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Effectiveness of training programs for graduate engineers

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EFFECTIVENESS OF TRAINING PROGRAMS
FOR GRADUATE ENGINEERS
BY
V.C. RAJASHEKAR

A THESIS
PRESENTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE
OF
MASTER OF SCIENCE WITH A MAJOR
IN
MANAGEMENT ENGINEERING
AT
NEWARK COLLEGE OF ENGINEERING

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Newark, New Jersey

1972

ABSTRACT

This thesis represents an investigation of effectiveness as a result of engineering training. The basic elements of effectiveness and its learning process are explained and said that the effectiveness could be learnt and improved.

The term training, is basically the process of education and training. But training cannot be performed as an individual, but is performed as a group. Therefore training a group with having so many individuals needs careful consideration in designing a training program.

In order to get the broadest possible picture of current thinking and current activity in the area of company training programs for graduate engineers, a survey was conducted. This survey consists of a questionnaire so designed to obtain the answer on which basis the effectiveness and the need for an effective training program could be determined.

The questionnaire along with a covering letter was sent to one hundred and one companies. Out of one hundred and one questionnaires sent, a total of forty two have answered and returned the questionnaire which accounts to 41.58% of total participation. After

recieving the answered questionnaire the author visited three companies personally and discussed various aspects of training.

To sum up the survey and personal visits, it could be concluded that there is a need for an effective training program. Because the management set up their goals and objectives, but it needs careful evaluation.

The process of learning again is an individual matter as such the teacher - whom is called as trainer, has the prime responsibility of training the graduate engineers more effectively so that they could be useful both to the company and to the society.

The engineer as an engineer has created wonders in the technology and now he has to face and resolve the consequences of engineering innovations. The concept of social problems is not appealing to every industry, as such this fact was enlightened.

The engineer has a great future. Hence training the engineers should be considered as a prime responsibility because engineer has many changing roles to play such as supervisor, manager and up.

The element of selecting a potential teacher as a trainer and training him to become a efficient trainer, would be the major success to-wards effective learning.

A training program, has been developed in general but certain guidelines has been indicated by which means the industry could develop and establish an effective training program.

It is the conclusion of this thesis that by means of an effective training program, every engineer will become more efficient to their industries and to the society in solving their social problems, so that the dream of having the cleaner atmosphere and healthy living will come back to the world again. A periodic evaluation and re-establishment of training program will be of more beneficial to the individual and to the company.

It is the sincere hope that majority of the business and industry will work as a team in solving to-day's social problems by utilizing the engineer's effectively.

Certain guidelines were developed which is to be followed in establishing the training program. The steps for establishing and adminstering the programs were spelled out. By following these steps the author is confident that the industry could develop the author's proposed effective training program to suit their changing needs. Adhering to these two predominant factors any addition would increase the effectiveness.

It is imperative to evaluate the effectiveness periodically and revise or review the training program to maximize effectiveness.

APPROVAL OF THESIS
EFFECTIVENESS OF TRAINING PROGRAMS
FOR GRADUATE ENGINEERS
BY
V.C. RAJASHEKAR
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PREFACE

The graduate engineer is potentially valuable in to-day's industry and business, since he possesses those qualities which are necessary for creating new inventions and to solve to-day's social problems. The engineer is also valuable as a supervisor and as a manager. Therefore, the purpose of this paper is to study and report on the problems of training for effectiveness and needs of an effective training program and to develop an effective training program to be used by industry for training engineers effectively.

In order to obtain accurate information on this subject, it was necessary to first obtain pertinent material from all the available sources. These sources consisted of text-books, magazine and periodicals, and company publications. Upon conclusion of this phase, the material was analyzed and placed in its proper sequence thereby forming the basis for chapters one, three, four, five and six.

In order to get the broadest possible picture of current thinking and current activity in the area of company training programs for graduate engineers, a questionnaire along with a covering letter was sent to one hundred and one companies. When the answered

questionnaire was received, the author visited three companies in person and discussed their thinking, their feeling toward the research. These results were placed into proper categories. This information is shown in chapter two.

By utilizing the questionnaire results and the additional background material, a training program was developed and outlined in chapter seven.

With the use of guidelines and the training program, the industry can vary the program according to their needs, but to make it effective, the author stresses the maintainability of the guidelines along with the proposed program.

The conclusion and recommendations of this thesis are set forth in chapter eight. They represent an evaluation of the material presented in the bibliography and appear as the author perceived the complex of the written word.

Critical evaluation, billed as chapter nine, serves a most important function of this thesis. Two men, at discrete management levels at the Western Electric, Manufacturing Engineering, Kearny, New Jersey, were then asked to render their personal evaluation of the material.

The author feels that their words, which reflect years of academic and industrial experience, contribute immensely to the worth of this thesis.

The author wishes to express his gratitude to Professor Joseph A. Rich for his invaluable help and guidance in the preparation of this thesis.

Grateful acknowledgement is also made to his wife, Nalini, for her aid in typing and proofreading, and no less for her patience, preservance and thoughtfulness without which this thesis would not have been possible.

V. C. Rajashekar

May, 1972

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CHAPTER I

INTRODUCTION

The purpose of this paper is to study and report the effectiveness of current training programs for graduate engineers and to develop an effective training program for graduate engineers.

In order to assess the effectiveness, several approaches could be used. A preliminary investigation seemed to indicate that it might be difficult, if not impossible, to assess the effectiveness of training.

After a careful thought and deep thinking towards the problem, it seems that a fair solution to the problem could be found, and thus hope to establish an effective training program.

APPROACH TO THE PROBLEM

In order to obtain accurate information on this subject, the author decided to use almost all the sources available. These sources consisted of text-books, magazine and periodical articles, company publications, answered questionnaires and brochure of current training programs from companies throughout the United States and personal visits to the companies.

The investigation clearly indicates that these were the valuable sources and the material is relevant to the subject.

The reader will find that almost all references in the bibliography deal with training in general, however, none have discussed the relevance of effectiveness.

EFFECTIVENESS

The term effectiveness may be simply described as the ability to get the right things done. High intelligence is common enough among engineers. Imagination is far from rare. The level of knowledge tends to be high. But there seems to be little correlation between a man's effectiveness and his intelligence, his imagination or his knowledge.¹

Intelligence, imagination, and knowledge are essential resources but only effectiveness converts them into results.²

Why we need effective engineers

The obvious answer is effective engineers are needed to perform their duties and responsibilities in the right way and to increase the organization effectiveness.

¹Drucker, Peter F., The Effective Executive, p. 1.

²Ibid, p. 2.

For manual work, only efficiency is needed, because it is, the ability to do the things right rather than the ability to get the right things done. There is a method to measure the efficiency, but there is none to measure the effectiveness. One reason for this neglect is that effectiveness is the specific technology of the knowledge worker within an organization.

"To day, however, the large knowledge organization is the central reality. Modern society is society of large organized institutions. In every one of them, including the armed services, the center of gravity has shifted to the knowledge worker, the man who puts to work that he has between his ears rather than the brain of his muscles or the skill of his hands. Increasingly, the majority of people who have been schooled to use knowledge, theory, and concept rather than physical force or manual skill work in an organization and are effective in so far as they can make a contribution to the organization."³

Now effectiveness can no longer be taken for granted. Now it can be no longer neglected.⁴

Working on the right things is what makes knowledge work effective. Knowledge worker thinks well and keeps thinking, is his specific work. The knowledge worker produces something that is effective by itself. He produces knowledge, ideas, information. The knowledge worker, therefore, must do something which a manual

³Ibid., p. 3.

⁴Ibid., p. 3.

worker need not do. The knowledge worker is the one "factor of production" through which the highly developed societies and economics of today -- the United States, Western Europe, Japan and also increasingly the Soviet Union -- become and remain competitive.⁵

Education is the one area, in which the richest of all societies, the United States, has a genuine advantage-- provided it can make the knowledge worker productive, and productivity for the knowledge worker means the ability to get the right things done. It means effectiveness.

Can effectiveness be learned

If effectiveness were a gift people were born with, the way they are born with a gift or music or an eye for painting, we would be in bad shape. For we know that only a small minority is born with great gifts in any one of these areas. We would therefore be reduced to trying to spot people with high potential of effectiveness early and to train them as best we know to develop their talent. Therefore effectiveness can be learned.⁶

Effectiveness, in other words is a habit: that is, a complex of practices. And practices can always be learned. Practices are simple, acceptively so: even a

⁵Ibid., p. 5.

⁶Ibid., pp. 20-23.

seven-year-old has no difficulty in understanding practice. Practices one learns by practicing and practicing and practicing again. By doing this, there is no reason why anyone with normal endowment should not acquire competency in any practice.⁷

Organization effectiveness

"No longer will our personnel and sales directors tolerate vague goal setting from their training units, training project proposals which are faddish and just nice to do, and men in their training departments who still confuse being efficient with effectiveness. Peter Drucker has underscored the need of managers to examine projects and proposals for effectiveness, not efficiency.....the criticalness of doing the right things, not just things right. There is nothing so useless in training thrust as doing things with great efficiency which should have not been done at all!"

Training programs can no longer be considered and constituted because they are inspirational or conform to 'the way we have always done training'. Each and every training thrust must be put on trial for its very life. The '70's, points out Peter - Drucker, is the time to remove training program clutter. Training program clutter dissipates effectiveness, monies, and the vital time of our employees to utilize their personal and organization resources for improved effectiveness."⁸

Increasing effectiveness may well be the only area we can hope significantly to raise the level of engineer performance, achievement, and satisfaction.

In order to achieve this, one of the technique has

⁷Ibid., pp. 20-23.

⁸Silber B. Mark., "Sunergy ----- Behavioral Sciences, Organization Effectiveness and The Training Professional," Personnel Journal, February 1971, p. 151.

to be used by the organization. This technique will be to train engineers effectively, and thus increase the effectiveness. But if engineers are trained more effectively, then in turn the organization effectiveness will be increased. However the performance of individual organizational members is clearly dependant on both their ability and their motivation.

The performance of an organization is dependant on the extent to which the actions of its parts are coordinated with one another and adjusted to changes in its environment. The motivation of individuals is a necessary, but by no means a sufficient, condition for organizational effectiveness.

The ability to perform depends on one's self-development, creativity and his attitude and behavior. These factors should only be considered a necessary supplement to-wards organizational effectiveness.

Effectiveness thus deserves high priority because of the needs of organization.

