁷ The system of using advisors and skilled employees as trainers is as popular in this method as in on-the-job training. It is mentioned that this system is the best way to train technicians of high caliber using as instructors engineers and scientists ¹⁰⁸ who may be brought from outside the company. It is important to note that this system of training has only one major purpose, that is, to allow the employee to improve in the performance of his work. This is not a training system which will permit the employee to acquire a general education. ¹⁰⁹ It is important to remark a drawback; the trainees are not forced to work at the line production pace, consequently learning only the skill hindering when placed on the line, the production rate.

As a good example of in-plant training at the unskilled

and skilled levels we may mention the case of the Sale Knitting Co., Inc. in Martinsville, Va. The company set itself the immediate goal of training 450 women. If and after this was achieved, the goal would be extended to the entire plant. They set the training rooms away from the production lines and tried to use girls who had completed their high school education, under the presumption that skill would constantly rise. In order to motivate the learner to a high degree, he was informed of his progress. They had planned to encourage the worker to reach a minimum pay of \$1.40, which would also attain the sales target. They found that the employees arrived in 28 weeks on several operations, at the minimum pay of \$1.00, but from there on they rose quite fast. They checked the steps in the training methods by the use of MTM. They concluded that their great success was due to the high motivation that they had given to the employees.

In the area of textiles we encountered the procedure of in-plant followed by on-the-job training. The weavers begin their training at a loom which is away from the production area, being helped by a trainer in the initial steps. They emphasize the use of progress reports on a daily basis. Once the trainee has acquired the fundamentals he is introduced to the production on a normal basis, not before having had the department foreman examine the capabilities of the employee when performing at the loom away from production. If his capacity for handling several looms is satisfactory, he is rewarded by the "certificate of achievement."

The separation of training activities in this system of in-plant may be for two purposes: to allow the development of productive jobs, or to remain with a training program of non-productive work. We shall attempt to delineate the advantages and disadvantages of these aspects in the program.

If we consider first the development of non-productive units, as advantages we may point out that the skilled operators in the job are relieved of annoyances created by the newcomers, quite inexperienced. It facilitates the screening of those employees who are incapable of performing the job satisfactorily. We may also mention that this system allows less experienced men to practice before they engage themselves in more advanced jobs. As disadvantages we may indicate that there is a high initial cost involved, because of the non-productive nature of the work, and also there is no immediate return, because the employee must be allowed to perform in the regular line of production where he can be frankly evaluated.

When productive work is carried on in the training section, the advantage is the following: it will theoretically relieve the officers and workers of definite responsibilities with respect to the training. There will be a tendency to have less interference with the regular work. As disadvantages we may indicate that it will be an expensive program if the number of employees that are engaged in it is small. Also there might be conflict between the authority of the supervisors and that of the instructors. Finally, there is a question of responsi-

bility which may arise. The training program and the practical work are divided responsibilities of at least two men. If a first class worker is assigned as instructor, he "may handicap the organization for which the superior is responsible in a very definite way."¹¹²

We shall now consider the other most popular method of training, so called off-the-job training. This type may be defined as that training offered by trade and vocational high schools, colleges and universities, in which the classroom instruction is complimented with shop-practice work.¹¹³ From the company's point of view we may define this type of training as "educational institutions or professional associations for special programs of various types." It is interesting to note that a report states that 35 companies with more than 10,000 employees spend on this type of training program a total of \$1,132,634,¹¹⁴ which indicates quite an interest in this type of arrangement.