MOTIVATION

Motivation is not a manufactured item. Motivation is woven within the fabric of the corporation and its organization. Information and motivation is part and

parcel of the knowledge of the manager and his subordinates.⁹

The problem of motivating people has been studied since the first foreman told the worker to increase his production. During all these years, the two most often used theories are in terms of Maslow or Herzberg models.¹⁰ Because these two models are the most popular, a comparison of the Maslow and Herzberg theories will serve as a basis of motivation knowledge as it is used today.

A chart taken from K. Davis, Human Relation At Work (see appendix) will serve as a guide to the comparison of the Maslow and Herzberg theories. Maslow assumes that any need can be a motivator if it is relatively unsatisfied. Herzberg argues that only the higher order needs serve as motivators and that a worker can have unsatisfied needs in both the hygiene and motivator areas simultaneously.

It can be seen that two basic considerations have been overlooked as far as the modern business is concerned.

1. The fact that there is no tie-in to motivation and achievement of organizational objectives and
2. that neither theory makes allowances for individual differences in motivation.

Dr. John B. Miner defines as follows:

⁹Svenson, L. Arthur., "Moratorium On Motivation", S.A.M. Advanced Management Journal, April 1971, p. 26.

¹⁰Hunt, J.G. and Hill, J. W., "The New Look In Motivation Theory For Organizational Research", Human Organization, 28: 100-9, Summer 69.

".....Motivation is largely an emotional phenomenon, and human behavior desires almost entirely from the interaction of positive and negative states, including-it is important to note - both those anticipated and those actually experienced. We act and talk as we do largely because we expect that we will achieve certain events and conditions which will provoke pleasant emotions with us."¹¹

In light of this definition, it may be concluded that motivation is concerned with human interests, desires and wishes; with impulses, intentions, wants and drives; and with attitudes, as well the impact of attitudes upon all of the foregoing. In short, motivation is concerned with the entire person, both on and off the job. Since motivation is concerned with behavior and since both on- and off-the-job behavior influences productivity, then management is inescapably concerned with motivation.¹²

But the question is, how are engineers different from other members of the labor force?

The basic philosophy in the Wagner act was that there were two kinds of people in the industrial world - employees; Perhaps for the very simple reasons that people are people. But an engineer as a professional is definitely a part of management and is different from the other members of the labor force.. Due to the lack of

¹¹Miner, B. John., "The Management Of Ineffective Performance," McGraw Hill Co, 1963, p-72.

¹²Ibid, p.72.

evidence on this problem, it is very difficult to conclude one thing or the other, but it could be pointed out that there are some important differences between engineers and individuals in other occupational groups.

There can be little doubt that "man is a wanting animal". This is to say that man wants, and wants, and wants: his wants are insatiable.¹³ The engineers as professionals tend to be more concerned with achievement, with power, and with money and status.

"A positive theory of motivation - if it is to be effective - must be based upon the premise that people differ significantly, each from the other, in a great many respects. Individuals differ, for example in terms of skills, abilities, capacities, and basic mental abilities; In personality, motor abilities, available energy, and stamina; In education, training, experience, and cultural levels; and most important of all, in interests, levels of aspiration, aggressiveness, and drives. They also differ in their needs and wants and in their willingness to satisfy them. Therefore, motivation should be given primary emphasis, if proper consideration for the individual is to be achieved in such manner as to be beneficial both to the person and to the firm."¹⁴

Similarly there is considerable variability among members of any occupational group, and predictions of the motivations of a particular from a knowledge of his occupation, or of his occupation from a knowledge of his

¹³Darr, W, John., "Motivation And Morale," Two Keys To Participation, Personnel Journal, June 1968, P. 389.

¹⁴Ibid, p. 389.

motivations, cannot be made with much accuracy.

"But, the creative individual is self-directed. This self-direction is a natural outcome of his motivation by the higher levels of esteem and self-actualization rather than biological, safety or social needs."¹⁵

ABILITY

The term ability may be simply described as one's capacity to perform his functions in a systematic and successful manner.

A noted Psychologist S. Dodd, said, "for a working concept, intelligence can be thought of as ability to achieve after comparable training."¹⁶

Another Psychologist D. Wechsler, said, "Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal with his environment."¹⁷

Intelligent is an improving factor which greatly varies from individual to individual. But the research report conducted to determine the relative intelligence of members of different occupational groups have shown that engineers rank high on the list. A superior mental

¹⁵Suojanen. W. Waino., Stephen Brooke., "The Management Of Creativity", California Management Review, Fall/1971/vol xiv/No 1, pp. 17-23.

¹⁶"A Profile Of The Engineer", Research report, A service of Deutsch and Shea Inc., p. 2.

¹⁷Ibid, p. 3.

ability is the outstanding characteristic of both the competent professional engineer and the successful engineering student.¹⁸

SELF DEVELOPMENT

Self development of the effective engineer is central to the development of the organization. It is the way to-ward performance of the organization. As they work to-ward becoming effective, they raise the performance level of the whole organization. As a result, the organization not only becomes capable of doing better, it becomes capable of doing different things and of aspiring to different goals. Organization are not more effective because they have better people. They have better people because they motivate to self-development through their standards, through their habits, through their climate. And these, in turn, result from systematic, focused purposeful self-training of the individuals in becoming effective engineers.¹⁹

CREATIVITY

Creativity is a process, which starts with finding a problem and ends with a solution satisfactory to the

¹⁸Ibid, p.5.

¹⁹Drucker, Ibid

ultimate user. It is also a quality that is often difficult to detect.

Creativity, once considered a handicap or luxury in many jobs, is rapidly becoming a highly desirable asset or even a requirement.²⁰ Creativity, no matter of where it is found, appears to follow no fixed rules. It adheres to no formal patterns of logic.²¹

Creativity is a matter of individual style and the courage to take chances as much as it is anything else.²²

"When a representative from industry is selecting college graduates for employment, if he should ask the dean of students: 'Does this young man have ingenuity or creative ability?' too often the answer is: 'I don't know, there is nothing in the college course which gave him a chance to show it.'"²³

Engineering is both art and science. Perhaps the artistic creative side of engineering is not receiving the emphasis which it should.

Practically everyone is creative, but to widely

²⁰Yoder, D., "Innovation Is In," Stanford Graduate School Of Business Bulletin, Volume 36, No.1, 1967.

²¹Suojanen., op.cit., pp.17-23.

²²Nash, M. Michael., "Intelligent Reading For Self Development", Personnel Journal, Nov 1971, pp. 861-866

²³Stevenson, A.R.Jr., "Creative Engineering", American Society Of Mechanical Engineers, 1944, p. 1.

varying degrees. As such, development of creative ability in young engineers is a responsibility that every industry has recognized for some years.²⁴

It must be realized that while men can be trained in the supporting sciences of engineering, it is extremely difficult to provide training in the creative phases of the profession. Men can be inspired, led or tutored in creative work, but the discipline and training of a formal course is scarcely applicable. Consequently, the creative side of engineering is very apt to be neglected in college work. It will not be too hard to establish a creative-engineering programs, with the principal objective of developing and revealing creative talent in young engineers.²⁵

The engineering schools is not giving greater emphasis in educating for creativeness. "Perhaps one day we will stop educating for conformity and start educating for creativeness".²⁶

²⁴Morgan, S. John., "Improving Your Creativity On The Job", A M A, Inc, 1968, pp. 18-45.

²⁵Johnson, W. E., "What Industry Can Do To Develop Creative Avility", Creative Engineering, 1944, pp. 10-11.

²⁶Jay Anthony, "Management & Machiavelli".

ATTITUDE AND BEHAVIOR

To day, training and management development aims to change behavior of all levels of management from the foreman to the president.²⁷

The term attitude can be defined as a manner of acting, feeling or thinking that shows one's disposition, opinion etc., about something.

Webster defines behavior as: "A mode of conducting oneself. The way in which an organism, organ acts, especially in response to stimulus."

Considering that a fresh graduate engineer whose behavior in the college days was only to achieve success in his educational effort so that he could get a good job. Once he gets a job, he is more secured and will start looking into the things in a defferent fashion. But his attitudes and on-the-job behavior should change, for the simple reason of achieving success in his future, and to achieve greater confidence with his sub-ordinates.

After examining many professional writings and discussions, it could be concluded that it is very difficult to achieve attitude change and behavior change. But there is a constant research going on and the modern training

²⁷ Wohlking Wallacw, "Attitude Change, Behavior Change", California Management Review, Winter/1970/volXIII/No. 2, p-45.

directors are very eagerly looking forward to offer alternative models and approaches to achieve attitude change and behavior change for improving organizational effectiveness.

SUMMARY

Training for effectiveness is not a easy task. But surely it is the prime responsibility of to-day's Business and Industry.

Effectiveness is surely one of the basic requirements of effective organization and in itself a most important contribution to-ward organizational development. Because, "Modern society depends for its functioning, if not for its survival, on the effectiveness of large-scale organizations, on their performance and results, on their values, standards and self-demands."²⁸

It is quite clear by now that, effectiveness can be learned and can also be increased, by using the right techniques. The dependable factors such as motivation, ability, creativity, self-development, attitude and behavior, are variable factors and has greater impact on building effectiveness.

²⁸Drucker, op.cit., p.171

The motivation of knowledge worker depends on his being effective, on his able to achieve. If effectiveness is lacking in his work, his commitments to work and to contribution will wither, and he will become a time-server going through the motions from 9 to 5.

Hence effectiveness plays a big role in to-day's Business and Industry. It deserves greatest priority as the tool of the individuals and as his access to achievement and performance.

Practically, so far, there has been no research work done on effectiveness, as such the author feels that it would be worth-while, to look into effectiveness of training programs. Hence the purpose seems to carry good weight. A sincere effort will be made to achieve and prove the purpose of this paper in the following chapters.

The author sincerely hopes that the final report will be a valuable one.

CHAPTER II

RESULTS OF THE SURVEY

In order to get the broadest possible picture of current thinking and current activity in the area of company training programs for graduate engineers, a survey was conducted. This survey consists of a questionnaire which was prepared with these three objectives.

1. To obtain enough information regarding their current training programs which would emphasize great deal of control over the training program to be developed.
2. To obtain the companies objectives to-wards their training programs for graduate engineers.
3. To obtain an overall opinion from the training directors towards this report.

The questionnaire along with a covering letter was sent to one hundred and one prospective companies, which covers most of the various industrial fields.

The number of employees in these 101 prospective companies ranged from 800 to 500,000.

Out of 101 questionnaires sent, a total of 42 have answered and returned the questionnaire. These 42 responses accounts to 41.58% of total participation, which could be grouped in the following manner.

I.	Companies having program answered only the questionnaire	16
II.	Companies having programs answered the questionnaire and has also sent additional information	12
III.	Companies which do not have established training program	8
IV.	Companies do not wish to participate for the reason that it is confidential at corporate level	3
V.	Companies misinterpreting the question- naire for a resume	3
	Total	<hr/> 42 <hr/>

From group I and II there were four companies (A,B.C& D) who were willing to discuss more about their training programs personally. As such the author visited three companies (A,B & C) personally and discussed various aspects of training.

SUMMARY OF DISCUSSION WITH COMPANY 'A'

Company 'A' has three separate training programs for the newly hired engineering graduate. These training programs are both for orientation purposes and for the purposes of training individuals who will later become managerial personnel. Each of these training programs is different

and has a different length of time. One of the highlights of the discussion was about their approach towards standardizing these training programs. For this purpose they have a special committee studying the possibility of standardizing these three training programs.

They have similar training programs for experienced engineers when they are hired by the company. Each of these training programs however, is tailor-made to suit the needs of the individual or the department to which he will be assigned.

Another part of the training program for engineers at the company is the tuition-aid plan whereby they encourage their engineers to go on to do graduate work at company expense.

They also have a continuing education program whereby information is disseminated throughout the organization about relevant courses and seminars given either during or after company hours throughout the United States Of America. They periodically send engineers, at company expense, to these kind of training programs.

However there was a clear indication from these three companies, that they are looking for a more effective training program for engineers. At the same time they were very interested to receive a copy of the report.

From these five groups, groups III, IV and V, did not answer the questionnaire, as such these groups can be eliminated from further discussion, thus focussing mainly on groups I and II for further discussion.

The 28 companies which belongs to group I and II, have various types of training programs for graduate engineers.

The 12 companies which belongs to group II have spent considerable amount of time in studying the questionnaire answering the questionnaire partly, but have sent a formal letter explaining their training programs and their own views.

In order to summarize the survey, a sincere effort has been made to translate the contents of the formal letter on the questionnaire.

Of the 59 companies which did not return the questionnaire, it must be assumed that they either did not have a training program for engineers, or, if they did, they must have felt that it was not of sufficient interest to participate.

RESULTS OF THE QUESTIONNAIRE

- I. Types of training programs used
- 23 On-The-Job training. 13 Off-The-Job training.
15 Class room training. 16 Formal training.
13 Informal training.
- II. Training programs oriented to-wards
- 13 Basic principles. 12 Theoretical training.
25 Pratical training.
- III. Engineers covered by training programs
- 23 Newly graduated engineers.
18 Newly hired engineers (with experience).
16 Experienced engineers (within the company).
- IV. Expected end result of training programs
- 7 Promotion.
22 Greater job proficiency.
16 Increased responsibility.
- V. How do you measure the effectiveness of the training programs
- 25 Engineering performance.
5 Creativity.
- VI. Frequency of training programs for engineers
- 2 Once in 3 years. 4 As required.
3 Once in 2 years. 5 No standard frequency.
6 Once in 1 year. 1 Continuing.
2 Once in $\frac{1}{2}$ year. 5 Did not answer this question.

VII. Training programs are related to the type of work
 Engineer performs 25 Yes, none No, Yes or No 3

VIII. Source of instructors for training programs
4 100% Outside instructors
10 50% Inside and 50% Outside instrucotrs
7 100% Inside instructors
6 10% Outside and 90% Inside instructors
1 75% Inside and 25% Outside instructors

XI. How many engineers are trained at each term

Thirty Engineers	<u>12</u>
Fifteen Engineers	<u>7</u>
Eight Engineers	<u>2</u>
Five Engineers	<u>3</u>
All Engineers	<u>2</u>
Varies	<u>2</u>

X. Indicate the length of training terms

Two years	<u>1</u>
One and a half years	<u>2</u>
One year	<u>1</u>
Six months	<u>2</u>
Eight weeks	<u>5</u>
Six weeks	<u>4</u>
Four weeks	<u>6</u>
Two weeks	<u>7</u>

XI. What percentage of fresh graduate engineers are
 attracted by your training program and accepted
 the offer.

75% of Engineers	<u>12</u>
30% of Engineers	<u>8</u>
5-10% of Engineers	<u>5</u>
Not known Engineers	<u>3</u>

XII. Objectives of your training programs

1. To acquaint the new engineer with all the various aspects of the locations manufacturing operations. To provide him with specific knowledge in the field to which he has initially a assigned.
2. To increase effectiveness on the present job. Prepare for positions of increased responsibility.
3. Formal: To orient new engineers with basic principles.
Informal: Send individual to outside program which will meet his particular needs.
4. Become familiar with organization and manufactured products. Increase understanding of job and its relation to overall company objectives. Update information to incumbent and experienced personnel.
5. To supplement and complement the academic training of newly hired engineers in those skills and principles important to our business.
6. To provide specific training for experienced engineers to improve performance and to achieve a given level of performance more quickly.

7. To create an environment in which the engineer will find the opportunity, the challenge, the motivation for self-development ie: improvement in performance, growth in sense of responsibility, dedication to career goals and company objectives.
8. Self-development and keep current in new technology.
9. To assist engineers improve their skills in making design decisions. To prepare the engineer for management responsibility.
10. To help the new engineer to understand where he fits into the company. To give him an idea as to our attitudes and philosophies. Inform him as to standard procedure, let him know where he can go for specific assistance.
11. Greater job proficiency, increased responsibility.
12. To provide the technologies for the more efficient performance of assigned tasks.

XIII. What percentage of engineers are willing to go back for further training

100% of Engineers	<u>2</u>
95% of Engineers	<u>5</u>
90% of Engineers	<u>7</u>
75% of Engineers	<u>5</u>
50% of Engineers	<u>6</u>
0% of Engineers	<u>1</u>
Unknown	<u>2</u>

XIII. What percentage of engineers have appreciated your training programs

100% of Engineers 5

90% of Engineers 3

75% of Engineers 7

70% of Engineers 6

50% of Engineers 7

XV. How often the traoning programs are reviewed

Once in 3 years 1

Once Every year 15

Continually 12

XVI. Are you planning to modify the training programs

Yes 26 No 2

XVII. If the answer is yes for the above question

please give a brief description of the changes.

1. We should elimtate many of the written assignments and give much more emphasis to vital skills of management such as; planning, organization, direction, motivation, evaluation, and control.
2. They constantly survey the needs, and adapt to provide the best program to satisfy the need.
3. Shorten the length of time in less meaningful areas.
4. Regularly changed and modified to reflect technological changes, and to meet changing needs.

XVIII. What percentage of engineers leaving company?

(a) Dissatisfied with work: 20% 3, 10% 5,
0% 12, do not know 19.

(b) Dissatisfied with training program:
20% 2, 15% 4, 0% 3, ? 19.

Do you wish your company to be identified?

Yes 2, No 26.

May portions of your program be used in my thesis?

20 Yes 8 No.

Would you like a summary of the survey results?

19 Yes 9 No.

SUMMARY

26 out of 28 companies are planning to modify their training programs, which shows clearly that current programs still have plenty of room for improvement. As such it could be concluded that the degree of effectiveness of current programs is not satisfactory.

However their objectives are very practical and if every individual company follow their objectives sincerely, their could be a significant change in their approach of training techniques.

To summarize, it is concluded that the responses was very satisfactory and will be invaluable in assisting in the development of an effective training program.

CHAPTER III

TRAINING

This chapter has been designed to present some of the techniques and problems related to training. The effectiveness of training as they were pointed out in the previous chapter, were kept in mind as some of the facets of training were considered.

The term "training" is used here to indicate any process by which the aptitudes, skills, and abilities of employees to perform specific jobs are increased.

During the past twelve years a fundamental change has been taking place in the role of training in business and government. Training is no longer, like the house organ, nice to have if you can afford it. It is becoming a basic tool for increasing the effectiveness of the organization.²⁹

Man has learnt to use the atomic energy for industrial purposes and design machines which can do the complex jobs. These have made the progress at a jet speed. Due to these innovations it has created a situation where people at levels of jobs would have to have new skills and most important of all learn to work with each other.

²⁹Warren W. Malcolm, "Training For Results," Addison-Wesley Publishing Co., Mass, 1969.

Since 1960, the field of training has been subject to considerable attention, unmatched since the early days of World War II.

For many years the training profession has been strongly influenced by psychologists, especially learning theorists. Their influence has been a rich one and has often led industrial trainers into the forefront of experimentation and testing of new teaching methods, where as the more conservative and stable college and school faculties have dragged their heels over introducing such change.³⁰

The vitality of the company depends upon well-educated personnel, informed in it tasks and, because of the assurance education imparts, eager to tackle the next challenge on the corporate ladder.

The demand for more effective education and training comes from all sides. It comes from government, which sees it as essential to the sound solution of key social problems.³¹

THE TRAINING CHALLENGE

Since the 1930's, there has been a significant increase

³⁰Odiorne S. George., "Training By Objectives," The Macmillan Co., London, 1970.

³¹Morse E. Gerry., "Mandate For Education & Training," Personnel., Nov-Dec 1971, p-8.

in industrial commitment to employee training, and the demand for training continues to outpace resources available for this purpose. If this trend continues, serious training deficiencies will result.³²

Competition among the companies today for top seniors is intense. Starting salaries are higher each year, and salaries are only a part of the expense picture. Training adds thousands of dollars.³³

The idea that a college graduate, having successfully completed sixteen years of study, needs any additional comes as a shock to some people. This is particularly true if the graduate has taken a business course. But a little reflection convinces most people that a period of indoctrination and training is needed by anyone joining a company.³⁴

If it is to prove effective, the training program must challenge the best the graduate has to offer, and it must be backed by the full support of line and staff managers. A program that does not meet these tests will

³²Buckley W. John., "Programmed Instruction In Industrial Training," California Management Review, Winter/1967, pp. 71-79.

³³College Graduates Assess Their Company Training., National Industrial Conference Board, 1963, pp. 2-5.

³⁴National Industrial Conference Board, Inc., op.cit. pp. 2-5.

prove prohibitively expensive, because many of the trainees will leave and those who remain will be poorly prepared for responsible assignments.³⁵

Companies have been experimenting with a wide variety of training programs designed to help the graduate make the change from campus to career in a way that will be satisfying both to himself and to the company.³⁶

Never before in the history of U.S. Business, the thinking of management towards the social problems gained such a top priority. We cannot be selfish anymore in designing a Training Program just to increase their productivity, efficiency and profits. What we need is an effective program which would give a chance for every engineer to use his education, experience and training in solving the social problems.

Part of the challenge to engineers in the last half of the 20th century is to recognize that they must be responsible citizens and assume their share of the burden as leaders is their profession and in society.³⁷ In so doing they must try to understand and co-operate with social scientists, political leaders and others who seek

³⁵College Graduates Assess Their Company Training Programs, Op.cit. pp. 2-5.