As noted in the above mentioned systems of training, the qualifications of the instructors are the first and most important step. These instructors should have a complete knowledge of the course content, the length, which may vary from a few weeks to a number of years, the method of instruction and other qualifications mentioned previously. The courses may well be extended to train middle management, technicians, and professionals, as well as top management. Aside of the colleges and universities that offer these programs, there are agencies such

such as the American Management Association and the National Industrial Conference Board, which also, dedicated in some manner to the betterment of the employee, offer retraining programs.¹¹⁵ Among the type of courses which may be found, we cite the following two: Supervisory executive training, which is "aimed at improving managerial capacity and ability, especially at the executive and middle management levels."--and professional or technical programs which are set for the purpose of improving the "technical competence at the professional level."¹¹⁶

It should be noted that this system of training is in general a compliment to on-the-job training, with the purpose of allowing the management and professional employees to be aware of the developments in their fields.¹¹⁷ As a good example, IBM is a company that long ago became interested in these training programs. Since 1949 the company has been sending employees to colleges and universities, aside of making them take part in programs offered by agencies like those mentioned above. "Several hundred employees take part in these programs."¹¹⁸

With respect to the costs of these courses, the policy which is generally followed by the industrial concerns, is to cover at least half of the amounts incurred. This I believe, is a policy followed in the entire country. I have not been able to verify much in this line, except from a few sources mentioned in the footnote.¹¹⁹

The use of university facilities is very popular and is said that aside of finding qualified people, experienced in the field of teaching, the atmosphere is highly conducive to appropriate studying and learning. ¹²⁰ On the other hand, the objections presented are based on the fact that many students are not willing to attend night courses, first because of family demands and second because they consider that the time is not appropriate since they find themselves very tired after the office journey. Brennan indicates that one of the objections presented by the companies is that the part-time evening students, in many cases, create an unstimulating atmosphere, adding the fact that there is in general a wide range of motivations on the part of the students. ¹²¹ I consider quite valid the above mentioned critics, but I must add that although the afternoon courses are not as desirable as those in the mornings, sufficiently skillful teachers may convey just as much; making them equally productive.

We shall now enter into the consideration of the very useful training called supplementary or versatility training. It consists of a training system conceive for the purpose of "brushing up skills of slow operators," and also for "training operators in new skills allied to the jobs." The actual teaching performance may be carried out in two different ways: using an instructor who will teach in separate groups "in a vestibule type school," or placing the slow operator between two skilled operators, until he is able to catch up with the

normal production. The major objection to this system is that it may cause serious delays within the production line, aside of causing possible friction among operators.

The next system of training that we shall consider is the apprentice training. This system generally composed of practice combined with instruction, which is carried on for a long period of time, usually four years. The individual is to work "under qualified journey men" and is "taught in speciall equipped workshops." Many key workers are prepared and trained in this manner; some 300,000 cary such programs today. ¹²² Mr. Herbert Harig, chairman of the apprenticeship committee in the Labor Department, has said that under apprenticeship there will be a collaboration between industry and schools. He mentions thst prospective apprentices should engage in at least one year's "training program in a school before they join a company." ¹²³ In England the apprenticeship rate has increased notably during the past few years. They have averaged 70,000 during the years 1950 to 1958. In 1961 103,000 (36 % of the school drop-outs) undertook apprenticeships. This area of training has received a considerable help from all the industrial concerns which have increased their training departments. There are also some organizations dedicated to help in this area. Among them may be mentioned the Industrial Training Council and the Engineering Industries Group Apprenticeship (EIGA). One of the functions of this last group is to train a sufficient number of students and then offer them to those

industries which cannot maintain their own training centers, this way avoiding the costs which such programs carry with them. The EIGA has 1000 training places, where a number of technicians, student engineers, aside of the great majority of apprentices, are undertaking their training programs.¹²⁴ It is interesting to note the large concern which has been placed upon the individuals who are in the capacity of apprentices, especially by the different industries which assume part of the responsibilities of such programs.

Another reflecting factor which indicates the concern in the line of the apprentices, may be seen by the following example in Denmark. In general the apprentice program for the metal industry is between 4 and 5 years. During these years they worked under the supervision of a foreman. The practical knowledge was complimented by assisting to the technical evening schools, during the first three years of the program. These courses present great difficulty in being carried out because in many towns there was a small number of candidates, making the program impossible for economical reasons. Consequently the Molder Association decided to propose the erection of an educational center which would function in such a way as to solve all the problems presented. It is expected to solve all the evening course, by making the students travel to this center once every year, during the required three, but to stay only approximately six weeks undertaking intensive classroom work.¹²⁵ There are other points

which may be brought out, but I consider less important since the point has been made. There is a reflexion of concern toward the apprentice class, and support comes from all sources, public as well as private. As a last remark it may be stated that most of the European countries, have apprentice training, as mandatory.