³⁶Ibid., pp. 2-5.

³⁷Carliss S. Oswald., op.cit., p. 16.

to solve these pressing social problems.

The real challenge is how the engineers could be trained so that they become more effective, not only to the company but also to the society to work on social problems.

WHAT IS TRAINING

Of ten people think of training as something that is done to or for someone. This general orientation can be very misleading. Learning is a phenomenon that takes place within the individual.

Like individuals, industrial or business organizations differ from each other. It can be rightly argued, therefore, that no two training departments can be identical in size, scope, and organization, or in the functions they perform.

It is wise to give a particular view point of training.

1. Training is a management tool, not an entity or a field in itself.
2. Much must be done in implementing training before it can become a well-established, valuable management tool.³⁸

³⁸William McGehee, "Training In Business & Industry," John Wiley & Son, 1961.

The main values of the company training programs are

1. Learning about the company and its products
2. Learning about the work he would be doing
after the training
3. The influence of instructors and supervisors
4. The association with other trainees.

These are the basic concepts the industries and business are using in establishing the training programs. At this point the author would like to make one view clear to the reader, that the purpose of this paper is not to change the basic concept of the training program, but for sure it is the purpose of this paper to bring in more concepts in establishing an effective training program, and suggest some guidelines in establishing the program which will be a positive approach in achieving the theme of 1972 Engineers Week, "Engineering.....A better tomorrow through technology."

This means the outlook of management's role in training should change rapidly, in establishing an effective training program.

TRAINING A REALITY

The training and development are among the vital functions affecting the performance of an organization and requiring predetermined goals.

The first and foremost necessity of training comes into reality in helping an individual to choose the right position because selecting the right position and the right line of work at the very first time after graduation can save years of tumbling and searching later on.³⁹

The world is filled with engineers who started training in one field of engineering and end up happy and satisfied working completely in a different field.

Training is one of the attraction for the fresh graduates to accept a company's offer. The five most important reasons graduates gave for accepting a company's offer of employment were, in the following order:⁴⁰

1. Company orientation and future
2. Advancement possibilities
3. Training program
4. Opportunity to do desired work
5. Salary

TRAINING FOR EFFECTIVENESS

An effective training program is certainly a requirement in to-days business and industry, it would even play

³⁹Alan E. Nourse, James C. Webbert., "So you want to be an engineer," Harper & Row Co.

⁴⁰Habbe Stephen., "College Graduates Assess Their Company Training," National Industrial Conference Board, N.Y.

a major role in reduction of engineering turnover, which is an area where large saving in manpower can be made.

Almost every company surveyed in recent years will admit to losing somewhere around 30 percent of its college hires within the first three to five years of employment. In a research sample of graduate students of management, over 50 percent left their company within three years after graduation, and a considerable number moved two or three times. Another problem concerns those who remain with the organization that hires them. In this group there is evidence of loss of motivation, increasing indifference and apathy, and the growth of a kind of organization complacency. To put the matter boldly, something happens to college graduates in the early part of their careers that makes them leave or become complacent.⁴¹

Dr. Stephen Habbe has this to say:

"I wish the title 'training program' had never been invented. Many so-called programs of the on-job-type are quite formal-more so than many 'formal' training programs with emphasis on on-the-job training. Confused? So, am I."

"Companies ought to stop tailoring training to what they think will appeal to college graduates and concentrate their efforts on bringing young engineers into productive positions as soon as possible.

⁴¹ Lawrence Stessin, "Young Managers: 'Immediacy' Sets The Tone," Personnel, Nov-Dec 1971.

When a training program becomes a recruiting gimmick, the brighter students soon sense there is something phony."⁴²

This will not only defeat the purpose of the training program but will also build up a castle between the bright students and the company.

The graduates after taking up the job do not wish to go back to the classroom atmosphere and face the same type of routine teaching. But they will happily accept any programs which will be of beneficial in gaining the knowledge and thus they could become more useful to the employer.

Management must maintain a corporate climate that encourages advancement of employees. Extensive programs should be provided throughout the organization. In this way company attitudes, principles and philosophies are handed on from one generation to another, the company is self-renewing.⁴³

"Of all the obligations facing management, none, it seems to me, is more essential for the future welfare of the company than that of providing continuous educational opportunities for employees."⁴⁴

⁴²Stephen Habbe, Op cit., p.25.

⁴³Alan G. Rude, "The Educational Climate In Business," Advance Management Journal, April 1968. pp.22-26.

⁴⁴Ibid, pp. 22-26.

"By educational opportunities I do not mean after-hours courses in liberal arts subjects, however landable they may be from the cultural standpoint, but on-the-job training in the techniques of business itself, from the rudimentary tasks of the clerk to the advanced procedures of management."⁴⁵

There is no fun in sending a graduate to a type of training where the training is strictly classroom teaching. Then the graduate will say "after 16 years of school I am tired of being lectured to" is a quote that universalized the trainees frustration with his education into business.

The first step in achieving greater effectiveness in development of training programs is to determine the needs and objectives to the desired results. As such this step deserves greater attention that it is generally given and its accomplishment can be improved by consideration of a number of factors.⁴⁶

Personal needs on the psychological and behavioral level may be elements in effective program design. It has been indicated that not only the job problems of the trainee and the real problem of learning, but also the many individual reactions, resistances, and expectations are part of effective program.⁴⁷

⁴⁵Ibid., pp.22-26.

⁴⁶Prieve E. Arthur., op cit, p. 236.

⁴⁷Adult Education Association, "Training in human realtions," (Washington D.C., Leadership pamphlet no-16, 1959) pp. 27-33.

GOALS AND OBJECTIVES OF TRAINING PROGRAM

The first step in preparing a program should be setting specific goals and objectives for the training involved. Setting up goals and objectives is key to the success of the training.

Prof. Ivar E. Ber Jr., associate dean of faculties, Columbia University, says many university graduates are victims of a "great train robbery."

"Too many college and graduate students are being educated and trained for mundane jobs, and the number is increasing, he continues. "American college youth across the country, including those among the 'silent majority,' are asking what their education is for-and what is its meaning if it ends up training them for jobs they perceive as offering little in the way of responsibility and growth. In many instances their perceptions square too well with the facts."⁴⁸

Goals of training programs

The goals of training programs have historically emanated from the organization and have been concerned with meeting organizational needs.

Setting up the goals is important, primarily because of the changing needs. Today, we are operating in an environment where individual and societal goals have become as important considerations in the development

⁴⁸ Machine Design, "College Students Trained For Mundane Jobs," Nov-1970, p-8.

and conduct of training programs as are organizational goals. Majority of the employees are thinking that participation in training can increase their job security, opportunity for advancement, status, prestige, personal satisfaction, etc. Societal goals are being recognized in that organizational training programs are being seen as a valuable adjunct to individuals realizing their potentialities and becoming contributors to a healthier society. Thus, organizational training goals that have been primarily concerned with such things as increased performance, creation of a manpower pool for promotion, improved safety, etc., must now take into careful consideration the desires of individuals and society.⁴⁹

Increased skill and knowledge gained from training programs will not only increase the organizational effectiveness but will also contribute to the development of a more healthy society in helping people realize their potential and become contributing member to that society.

In establishing training programs, take into consideration individual and social goals as well as organizational goals.

Training objectives

The subject objectives in training has recieved

⁴⁹Ackerman Leonard, "Training Programs; Goals, means & evaluation", Personnel Journal, Oct 1968, 99. 725-727.

considerable emphasis in recent times.

"In current thinking and writing, the starting point for either a philosophy or the practice of management seems to center around predetermined objectives. The entire management process concerns itself with ways and means to realize predetermined results and with the intelligent use of people whose efforts must be general or specific, they may concern the organization as a whole, a segment of it within a decentralized unit or even a particular function such as production, sales or personnel."⁵⁰

The primary objective of any education or training is a better life. It is to help the individual to discover, develop, and utilize his highest capabilities. It is to equip him to live with himself and others. There is no way to do this "wholesale." Learning, like living, is strictly an individual affair. This is our dilemma-how to educate and train individuals so that they can live together in an open, free, creative society, yet attain maximum self-fulfillment.

Establishment of a successful training operation requires careful delineation of managements objectives.

The mission of a training function is to bring about behavior change. The behavior change brought about by the training function must be measurable in terms of the organizations requirements. But this is a

⁵⁰John F. Mee, The Essential Nature Of Objectives," from "Management Philosophy For Professional Executives," Business Horizon, Indiana University, Dec 1956, pp. 5-7.

crucial point. The organization should have some means to measure his ability after training.

Before we can attempt to change behavior, the required behavior must be known and the means to measure the change in behavior must be found. Until these two constraints are satisfied, the effectiveness of training actions cannot be known and their functional utility becomes a guesswork.⁵¹

Behavior changes brought about by the training can be divided into three kinds, (1) Change of skills, (2) Change of attitude, and (3) Change of knowledge.

The literature of several disciplines considers objectives from various perspectives and gives us several bases for analyzing the content of an organization's objectives.

General standards for the establishment of objectives for management development and training programs would suggest that objectives:

1. Be realistically attainable
2. Be in harmony with other objectives within the organization
3. Consist of short-range and long-range orientation

⁵¹Warren W. Malcolm, "Training For Results," Addison-Wesley Publishing Co, Inc., 1969, p.8.

4. Have common meaning to all concerned
5. Be closely related to the personal goals or objectives of the learner.⁵²

By definition, objectives would be the standards used in the determination of training needs. In general objectives are, therefore, the goals toward which training and development efforts are to be directed. As such they describe the proposed changes which will result in increased personal efficiency and growth and more effective organizational operations. These training objectives become the criteria by which

1. Materials will be selected,
2. Content is outlined,
3. Instructional procedures are developed, and
4. Evaluation standards are developed.

All aspects of the program are in essence the means to accomplish the basic purpose.⁵³

SUMMARY

Training for all levels of industrial skills, from mechanic to manager, is the greatest challenge facing

⁵²Thiede Wilson, "Evaluation And Adult Education," (Adult Education Association, Washington D.C., 1964) pp. 296-297.

⁵³Prieve E. Arthur, Wenrof A. Dorothy., "Training Objectives-Philosophy Or Practice?" Personnel Journal, March 70, Volume 49, Number 3, pp.235-240.

the growth of American Business.⁵⁴

"Training, if it is to become an effective tool of management, must be a systematic, orderly procedure constructively applied to solutions of organizational goals. Training to be effective, must be backed up by careful and continuous research. Training in industry is not an end but a means to an end; it exists only to help achieve organizational goals and objectives. To be effective, this management tool must be used when and where it is needed and not as a window dressing to impress visiting firemen with the alleged "Personnel Mindedness" of an organization. The use of training to achieve organizational goals requires careful assessment of training needs within a company: a determination of the goals which can be served by training, the people who require training and for what purposes, and the content of training.⁵⁵

The organizational objective is, indirectly a personal objective of all the participants. Objectives serve a two-fold purpose, that of developing learning experiences and of providing evaluation procedure help to clarify the objectives. It must be concluded that

⁵⁴Douglas H. Fryer, M.R. Feinberg, S.S. Zalking.,
"Developing People In Industry," Harper & Brothers,
N.Y. 1956.

⁵⁵William McGhee., op cit.

not only are properly determined and formulated objectives crucial as a first step in designing a development program, but that this step is basic to the succeeding steps involving content, procedure, and evaluation.⁵⁶

No program has yet been devised that offers all things to all graduates and yet companies find it difficult to understand why all trainees are not satisfied with programs which have been thoughtfully prepared and which are administered at considerable expense.⁵⁷

Although modern industrial training has come a long way since it was begun as a formal activity a half-century ago, there exists in the function today altogether too much misdirection.

"A man may not be competent to handle a new job because he has not had the appropriate preparatory training. Industry obviously recognizes this and for that reason has established many and varied training programs, the main purpose of which is to prepare people for the new or different responsibilities related to promotion. Individuals, therefore, may increase their assets and reduce liabilities with reference to specific positions through education and training. That does not necessarily mean, however, that everyone will display the same degree of on-the-job competence."⁵⁸

⁵⁶Prieve E. Arthur, op.cit, p-240.

⁵⁷Habbe Stephern, op.cit. p-240.

⁵⁸Cangemi P. Joseph, Kenneth T. Cann., "Peter's Principle Principle," Personnel, Nov 1971, pp. 872-877.

Training is truly a co-operative venture. From top management to staff, line management, and the trainee, the co-operative of all the members of the team is required if training is to be successful.

CHAPTER IV

TRAINING THE TRAINERS

In the previous chapter it was shown how the training will influence upon the individual. Every engineer is different, but they have one thing in common "education", may be in different style, but it will set them apart in their thinking. Because some are oriented to-wards applied engineering, some to-wards management, so on and so forth. For the pupose of this paper it does not matter what the goals of each engineeris, but sure their thinking makes a big difference in selecting and training the trainer for engineering training programs.

In the American Business, development of people is ranked as equal to or even surpassing their other important economic functions. Training for all levels of industrial skills is a great challenge. There is to be a better understanding of people. This trend of understanding people and their development in industry will continue. The need is increasing for specialists who can train people.

The developer and trainer op people is a new specialist of the American Industry. He is invaluable to the management. The training specialist must note that the top executives in the present big business invariably

started from the lower ranks and worked up because of their initiative and the capability they had to bring out the best from the people whom they supervised. Thus the training specialist should possess the skill to spot early the potentialities of a person.⁵⁹

There is no doubt in the author's mind that training is a speciality and the trainer should be a specialist. It would be of advantage to the company, if they choose supervisors and train them to become an effective teacher. This is mainly the function of training department.

The efficiency of any training program, and particularly one designed to help the young engineer over the often rough transition from academic halls to factory floor, is directly dependent upon the effectiveness of the supervisor as a teacher.

TRAINING DEPARTMENT

A training program has a much better chance of being effective if it is well organized. To achieve this the training department should have qualified men from top to the bottom. The management has the obligation to fulfill this. Because they have the responsibility of planning, organizing, and evaluating the program.

⁵⁹Douglas H. Fryer, op.cit.

Training an engineer is not a big task, but surely it is the task of management and the training department, to train the engineer so that they could be useful to their business and as well to the society. Now, as never before in history, society expects the engineer to manage the technology which he has developed, and that his management will be for the social good.⁶⁰

Careful interpretation by the trainer may be needed to arrive at feasible and appropriate objectives considering these individual differences. In addition, the trainee's needs for change may change as training progresses. It is not sufficient to base a program only on needs perceived to training.

Despite the modern advances in education technology, a large portion of industrial training is still being done by conventional classroom instruction, but a great deal of this instruction fails to pay off in results on the job. The fault often stems from misconceptions on the part of training organization-and the trainees in particular.⁶¹

⁶⁰ Carliss S. Oswald., "Management Frontiers In Engineering," The challenge of the 70's, S.A.M., Advance Management Journal, April 1971, pp. 10-19.

⁶¹ Broadwell M. Martin., "Training The Trainers," Personnel, Sept-Oct 1966, p. 50.

It is popular to reason that "if the student hasn't learned, the instructor hasn't taught," but this doesn't tell the whole story of training. A company can hold a trainer responsible for results, but he cannot get results unless he is successful in eliciting the cooperation of the trainee. It is a well established fact today that learning is an active process, and that the best results are obtained when individuals participate willingly and whole-heartedly in the process.

The training department has the prime responsibility of selecting and training, the trainees. But unfortunately most industries do not have available to them a satisfactory means of training the trainers.

Therefore both the training department and the trainer has greater responsibility in establishing and organizing the training program so that the trainees will participate willingly and wholeheartedly.

SELECTING THE TRAINER FOR TRAINING

Training programs have become common place in American Industry over the past three decades. The initial concerns were to develop programs and get them on stream, so early activities in this field focused on determination of individual and organizational needs for training, creation of suitable course content, development

of instructional methods and materials, and selection of competent instructors.

Little attention has been paid to question of the basis on which the trainers are selected, for the training programs. In the past, one of the greatest difficulties of instruction in industry has been the lack of teaching experience or knowledge on the part of those responsible for this function. Many a times a trainer has been "ordained" an instructor and then has been left to sink or swim on his own.⁶² Another mistaken notion is that the man who does the best job on the production line makes the best trainer. Frequently the reverse is the case. The greatest care, therefore, should be exercised in the selection of training personnel.

The training department should analyze their goals and objectives, then come to a conclusion as what type of trainer they are looking for. Depending on the structure of the program, the trainer should be evaluated as an arbitrary person then come up with the qualification and the requirements that are needed in the trainer. Then the trainer should be picked on the basis of availability and the teaching ability. If these objectives are fulfilled in selecting the trainer, then the responsibility

⁶²Frank A. DePhillips., op.cit., pp. 131-132.

is to train them to become an effective trainer.

It goes without saying that the supervisor of trainees should have a thorough knowledge of every phase of the operation of his section, but in addition to this he should have a capacity to inspire the spark which makes the difference between the follower and the leader.

Selecting, however, is only the first step. More and more, industry is learning that it must also train its supervisors in the techniques of training and then maintain a continuing supervision over them to insure the effectiveness of the program.

By now it is quite clear that both management and training department should co-ordinate in selecting the trainers. It is very essential for the training department to consider the trainer's dual role in selecting the trainer.

TRAINERS DUAL ROLE

Trainer has two important roles to play. On he has to play the role of a good "teacher", and the other as a careful "observer." As a observer he has to study the trainees very carefully, discuss with them about the company policies, their superiors, subordinates and their outlook as a whole.

The trainer as a teacher

The first obligation of the trainer, then is not to accept someones elses definition of a problem or to define the problem by himself, but to help the management or the manager more clearly to perceive and define his own problem, through joint diagnosis.

As a "teacher" he has the big responsibility. Because he has to study the company objectives, and their goals very carefully in order to get himself prepared to become an efficient trainer. Depending on the objectives, the trainer will have to find the means to use the teaching techniques and organize himself in order to fulfill the objectives. Trainer should also give careful consideration for trainee participation in the program. In organizing, he must determine the exact sequence of the training, the depth of or the penetration into the subject at hand, or the levels at which conflicting aspects take precedence over one another. Trainer just cannot accept what management tells him to do. Many a times the managements perspective may not be practical and may not be up to date. Therefore trainer has to evaluate the program carefully before he is ready to teach. Because he is the one who knows more about the morale and attitudes of trainees learning. Management only establishes the groun rules under which the trainer is to work.

To train others efficiently, the trainer should be equipped with proper knowledge, skills attitudes with regard to the knowledge he should possess, it is helpful to classify this area into job knowledge and psychological knowledge. Job knowledge refers to a thorough understanding of the nature and breakdown of the job into its logical arrangement of steps and also includes skill in performing the task of more importance to the trainer are the human requirements necessary for the performance of the job. In this category are such human qualities as mental capacity, motor co-ordinations, physical and postural factors, visual acuity, temperament, and attitudes. A knowledge of these requirements, as well as many others, will serve to help the trainer to perform his training function in a more meaningful framework. His knowledge of the psychological nature of the learning process is also important. This body of knowledge includes individual differences, theories of learning, methods of teaching, motivation, attitudes, communications, visual-aids, and lesson plans.⁶³

With regard to skills , the trainer should be adept in performing the job, should be skilled in logical thinking so as to arrange the content of his lessons, should be a good demonstrator, a clear, concise, and skillful speaker, and should have skills in human relations.

⁶³Frank A. DePhillips, op.cit., pp. 288-307.

The trainer as liaison

As a careful "observer," the trainer would be of great help to the management. As a result of his interaction with training program participants, he could acquire organizational information which would be of considerable value to management. Some trainees do feel free in expressing their views and some trainees express their views because they want these view to be transmitted to their superiors.⁶⁴

The fact that training session behavior generates information potentially useful to management raises several questions immediately. This raises the question, can the trainer serve as a source of useful organizational information?⁶⁵

To answer the question, there is empirical evidents that the trainer can, indeed, be a valuable souce of managerial information objectively.

During a training session, the trainer will also come up with certain recommendations to make the training more effective. He is involved in group participation, open discussion and will also become a part of the trainees thinking. This way the trainer is exposed to a healthy

⁶⁴Thad B. Green, & Frank J. Schilage, "Information For Management: The Trainer As Liaison," Personnel, July-August 1971, pp. 50-51.

⁶⁵Ibid, pp. 50-51.

atmosphere where the trainees will reveal and discuss the existing problems sincerely. Which means often the trainee may come up with the answer for a potential problem too. The trainer can gather these problem-oriented problems and relay it to the management.

Another kind of information that the trainer may have gathered by the end of training session relates to the specific program of which he has been a part, and perhaps to the over all effectiveness of the organizations approach to training. The trainer may observe changes called for with respect to program content, trainees, instructional techniques, evaluation methods, facilities, program duration, and type of trainees, among other considerations. The fresh, relatively unbiased views of the trainer might result in suggestions leading to improvements.