The Junior boards of executives also occupy an interesting position among the training programs. In general they are used as devices for training top management employees. The purpose is to create committees, assigning positions which should be rotated. The rotation is to be carried out with as many employees as possible. The employee is trained in carrying out orders or performing special tasks. Among the advantages that may be mentioned when referring to this type of training, are the following: A considerable amount of men may be trained by assigning them projects directly related to their work, allowing them to acquire a comprehensive view of many company aspects, policies, and problems. Management may also benefit from useful suggestions from these boards.

From these junior boards we may enter into the conference type of training for management. This system is especially useful because of the fact that today public contact and public relations are aspects of everyday performance, and as a consequence the employees should be well trained in discussion methods. It also shows the management employees that conferences may be called very frequently under two aspects: First, that

one is interested in getting a particular point or points across to a group of people, and secondly, that one may be interested in getting some opinions in order to develop a plan for some particular use.¹²⁷ This training method allows all the individuals that participate in it to profit from the discussion of common problems.¹²⁸ Examples of this type of training exist in almost every company, because the benefit which is encountered with this exchange of ideas, has proven to be very fruitful.

Among the salesmen, the technique of using conferences to promulgate sales, is very popular. Freid presents an interesting case of how a series of potential salesmen were trained using this technique.¹²⁹ It has to be understood that this example deals with a large scale of members, while the company conferences in most cases, are limited in the size of the members.

We may now consider a new method of training which is used by many companies today. It consists of training by the use of a machine which acts as a substitute for the instructor. These machines are based on programmed instruction, which provides the students with information in a series of short steps. The students proceed at their own pace and at the moments when it is convenient for them to take the lessons. The results appear to indicate that the students may retain more than what is generally retained in a lecture course. Also the student is supposed to learn easier and faster.¹³⁰ These mechanical

systems of training have been used, so far with success, by a number of companies. The Mobil Oil and Mobil International divisions of Socony Mobil Oil Co. have been instructing their employees with equipment which simulates actual processes. The use of the machines has also permitted the company to check the reactions of the employees on situations which might never occur, or if they occurred, they would be considered as emergencies. ¹³¹ The system has failed at Bell and Spiegel companies. Some of the other companies which might be cited as examples, are Eastman Kodak and the Plumbing and Heating division of American Radiator and Standard Sanitary Corp. The latter has used the technique to boost up the sales of hydronic (hot water) heating. The salesmen are given a set of instructions which they are to answer at the end of one of the short steps in the program. If the answers are correct the machine will proceed to the next step. Otherwise, the user is to review the lesson. The results have been a reduction in training time. Apparently the system permits a more decentralized technique of training which is stated as one of its advantages. Among the problems that are found with in the system, we may mention that the cost may vary from \$2.50 to \$5,000. Also there is great difficulty in writing up the programs. It has been stated that it is useful only on limited occasions, for example to teach terminology ¹³² to the students before a training course is to begin.

The most unusual case that I have encountered in the case of the machine's use, has been in the nuclear power area. The

Berkeley nuclear power station (England), has introduced an electronic simulator with the purpose of training their engineers in controlling normal and abnormal conditions. An important characteristic of this simulator is that the trainee is not required to know any mathematics whatsoever. The advantages that have been indicated lie on the side of the nuclear power plant. It appears to be that it is very difficult to produce disturbances because the problem of safety is of major concern. Even more, the cost incurred in shutting the plant is tremendous, consequently this possibility may not be considered. Among the advantages of the use of simulators in the nuclear power stations it may be said that the simulation of plant operations, at a comparatively low cost, without requiring excessive skills, is particularly useful, although it has not been widely accepted. ¹³³ As a general objection to the use of machines in training, the general question, of how long do the trainees retain the facts taught, is what creates a general doubt.