"If, as now seems evident, that the trainer can serve as a valuable source of organizational information, the next question is whether he should—that is, are negative consequences likely, and if they are, do they weigh the informational advantages? Some negative consequences are possible if the trainer is used as a source of information obviously, it would be undesirable if management began to over emphasize the utilization of the trainer as an information source particularly as a principle one."⁶⁶

⁶⁶Ibid, p.52.

If this becomes true then the trainees would tend to be more selective in their discussions and careful to emphasize only what they wanted to have relayed. Then this would defeat the purpose of using the trainer as liaison.

Alerted to the possibility of such distortions of the training program purpose. Both the trainer and management can take various precautions to avert the more serious dysfunctions. In particular, trainer relayed information must always be treated confidentially in this trainer-management relationship, and the fact that it is must be emphasized to the trainers.⁶⁷

The trainer is obligated both to the trainee and to the management. As such he should be very very careful in giving out the information. The information provided by the trainer should go only to those who are concerned and not to anyone else.

THE TRAINEES PART

The trainer has the responsibility of teaching where as the trainee is responsible for learning. How much he (the trainee) is responsible for learning depends on the efficiency of teaching and the trainees attitude

⁶⁷Ibid, p. 53.

of learning. Learning is the primary importance of training because the test of a training program resides in the or the learner.

The trainee is responsible for absorbing the knowledge that management had determined as necessary for him to do his job for himself and in the interest of efficiency. This means that the trainee must apply his effort and energy in a directed manner so as to learn all the knowledge and to develop attitudes and ideas, the trainee should be able to utilize his new knowledge as soon as possible after the completion of his exposure to the new knowledge.

Knowledge is usually a prerequisite to the acquisition of a skill. The trainee is responsible for learning for learning the skills needed to do the job effectively, including skills as the motor co-ordinations required, the arrangement of his work, the speed and accuracy necessary, the safety skills, and the human relations skills needed to get along with fellow employees and management.⁶⁸

According to the recent studies, young college graduates who joins the company has high enthusiasm to learn and appreciate the program. The level of enthusiasm

⁶⁸ Frank A. DePhillips, op.cit, pp. 61-62.

varies by program and by company, but no instance is it low.⁶⁹ With proper motivation and favorable attitude, the trainees will not have any difficulty in acquiring the knowledge and skills needed for his work and for his society.

Management is usually held responsible for motivating and developing attitudes in the trainee, but it is unwise to conclude that the trainee cannot and should not make a direct contribution himself.

The trainee can do this if he realizes that the company is spending tremendous amount of dollars with the purpose of educating him and training him. Then the trainee should be better motivated to learn in a training program. The only way it could be achieved is Self-Motivation which is the keynote to effective learning. Furthermore, the trainee should recognize that his training is a stepping stone to further training and advancement. By accepting the attitude and viewpoint that training is mutually beneficial both to management and to the learner, the trainee will be in a better status to accept and learn effectively. If the trainee views the training with bias, prejudice, and suspicion, believing that it serves only management's purposes, cannot learn effectively.

⁶⁹College Graduates Assess Their Company Training Program.
op.cit.

In a word, the trainee should be self-motivating and should develop wholesome attitudes because they can help him to satisfy his own needs ambitious.⁷⁰

The trainee should make use of the opportunity not only to get education and the training, but should also expose to the group and to the trainer by means of discussions—simply because, the training session is a vital link in communicating to organizational members and to management.

THE NEED FOR TRAINING THE TRAINERS

The same philosophy of training as it was discussed before holds true in training the trainers. There are exceptions but for every excellent instructor there seems to be a duffer who produces no learning at all. There are many reasons for this mediocrity in instruction:

1. Industries do not function primarily to train, hence training at best is an adjunct.
2. Most industries do not have available to them a satisfactory means of training the trainers.
3. Existing teacher-training courses are oriented to teaching, not to learning.⁷¹

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Frank A. DePhillips, op.cit., p-62.

⁷¹

Broadwell M. Martin, op.cit. pp. 50-51.

The need for training the trainers arises from the following reasons:

1. Efficient trainers will make a training program more effective.
2. The best trainers will not always be available.
3. Training is a complex process that makes strict demands on the instructor.

A first step, therefore, is for the trainer to become more efficient is to take a good close look at himself. He must follow the idea "Know Thyself".

As Chris Argyris put it, "It is impossible to understand others unless we understand ourselves, and we cannot understand ourselves unless we understand others."⁷²

There are bad and good instructors. But there are some who will lie on in between--neither very bad nor very good. But they can be made better.

The best teachers will not always be available, and the class will not always consist of just the right students. These things can be improved, but they will never reach perfection.

Taking all this into consideration, how do we improve

⁷²Chris Argyris, T-Groups for organizational effectiveness Harvard Business Review, March-April, 1964.

instruction in industry?

"Starting with the operation of a training school, how much of the activity is the result of tradition? Do the students go all day (7-8-hours), because they always have, or because those are the hours they ordinarily work? Is the course a "pattern" course, offered over and over again like an assembly-line item, with no effort made to examine its effectiveness? Is the instructor give a leaders guide and a set of visuals, then told to "follow this and you won't have any trouble"? Has anyone checked to see whether the course is changing any behavior back on the job?"⁷³

Teachers are not born, they can be made if they are systematically taught. It is sufficient here to point out that it is imperative to teach selected instructors. The art of teaching, setting up the class schedule, the way to get his job done, and the development of concepts and attitudes.

The very word teaching brings the concept of "lecture." This means "to read or deliver lecture to," and that is what just happens in many classes. Just by going to the class and reading to the class, "delivering" the lecture does not mean that the students learn or grasp everything has been said in the class. By the time student goes out, he may not even remember 75 percent of the dumped out lecture. As such a better way instruction should be used, by which means the student can grasp and remember, what he has been taught. The type of instruction should be

⁷³Broadwell M. Martin, op.cit. pp. 51-52.

selected in a way so that it will not be boring for the student to spend the time in the program. To do this the teacher should have enough knowledge in all type of instructions that could be used for efficient learning.

The prospective teacher should, of course, learn the principles and techniques of teaching, but he should learn them as realities rather than as theories.

The class schedule has a bearing on "learning" also. Nine-to-five may be efficient hours for a workday, but that does not necessarily be the best time for learning. Therefore an analysis should be made as what are the best time to conduct classes, and what type of instruction to be followed, day to day. The learner comes to the class to get the maximum from that day's class, so as the teacher should be-to give out the best.

Student-teacher relationship is very important in the process of learning. A good class set up with proper timing, and the right techniques, should be more than enough to see that the program is effective. A good student-teacher relationship has greater impact on student's learning, according to a leading psychologist.

Finally the development of proper attitudes toward the learner is basic to the improvement of instruction.

Most instructor-training classes provide basic

information on class room techniques, they emphasize the proper use of visual aids, and the importance of being heard, being enthusiastic, avoiding distractions, and so forth.⁷⁴

SUMMARY

The trainer and the trainee must recognize and accept their respective role in this process.

Both the trainee and trainer as an individual are the same, every individual is different, so is the trainer and the trainee. But the trainer has to start with the assumption that he is dealing with graduate engineers as such he will not have too much difficulty in the learning process.

The training department is primarily responsible for setting up the goals and objectives. It is also responsible for reviewing their objectives. It is also responsible for reviewing their objectives. They have the responsibility of selecting the teachers and training them.

The trainers dual role clearly indicates the importance and careful consideration to be given in selecting him. He should be highly capable and intellectual, and also a good teacher. He should also be a good supervisor, so

⁷⁴Broadwell M. Martin, op.cit, pp. 53,

that he can delegate the trainee's in their participation, because to-days engineer's are to-morrow's managers.

During the process the training department, the trainer and the trainee should not forget their obligation towards social problems.

The role of the trainer play's a major role in training, because training is a speciality. The trainer is equally responsible as a trainee because of the teacher-atudent relationship. Unless and until the teacher puts his own learning process into practice, and see how much the student will learn. An efficient teacher will naturally change his teaching techniques if he realizes that the learner leaves the class not learning up to his expectation.

Because the danger of competitive obsolecence was never greater, management must take a hard lood at its training, developmental programs, and its trainers to see whether they are meeting to-day's pressing needs. Because no instructor will immediately become a good teacher just by experiencing and bad instruction.

Selecting an individual is a complex process and selecting a potential teacher is much more complex. But after establishing the goals and objectives of the training program, the trainers dual role, and the trainee's responsibility, it will not be too hard for the training

department to select a potential teacher.

If the training department is sincere in selecting the potential teacher then the responsibility of training him is much simpler and easier. It is needless to say that by selecting a potential teacher as a trainer and training him to become an efficient trainer, would be the major success towards effective learning.

The trainers to meet today's challenges, however, requires more than equipping them with a series of rules for handling specific situations.

But if he now has an understanding of his important role in producing learning, he has the concern that will cause him to want to improve his techniques. Where he formerly might have blamed the class for their lack of interest, he now will blame himself for failing to interest them.

Combine this concern on the part of the instructor with improved scheduling and with a stronger desire on the part of the training organization to direct all the activities towards the learner, and the result is bound to be better learning.

CHAPTER V

THE ENGINEER

In the previous chapters, the purpose and importance of training the engineers effectively has been clearly indicated. It was also pointed out that effectiveness could be learnt and could be increased. After discussing sufficiently about the training programs, it is the right time to discuss something about the engineer. With this purpose this chapter is designed to explain why is it so important-training engineers more effectively, what an engineer is, as an engineer, as a manager, and as an individual-his responsibility to the society.

Engineer, as we have seen, is an extremely complex field of human endeavor. At first glance it seems highly confusing-so much so that four out of five first year engineering students are only vaguely aware of what engineering is all about when they begin their training. Engineering presents almost unlimited challenges in thousands of different and exciting fields of work.⁷⁵

By and large engineers are paid by society to work on systems dealing with problems whose solutions are of interest to that society. In carrying out this work

⁷⁵Nourse E. Alan, So You Want To Be An Engineer, Harper & Row, Inc.

engineers engage in various activities ranging through engineering research, design and development, construction, operation and management.⁷⁶

Engineers and scientists are dependant on one another, but they have different objectives. The scientist investigates the fundamental laws of nature and defines the principles which govern them. The engineer applies those laws and prnciples to create something special. As engineer-pioneer Von Karman once said, "Scientists explore what is; Engineer's create what never has been."

The newly graduated engineer usually expects to spend his working day applying the technical skills developed in college. Generally he is surprised to find that he must allocate some portion of his time to non-technical work. This is the reason why most of the company's will have few weeks of orientation to the engineers before they start their jobs.