There is another interesting, and certainly not very popular method of training. It consists of training the employee while the plant is being built. Apparently the program will permit the employees to be ready to work as soon as the machinery is installed and the production is set to roll. This training program was carried out by the Baerings Co. of America, a division of Federal Mogul-Bower of America, for their new plant at Greensburg, Ind., in collaboration with the Cin-

cinnatti Milling Co. Twenty-three employees were sent for a training program of three months. Jack Musselman, manager of the new plant, indicated that the training program had been useful because of the fact that it would have been necessary anyway once the machines had been placed in the plant. He also indicated that the start-up costs had been reduced considerably.¹³⁴

Overtraining has also been used as a system of training in those occasions where the skills that are learned have a greater possibility of being forgotten too quickly. The system is very simple. If the operator is to produce 100 pieces in his regular job, we are to teach him how to produce 130 with proficiency. This overtraining technique may also be substituted by retraining more periodically, obtaining the same results.¹³⁵

As a last system of training we shall consider, if it can be called a system at all, the sink-or-swim training technique. This method consists in placing the individual just hired on a regular production line and allowing him to learn by observation, permitting him to figure it out as best he can. The system has, if may be called advantage, the fact that the men who do survive the treatment will most probably be later on turned into very satisfactory employees. Some disadvantages are that it disrupts the production line, causing a delay in production, causing friction among fellow-workers, causing tention with the supervisor, etc.,¹³⁶ We may state that

this lack of plan may turn out to be the most expensive system of all, and we particularly recommend that it not be used.

In order to conclude this chapter on the different kinds of techniques of training, we find it advisable to indicate a series of common fallacies which are accepted because they are not spotted as such, and are being used as training systems.

First, is it true that "making information available constitutes training?" The fallacy consists in believing that a training program may be developed with the mere fact that information is made available to the employees. It should be understood that it is an unsatisfactory system when the information provided is not conveyed in some other ways.

Second, is it true that "the belief that if general principles are taught individuals will make their own applications?" This fallacy relies on the fact that it is believed that if the general principles are exposed to the employees, they will apply these when they are confronted with specific problems. If these principles are enlarged through practice, there will be a greater probability for the individual to understand the principle as such.

Third, is it true that "the idea that satisfactory results will follow instruction by persons unfamiliar with the work?" The fallacy consists in expecting that good results will be obtained when the instructors are unable to convey to the em-

ployees, in their language, the general principles required. This is a mere problem of communication.

Fourth, is it true that "the idea that constructive outcomes will result where interest is lacking?" This clearly indicates that the employees should be willing, not forced, to undertake the training programs. If this is not observed, the most elementary rule is by-passed, that is, interest. ¹³⁷

This chapter has attempted to give the insights to a number of training systems, after it has been accepted that whichever system is chosen, it should be convincing to the managerial spheres, and to the training department. The costs involved in all the systems, vary considerably from one to another, thus providing the training manager to determine the most convenient system if a strict budget is placed upon him.

The on-the-job training method was indicated to be informal in relation to the other systems, since it requires a few check-ups as the process goes along. The advantages and disadvantages were delineated, illustrating the points by some examples. The in-plant, variation of the on-the-job, was shown to be a very expensive system if it is not well handled, and carefully planned. Some successful examples indicated the areas of possible use. The popular method of the off-the-job training, was illustrated when applied to technicians, for the skilled category, the professionals, and then to the spheres of

management. The relation of the college professor with the industrial concerns was highly emphasized, since both areas gain considerably in their interrelations, and cultural exchange of ideas. The apprentice programs were emphasized as to indicate the actual concern for the young generation of unskilled, manifested as aid through the private as well as the public concerns. The Junior boards, the conference method, the training while building, the overtraining, the sink-or-swim policy, plus the use of machines as training aids, indicate that the originality of man is never ending, and that it will always do the best possible as to communicate the ideas from ^{one} to another. The conclusion is a series of fallacies which if properly meditated, will lead to the discovery of many errors which are carried unconsciously in many training programs.