The engineer so aware of the fact that he is being supervised, to judge his abilities in the engineering field, his attitude and behavior, and also his personality; primarily because the management is concerned about the engineer's progress. Depending on the supervisors

⁷⁶W.W. Harman, "Abstract report of the Standford university committe on evaluation of engineering education," The Journal Of Engineering Education, Vol 44, Dec 53, pp. 258.

evaluation either the engineer will be promoted to a higher level of engineering or to the management --- all the way from engineer to top executive.

For the purpose of this thesis the author would discuss the responsibility of engineer as a supervisor, and engineer as a manager; primarily his responsibilities to-wards to-day's social problems.

THE ENGINEER AS A SUPERVISOR

The engineer as a supervisor is more worth the company. He has a important role in to-day's industry which has led through technical and economic progress toward a higher standard of living, but caused the damage to the society thus creating the social problems.

The change in the social condition needs a great revolution in technology. Because the technology has to come up with an answer to its own innovations. This social change calls for a better understanding between people, this trend in the relationship not only creates numerous problems in the management, but also opened the eyes of to-day's business world.

Therefore both the employee and the employer has much more to offer to the society and to self. The technology which has brought the comforts, thus increasing the standard of living, now has to maintain the standard of living, by

means of cleaning every particles that is entering the human body. These changes calls for better understanding of to-day's social problems.

To-day the management needs the engineer as a supervisor who is part and parcel of technology can only lead the team to-wards the right direction. There is no doubt, why the teams lead by engineering supervisors cannot achieve sucess.

The very extent of the engineers education and training makes him a highly adaptable as a supervisor. The engineer posses other attributes which makes him more desirable as a supervisor, because of his ability to think logically, plan carefully and delagate the team to the sucess. He will use the scientific method of approach to the solution.

The supervisor is primarily responsible for interviewing new applicants, rating and reviewing supordinates, establish the organization to "Do The Job," motivation the employees with proper rewards and placement, transfer, promotion, etc., of employees.

Thus engineer has all the qualification to become a good supervisor. The engineer will definetly make a good supervisor. But he has less authority in taking the decissions. As such he would be eagerly looking forward to move up in the management.

THE ENGINEERING MANAGER

We are living in a period of prodigious social and economic change. We are also living in a period where the technical and scientific growth amounts to almost an explosion. For the first time in history, managers of technology, concerned with the utilization of scientific knowledge in the development of new and unique devices are being compelled to look beyond the first order to the second, third and fourth order of the consequence of what they are doing. It is this management of new technology to achieve the maximum social good that concerns us today.⁷⁷

The world we live in and work in is in a process of sudden change, it is a world of technological revolution and scientific breakthroughs. These confront management with unprecedented problems. Once dependable ways of conducting business no longer seems to work, nor do traditional methods of dealing with people.⁷⁸

The greatest challenge which confronts the profit conscious executive is the handling of people, particularly his managerial staff. How can he turn the managers on his staff into a real "team" -- a group of men who work well and enthusiastically with one another, who pull for the

⁷⁷Carliss S. Oswald., op.cit. pp. 10-19

⁷⁸Marrow. A.J., "Behind the executive mask"
American management association; 1965

company, and not merely each for himself? How can they be led to understand their joint as well as their individual functions in the enterprise so that responsibility is best met and authority most effectively exercised.

The principle "products" of a manager are decisions. But deciding is not a separate element of the manager's job, deciding is his job. A manager should be able to put his own company into prospective if not he will be able to see what he still must do, and get a feel for how long it will take to reap the benefits from managing the objectives. Whether a manager is creative or not depends upon his habits of thinking and acting. The creative manager recognizes that his operation can be improved, questions established ways of doing things and welcome questions from others. He should be honest - in admitting difficulties and should be perceptive and analytical in figuring out what is wrong. The creative manager is problem-oriented rather than technique-created. The creative manager must be both able and willing to put things together in new relationships. His thinking must be flexible rather than stereotyped. Rigidity of thinking is the enemy of creativity for the manager. In solving problems a manager should not have too good a memory. should not rely too heavily on past history as a guide to future action. The creative manager should view the new ideas with enthusiasm rather than suspicion and the idea

should be given a chance to prove its worth. In summary the creative manager has facility in analyzing his problems and in arriving at appropriate solutions. It is fair to say that such a manager is just as creative as an artist who paints a picture or an architect who designs a building.⁷⁹

There are two differing schools of thought about the nature of managerial talent. One is a life process theory, which says that a manager is the result of years of development preferably through very careful guidance. The other is a skill insight theory, which says that there are similar traits of managerial screens and that people with these traits can be turned into a good manager with a few weeks or months of training.⁸⁰

Today, managers still know how to make money; they still produce, buy, sell and raise capital. Many, however, have found they must also be versed in statistics, mathematics, law the social sciences, geography or international affairs. They may still use the carrot and the stick on occasion, but these are only two of their motivational methods.⁸¹

Patton found only one common historical fall from a sample of 100 leading managers; each was making more money

⁷⁹"Managers Too Can Be Creative"- Michigan Business Review January 1964

⁸⁰ "Personnel Testing"- By R.M. Guion - 1965

⁸¹ "Developing Managerial Competence" - Walter S. Wilkstrom (A Research Report from the Conferene Board) 1964

than the average for his age group between two years after joining his company. This happened because the traits resulting in later success gave them an early lead. An alternative view, however, explains it by a kind of organizational inertia; those who make a good early impression get ahead while those who might have become as good or better, but had not developed as rapidly, were left behind unnoticed as people got used to them. The developmental view suggests that the managers had started strong and then, perhaps, marked time under the halo of their good beginning while they developed the executive talent that, given the same guidance, others could also have developed.

Comparing the relative merits of the two, extremes: there are elements of truth in both points of view.

Engineer in to-day's society has the greatest responsibility and he is facing the real challenge. The thinking of engineers are changing much more rapidly than ever before. Is it because of the technology or is it because of the social problems? The question is still unanswered. But one thing is clear in to-day's engineers mind about his future in to-day's business world. The engineers are attracted to-wards the new concept "Management." This was clearly identified in business world as majority of graduate engineers are going to

school studying management, business etc, which leads to the business degree.

In the recent years, the attitude of engineers is changing rapidly. After examining many professional writings and discussions, it is clear that engineers are looking forward to get into management and are trying to climb up the ladder much faster. This is mainly because the engineers have:

1. Recognized for long time their need for management training.
2. Resented the often - implied view that the engineer is solely technician.
3. Argued consistently for greater participation in the management responsibilities of business, government of business, government, and especially - engineering enterprises; and
4. Become convinced of the need for applying the engineers scientific training and constructive creative mental approach to the general management field.⁸²

The engineer has all the know how but is left with no power at all. So they are looking for power, authority, delegation and rapid progress. A well educated and trained

⁸²Stephen C. James, & Jacobs C. Gilbert, "The Engineer Manager," Personnel, March 1954, pp. 375-6.

engineer with his creative ability would be the best choice because of the need of the business world "creative and effective manager."

The engineer as an engineer and as a manager has more to offer towards social problems.

At this stage the reader may be wondering as what is the relation between engineering training, engineer as a manager and social problems.

The role and responsibilities of business towards society is not clear at all.⁸³ It is interpreted differently by government, society and almost every company. The lack of this understanding is largely magnified to-day when our society is facing such proportions that government and society cannot cope with them effectively. United States business is being asked to take over more and more of the burdens which were previously the governments responsibility.⁸⁴

Actually, the question which is now facing the business is not that they should help society or not, but rather how much and what way?

⁸³Case.F.E., Business and the urban scene, Management Review, Summer 1969, p-4.

⁸⁴Hazel Henderson, "Should Business Take Society's Problems?" Harvard Business Review, July-August 1968, p. 77.

After stressing the responsibility of engineer's function as a supervisor and particularly as a manager to-wards the society, the reader may begin to think about the social problems. As a such the author would like to describe in brief, the social problems and then define the responsibilities of the business.

The Social Problems

"The polluted atmosphere of New York.....is just one aspect of man's assault on his environment."⁸⁵
 But, "as we look around us, we see many problems which are building with unprecedented pressure!"⁸⁶ Just to name a few, which becomes part of every day life, are: antiwar discent, crime, youthful protest and new moralities of sex and drugs. There are civic issues of budgets, inflation and taxes, and the social issues of hardcore unemployment, the poverty circle, family breakdown and marginal education.⁸⁷

In addition to these human problems there are others, more physical in nature, but equally important. These are transportation problems of safety, congestion and noise; housing deficiencies and urban congestion; pollution of air, water and land.⁸⁸

⁸⁵Davy.J. The environmental Crisis, Management Today, Sept 1969
pp. 66

⁸⁶Keating. S.F., Managements Role in the urban Crisis,
S.A.M. Advanced management journal, 1969, pp. 19

⁸⁷Ibid

⁸⁸Miller.I., "Business has a war to win," H B R, March-April 69
pp.68

The seriousness of human problems must be clear to everybody, since they are attacking the core of our civilization. But it cannot be treated lightly either because they can take disastrous proportions, such as radioactive waste, pollution by pesticides and other chemicals (DDT, for example). oil leaks on the sea and the pollution of lake erie.⁸⁹

But when business is asked to help, they are under attack from various groups. Stockholders are demanding more dividends, workers are seeking pay increases, customers are complaining about high prices, and government interferes with more taxes, laws and regulations. Management, actually is caught in a squeeze between running a more efficient operation, to satisfy these groups, and helping to solve society's problems.

The responsibilities of business

As it was stated before the responsibilities of business to-ward society have never been clearly defined. There are many opinions on this issue.

According to Drucker,⁹⁰ the "second survival need" of a business organization is to have a good relationship with the community. "The enterprise.....exist only as long as society..belives that it does a job and a necessary,

⁸⁹Davy. J., opcit. pp. 67

⁹⁰Wadia, Scott, Foresman, "The Nature & Scope of Management, Scott, Foresman & Co., 1966. pp.39

a useful, and a productive one."

Most of the companies are realizing that they have to do more than only earn profit.⁹¹ Johnson & Johnson, for example puts it this way: "Our fourth responsibility is to the communities in which we live. We must be good citizens, support good works and charity and bear our fair share of taxes...."⁹²

Business is responding to these new challenges, but they really not equipped to solve them.⁹³ They are suddenly expected to be masters of behavioral science, anthropology and social psychology. No wonder that they are confused, frustrated and immobilized.⁹⁴

Irwin Miller⁹⁵ sums it up best stating: "This is a business and industry society. We are the power group, the lead group, the group that has a chance to show the way."