The Federal Government's Concern

A complete analysis of the training and retraining problem would not be complete unless we review some of the solutions which have been proposed by the federal government, with respect to the unemployment situation.

We shall begin by stating that the rate of unemployment is "close to 6 % of the labor force." The percentage has been similar in the past years, indicating that there are too many workers, especially unskilled operators, who are displaced by automation and other technological advances. ¹³⁸ The figures in June of 1961 stated that 1.8 million workers had been jobless for at least 15 weeks, and that 900,000 had been out of work for more than six months. The Federal Government, at that time, was trying to pass a package through Congress (Kennedy Administration), which would aid the displaced worker. The three main points requested were: a) that a free hand to locate, b) to train, c) and to find employment for those displaced, be granted. "The most ambitious part of the entire request (is) was the administrations manpower development and training bill, which will permit the government to help the unemployed who already have lost cut, even in healthy industries." The Secretary of Labor, Arthur J. Goldberg, has stated that the Government realizes, industry alone, cannot cope with the problem. The research has indicated that the most acute unemployment is occurring in the unskilled and semi-skilled coal miners, the textile workers, the steel workers, in the auto industries and ¹³⁹ other manufacturing concerns.

I should state, as background to the interest taken by the Government, that most of the unemployment began to occur after the Korean War, as a result of many industries changing locality and/or automation being implanted. In order to cope with the problem, Congress passed the above mentioned package, to be known as the Manpower Development and Training Act of 1962, (MDTA). The Area Redevelopment Act of 1961, has been considered of little or no use, leaving the public to comment on the most recent act, the MDTA.

Before the passage of the MDTA it was industry alone, which handled the problem of retraining. In a number of cases failure instead of success was the product. Among these we previously mentioned the case of Armour & Co., and it is not meaningful, to bring up the case of the Connecticut's Community Action Plan. The purpose of this program was to retrain some of the 12,000 unemployed of the Bridgeport area, who were mainly unskilled and semi-skilled operators. It was considered that training them in the semiskilled operation of machine shop work, would permit many of them to find jobs. Out of the 4,400 job applications which were initially considered, only 1,500 were interviewed. Out of these, 1/3 indicated that they were not interested, another 1/3 were rejected on the grounds of unsuitable. The remaining 600 were to take a series of tests administered by the United States Employment Service, but unfortunately 200 did not appear, and 250 failed to qualify satisfactorily in the tests. Of the 150 remaining, 56 for one reason or another, failed to complete the course, leaving the sad result of only 84 trained men from an original amount

of 4,400 available, potential trainees. This leads us to indicate that one of the main problems encountered in these types of retraining programs, is the lack of skills, unabling many to fill the jobs available in their respective communities.¹⁴⁰ One of the aims of the MDTA was to secure a solution to problems similar to the one just referred.

The first effort of the MDTA was to retrain those who had been displaced by automation or by plant closings. It was discovered that most of the men that fitted this category were between 45 and 60 years of age, and further more, many had a limited education. The age and other factors led the officials to disregard this group as possible retrainees for skilled jobs. The new focus was towards the young individuals, being in this area equally unsuccessful, since most of those who compose this age group are school drop-outs, lacking in most cases, the ability and capacity to undertake the school work. Daly sustains that although the goals of the MDTA are legitimate, the programs "are not achieving their aims."¹⁴¹ Before attempting to show other examples and opinions, which express the contrary view, let us continue to expose some more faults.

Jakubauskas sustains the same views as Daly, indicating that the unemployment figures show older workers remaining unemployed for longer periods of time, in comparison to the young generation, which are confronted with the same problem. Despite this fact, he makes it quite clear that the lack of education, skill, and others among this group, will hinder consi-

derably the efforts done toward employment and retraining. ¹⁴²

Among others who are pessimistic, we find A. H. Raskin, who has indicated that the program "is still moving slowly in terms of workers trained and placed in jobs." He also recognizes the incapability of many of the possible candidates, due to their ages and lack of formal education. ¹⁴³ On the other side we find good figures to support the MDTA. The fact that the Act covers the expense of teachers, materials and classrooms, plus the fact that it shares with industry a large portion of the costs incurred, permits us to state, with satisfaction, that up to July of 1963, 60,000 workers were being trained in trade schools, although there appears an inclination toward training on-the-job, instead of trade schools. It is expected that 140,000 workers will be trained by the month of July 1964, arriving to 370,000 by 1965. ¹⁴⁴ A supporting example is the case of the Granite Steel. Between the company and the Government, they are splitting the total cost of \$40,000 required to carry out their retraining program. It is important to note that the above mentioned cost includes materials and equipment, trainers training, plus other administrative expenses. This is brought out, to indicate that the Government realizes the necessity of aiding all the way. The company, through the Training Supervisor, Mr. Garst, indicated that such a program would have never been carried out if it had not been for the Government's support. Another point which was helpful in the success of the program, was management's support, since they foresaw the need of a training pro-

gram. The union's co-operation is also worth mention, since they encouraged their members to sign up, being this an indication of labor unions support to Federal Aid when retraining is concerned.¹⁴⁵

It is important to note that the industrial concerns who find it difficult to retrain certain people, are now tending to "rent" or hire temporary help. It appears to be that in many cases it pays off to have qualified men on a temporary basis. In some cases, such as ^{the} example from General Electric, division of Ontario, California, the men who were hired on this basis were retired individuals, with a vast experience. The Manpower Inc., and the Kelly Girl Service appear to very much in the alert, expecting a high demand very soon. It is stated that there is no problem finding the qualified people. A representative from Manpower stated that "number of both nomadic personality types and the older retired men are increasing."¹⁴⁶ We must add that this utilization of wasted manpower is not surprising, since someone was bound to realize it. A man at 65 is not necessarily incapable, although he has been forced into retirement.

The head of the newly created office of Automation and Manpower in the Labor Department, Seymour Wolfbein, has proposed that if industry could manage to place the unskilled workers one step up in the ranking of work, "thereby freeing better trained workers to learn even higher skills," a possible solution to the problem could be found.¹⁴⁷ We consider that this method has a major drawback with the following consequen-

ce. If we are to continue training individuals up the ladder, we will arrive to the professional level, being these the ones to suffer, because they cannot go any higher, adding in this manner qualified men to the ranks of the unemployed. I think that this has been the case at R.C.A. where a great number of professionals were laid off.

The other aspect of training programs sought out in advance, in sufficient quantities, will permit industry to have skilled people, their actual demand; also entering into the category of "rented", described earlier, since they will be available at the time industry needs them. Mr. Goshen also points out, that the system of planned training will "put an end to 'pirating' of workers," which is particularly evident among professional and technicians.¹⁴⁸

The theory which sustains that the centralized system of training should exist has two aspects. First, if this type of program is carried out, it is limited in scope to the more or less general aspects of training;¹⁴⁹ Second, as shown by General Electric, in which the first point is sustained, that is, it is too general, leads to the necessity of local training programs based on local needs, and adapted to local conditions.¹⁵⁰ The efforts which have been made by the industries to solve this problem, may be indicated by the series of examples in which training was done on a local basis as need arose, being quite successful. We may cite Dupont with the production of Dacron. Before, the company had been producing viscose rayon;

when the production of this product ceased, the company retrained all of its working force, except 14 % who were helped to find new jobs. The Xerox Corporation has been highly praised by its union after spending \$100,000 in retraining personal eligible for other jobs within the company, avoiding in this way any lay offs. Goodyear Tire and Rubber Co., in Akron, Ohio, has three of its six floor Goodyear Hall building entirely devoted to general training.

Another phase which might help in this general problem comes from Professor George S. Odiorne, director of the University of Michigan Bureau of Industrial Relations. He states that if, in a very controlled form, in order to prevent some industries from taking advantage, a tax reduction is given to the companies that will initiate retraining programs, the companies would undertake these programs with even greater emphasis, because of this facility.

The Union Carbide Co. has had a program in which it has been moving into automation in a very cautious way. It has been retraining as the need has arisen. It has considered that the manpower surplus is being absorbed with retirements, deaths, and voluntary leavings. This has led us to think that if all the companies in this country dedicated themselves to such a policy, there would be a moment in which they would not be able to hire any of the new college graduates, because their surplus would still be too big. As a consequence, we would begin to have unemployment directly from the state of college. This would be

unbearable.

We have reviewed in this chapter the difficulties which the industrial concerns have had with retraining programs. The fact that unemployment continues to be steady, 6 % of the labor force, led the Government to seek for solutions. The Manpower and Development Act of 1962 was review and criticized^{ci}, showing the failures by the use of several examples. How expenses are shared by both Government and Industry indicated to be a very favourable point, despite all critics. The ambition of the Act to locate, train and find the necessary employment are classified as very legitimate goals, although in many cases the allocation to new jobs was impossible, because they did not exist. The National retraining program was compared to the Local, giving indications that the latter would be more helpful since there is more possibility to retrain for the required jobs in the community, with greater depth. It may be concluded that the efforts manifested will, despite all imperfections, retrain a large number of individuals, helping in this manner to solve the general problem of unemployment.

The Problem in Europe. Brief Review

Our research has indicated that the United States is not the only country which is faced with the problems of training and retraining. We shall take a very brief glance at a few European countries, seeking new possible solutions.

Let us begin with England. The Federation of British Industries, (FBI), through its Educational Committee has been very concerned about the education of technologists and of managerial personnel.¹⁵³ They have the following systems for providing management education and training. These systems are developed "within individual firms and within particular industries," cooperative arrangements being established among the firms with voluntary and professional bodies, "education carried on at technical colleges, at residential adult educational colleges and at universities."¹⁵⁴ Aside from this, the Minister of Labor, Mr. Hare, has had a program set in action, in which his principle objective is an industry-by-industry training boards. With them is accompanied the creation of a series of training centers all over England, in order that men may be taught new skills. The interesting point is that at first sight this program sounds very appealing, but somehow the unions are not satisfied, and what is worse, the industry isn't either. Industry insists that the problem pertains ^{to} them, and as a consequence, the government should stay out. With this general situation and the government being highly criticized, the training situation in England is "maddeningly out of date," although it is admitted that it has been "toyed with in the past five years." This is the first country in which we

see that no definite solution has alleviated the problem.

From the other countries we know the following. In Sweden the employer's confederation has a training center of its own, in which a training program is carried out for industrial training supervisors. In Denmark, as we reviewed earlier, the different associations attempt to cope with the problems which arise in the particular specializations. In Germany, the training programs have been taken into consideration to such an extent, that they have arrived to a point in which if an apprentice fails the national proficiency examinations, he may sue his employer under the charge that his training has been inadequate. In the Netherlands, the central government gives the individuals undertaking retraining programs in the state schools, 80 % of the unskilled laborer's rate in the trade in question. In Italy, the Ministry of Labor, has devised a system in which the techniques of training may be studied while performing the practice. The training centers for instructors have been attached to the apprentice training schools. In Switzerland, a Federal Act as old as 1933 declares the apprenticeship courses which have to be taken previous to the specified jobs, being the duration of the training programs also indicated. It is presumed that reforms have been made in order to cover all of the techniques. In France, the state-run "colleges d'enseignement technique" take care of teaching one third of the skilled workers. The colleges have been set up according to regional requirements, and there are 900 of these.

Our very modest review of how other countries which face this same problem of retraining in order to cope with the modern requirements, has permitted us to recognize the value of governmental aid, without which we consider most of the retraining programs of a vast nature, completely impossible. It demonstrates that industry alone is incapable, requiring a large support. We tend to notice a stricter form of regulation, in the acceptance of students, but there is no support for this statement.

Conclusions

The purpose of this thesis has been to gather in a coherent and consecutive form, a large amount of material which deals with training and retraining of personnel. It should be mentioned, that I did not encounter in my research for this thesis any paper or book which attempted to deal with all the phases of the problem at once. If one author is to deal on the recognition and need for training, the next will deal with the costs involved, stating that the important thing is to overcome the fear of spending when carrying out such programs. Others devote large paragraphs to the importance of the supply and demand of personnel for the coming decade, stressing the fact that the middle management positions will be, to a considerable extent, occupied by capable females. The unity between education and training is another of the phases which is never forgotten, mainly because of its importance. The functions to be performed by the colleges and the professors in them, is highly stressed. The difference and the confusion between the roles of the scientists and the technicians, is another factor which appears to be prevalent among many authors, emphasizing that the role of the engineer, among others, should not be by-passed, since they are the ones who accomplish the discoveries carried out by the scientific minds. The planning requirements so as to carry out a satisfactory training program, is one of the phases, if not the most important, which is repeatedly covered. It is here where a division of tasks takes place, being always able to permit the learner a gradual comprehension of his new job. The po-

sitive recognition of good performance while carrying out the training program, is highly emphasized by the industrial social psychologists who have recently entered into the picture of training, considering it another area where the human behavior is of the utmost importance. The problem of the school drop-outs is one of major concern for many authors, mainly because they are increasing to such proportions that if something is not done to help them, the "disemployment" will be large. The waste of manpower has not been forgotten, since many have realized that the simple fact of arriving at the age of 65 does not disqualify the individual to continue with a satisfactory performance of the job which they undertake. Other authors prefer to remain in the area of the specifics, meaning, the analysis of the different types of training, whether on-the-job or off-the-job, and so on and so forth. The solutions which are found by many of these authors deal only with the particular industrial concerns which they have used as examples, being this insufficient. Very few forget to criticize the Federal Government, although great efforts are being made on their part, to seek for a satisfactory solution to the problem of unemployment through training and retraining. The unity of these and many other concepts, which are treated frequently but never in a vast form, has given the proper value to this thesis.

It has been proven in many forms, that once an individual is given proper attention, satisfactory results are obtained from him, in this case manifested through higher pro-

ductivity. This is a concept which has to be applied thoroughly if these programs are to be successful. The possibility for an employee to understand his job, backwards and forwards, gives them a better grasp of technical requirements, with which modern society is so concerned about. It is in this light that I propose as a solution to the problem of training and retraining of personnel, so they may acquire the sufficient skills as to not become obsolete, a correct balance between the contributions of both management and the Federal Government. I believe that the programs should not be carried out on a national basis, because if this is the case, we will sacrifice depth. The problem should be attempted entirely on a local basis. It should be made a responsibility for every company within a community to retrain the personnel which they no longer require in some jobs, into others, and if these do not exist, make them exist by expanding their particular markets and facilities. Furthermore, they should be responsible, if the above is not possible, to allocate all the manpower they train, within the other industries of the locality, not distant, because in general the individuals involved will not want to transfer since they have settled, in the full sense of the word, and are not willing at the age of 40 or more, change to other communities which will require them to be involved in new surroundings, new neighbours and others, conflicting with their personal interests. It should be understood, that the most important point is to keep the manpower available through retraining, being this to the advantage

of both the companies and the individuals concerned. The function of the Federal Government should be to allocate funds to each individual company, the way they are now doing, in order to share the costs involved. Beyond this point, their job is to set up apprentice centers, to cope partially with the drop-outs. A law should be attempted to restrain all those individuals who do not have high schools degrees, from being hired in jobs, even if it involves semi-skilled jobs, (a bracket which we have observed is tending to disappear). These compulsory apprentice centers would definitely make many of the potential drop-outs reconsider their positions. The objective is to gain time, removing a large portion of the incompetent labor force, while at the same time we continue the introduction of automation and new technology, training and retraining the existing unskilled operators and placing them in new jobs. The actual retired professionals should be given a chance to teach at these apprentice centers, thus, helping to solve their obsolescence.

FOOTNOTES

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