Summing up these views, and taking into considerations the other factors involved, it is clear that business must

⁹¹Case, F.E., Business & the Urban Scene, Management Review Summer 1969, p.5

⁹²Bristol, L.H.Jr., Developing the Corporate Image, Charles Schribner's Sons, N.Y. 1960 p.38

⁹³Handerson Hazel, Should Business Tackle Society's Problems? H.B.R., July-August, 1968, p.77

⁹⁴Ibid, p.50

⁹⁵Fendock, J.J., The Business of Business, Personnel, Sept 1969, p.8-9

take an active, effective, leading role and government must set guide lines and co-ordinate the efforts to launch an effective program to solve our society's problem. All problems should be looked from economical standpoint also, since business must exist in this environment, they must preserve the air, land water, workforce and customers which are necessary to their profitable operations.

Every company should realize that "private business programs for solving social problems are more than social responsibility-they are necessary part of producing better profits."⁹⁶

THE CHALLENGE FACING THE ENGINEER

The British historian Arnold Toynbee, wrote,

"My own view of history is that human beings do have genuine freedom to make choices. Our destiny is not predetermined for us; we determine it for ourselves. If we crash, it will be because we have chosen death and evil when we were free to choose life and good."

A less optimistic 20th century writer has said, "Man is the only animal on earth capable of self-destruction, and he seems bent on doing it."

The challenge facing the engineer is to rise to the task of managing what has become a basically technological

⁹⁶Case opcit. p. 6.

society.

Dr. Eugen Fubini has defined the orders of technological development. In a provocative article in the magazine, "Innovation," he states, "In recent years those of us who manage technology have had to become more conscious of the work that we do - much more than we used to be."

If we go back to the history and look into the inventions such as the Atomic Bomb, the internal combustion engine, the man who invented never thought about the consequences they had created. At that time the society was welcoming the inventions. Every country felt that she has to go ahead and create more and more inventions. The people were welcoming new inventions. But now the view of the people has changed. They want clean air, clean water, and a different type of healthy living. It is not only the cigarette smoker has to worry about cancer, but everyone is worried about this. There is no doubt that many of these inventions has brought us the comfort in life, luxury in life and now it is easy that a man can do everything mechanically. The people does not have to dream anymore, as what moon is and what it looks like. But sure man has to worry more and more now, because he is part of all this, so he blames the society. But one should know what is society and who

belongs to the society. But now social problems is really a problem facing every individuals.

People accept and enjoy the benefits of technological change but are prone to criticize the side effects.

"I am sure, so far as I was concerned, that it never went through my mind when I was working on a new technology or a new discovery—to worry about its ultimate social consequences. One always worries about the first set of consequences; but people seldom worry about the second; never about the third or fourth."⁹⁷

First Stage:

How can I use this new technology or scientific discovery to improve what I am now doing? Improvement of Existing devices.

Second Stage:

What else can I do with this new technology that I have been unable to do before? Creative Utilization of the New Technology.

Third Stage:

What change do I make (or does society make) to match this new technology? Accommodation for the New Technology.

Fourth Stage:

What are the social consequences of the changes in life which this new development will make? Consequences of Using the New Technology.

The frontier in engineering is to continue with our utilization of new technologies and still be responsive to the four consequences which Dr. Fubine has outlined.⁹⁸

Technology has provided the basic needs and the society very well accepted by showing a great deal of satisfaction.

⁹⁷ Carliss S. Oswald, op.cit, p-10.

⁹⁸ Ibid, p-11.

But to day we are showing the concern for our environment, for other people, for peace, for the kind of life we live. These have become the dominant issues of the day.

In those areas where our fast advancing technology was created problems our responsibilities as engineers is clear. Engineers are being asked if the price society must pay for technological progress is really worth the social costs that are incurred.

Engineering is being asked to bring its unique skills to bear in solving the social consequences arising in part at least from our technological advances.

It has become fashionable to blame the engineer for all of the problems affecting our environment. Thoughtful people are calling for drastic changes in the political and social ground rules within which business is conducted. In the opinion of many, engineering, since it organizes and channels a high proportion of the total action of society, has been, and still is deeply implicated in the deterioration of our environment. The solution to this problem rests heavily upon business for resources, and upon the engineering community for the innovation and necessary technical leadership.⁹⁹

⁹⁹Ibid, p-16-17.

In recent letter to the membership, H.F. Barr,
President of SAE, summed up the challenge in one sentence-

"The principle causes of the controversy confronting us are the unstable economic picture, the increasingly sharp focus of the government and public on the engineer and his work, the information explosion in awareness of the engineer himself."¹⁰⁰

SUMMARY

It has been made clear of to-day's social problems and the consequences. It can no longer be neglected either consciously, or unconsciously. It should be kept in mind that every decisions is made should be given long range consideration. The problem is to guard the rising technology against the "side effects."

"The time has come that we can no longer turn our backs on society; we cannot retreat to that ivory tower of professional engineering and leave the social problems to others. We must find ways to contribute our skills to the solutions."¹⁰¹

"We face a tremendous challenge-but we do have the basic tools to meet that challenge."

"We have a technology that is expanding at an exponential rate to draw on for the means."¹⁰²

¹⁰⁰ Carliss Oswald, op,cit, p-18

¹⁰¹ Ibid, p-19

¹⁰² Ibid, p-19

To achieve this it is very essential to have qualified and welltrained engineers. It is the function of the training department to offer education and effective training to their engineers. This is the biggest responsibility because to day's engineer will be future executive.

To do the job that lies before us we also need creative engineering managers. The only path is to release and channel the creativity for the greatest social good.

Engineers, as managers, cannot overlook the daily business decisions, which may affect the environment. He as a manager, must exercise sound business judgements in establishing the goals and the time tables. Management cannot legislate creativity but it can establish the goals and provide the environment. The goal of effectively and managing creative engineers is not easily achieved, but it is apparent that the potential payoff in technical accomplishment, in impact on to-day's problems, in responding to the social needs, is great.

In this swiftly moving era, engineers are finding that it is not enough to be technically competent; they must be able to anticipate technological change in order to take advantage of it.

"Dr. James Bright urges that the engineering manager develop his ability to forecast change; to evaluate the signals of change; to use all the parameters available to evaluate the signals. He calls this process "- monitoring the environment for impending technological change."¹⁰³

Dr. Vannevar Bush has this to say about management

"Management today is a profession, a very new profession compared to medicine or law, but it is well on its way. So we have management the art, and management the profession-and this is not all. The structure under every art is technique, and so technique underlies management also. Art, profession, technique- these three strands weave in and out to make a braid, and in thinking of management it often takes some close work to know which is which. The good manager is the practitioner of an art, and art in any form does not yield to analysis. It yields to the practiced hand, controlled by an accustomed mind."¹⁰⁴

"We have the challenge-surely we have the practiced hand and the accustomed mind."

"To prosper in a fast changing world, top business leaders must think more like philosophers than efficiency experts."¹⁰⁵

¹⁰³ Dr. James R. Bright, "Evaluating Signals Technological Change," Harvard Business Review, Jan-Feb, 1970.

¹⁰⁴ Dr. Vannevar Bush, "Science is not enough," 1967.

¹⁰⁵ Anshen Melvin, "The management of ideas," H B R, July-August 1969, pp. 99. 107.

CHAPTER VI

RATING AND EVALUATION

The purpose of this chapter is to discuss the importance of rating the trainee and the evaluation of both the trainee and program itself.

In this step the trainee is "on his own". He must perform the job without any help. For evaluating the trainee there are many methods available such as rating forms, written tests and personal contact for evaluating the program the available methods are check the trainees and the supervisor's reports.

The evaluation of both the trainee and the program itself are treated together here because the two are mutually dependent.

Rating the trainee is often advantageous to the company and to the trainee. If analysis of trainer rating cards shows a significant number of young engineers to be deficient in one or more of the same areas of learning or activity, then it is obvious that something is wrong with the program.

RATING

Many of the rating forms now in use are elaborate in the extreme training program, covering every factor

not only to the trainee's performance on the job but also as to his personality. Most of the firms which use rating cards employ the similar method of evaluation, characters and skills are essential for a future career in management for an individual.

Rating cards currently in use range all the way from a single mimeographed sheet, covering only a few broad characteristics, such as output, knowledge of job, responsibility and co-operation to elaborately printed, multipage forms which cover dozens of performance and character trait evaluation.

The usefulness of such a system is entirely dependent upon the observation and good judgement of the supervisor, and it is imperative, therefore, that they be well trained in its use and that their evaluations be checked periodically by their superiors.¹⁰⁶

Rating cards can be extremely valuable aids to evaluation of potential plant executives. The boss must check the statement that is most applicable to the man being rated and the one that is least applicable to the man being rated in each case, for example, the trainee during his training program will be judged and rated such

¹⁰⁶How to train engineers in industry
The National Society of Professional engineers 1955.

as technical knowledge, very accurate, is often late to work, his subordinates, is very decisive and works very hard.

There is another type of evaluation form such as an essay rating. The boss simply writes a little essay on the trainee listing his strong points and his weak points with notes on ways in which he can improve. Then eventually promotable, or not promotable.

Rating cards should be used only in conjunction with personal conferences, detailed reports and other indicators of character and ability. The trainee's personality will be rated by his supervisor. His personality such as, is he liked by everyone, well liked, disliked, liked by some, disliked by others and refuse to mix. The trainee's ability to learn also acts an important role in the training program of rating such as whether the trainee grasps ideas and methods quickly, required detailed instructions and needs repeated instructions.

The trainee's emotional balance should always be calm and good self-control. The trainee during his training program will be easily excited, moody at times, nervous and irritable, this should not happen because all this counts for his rating performance. The trainee's co-operation is also important. The trainee should be a good team worker. The trainee's enthusiasm such as eager to learn

all phases, enthusiastic about certain things, does work satisfactorily, no apparent enthusiasm and holds back, these are some of the enthusiasm which accounts on his rating performance. These are some of the above points for the trainee to be rated on his performance during his training program.

The trouble is that in many cases high scores do not have relation to performance, for example, there are many people who are rated highly intelligent by everyone who knows them, but who are so lacking in common sense that they do everything wrong, there are people who are so "co-operative" that they spend their time satisfying others rather than getting things done.

Numerical rating is not in much use in most of the companies. A graduate scale was used rather than numerical rating on which the boss was asked to rate each trainee on each characteristic features, such as poor, below average, average, good or outstanding. On these basis the boss would be told to check the most applicable to his subordinate. This type may be easier for the boss to fill out than those which call for numerical scores.

Thus when the boss makes the rating for a trainee, he has no idea of how to rate on many of the trainee's characteristic features, especially some of them may be very needful for instance "personality", this is an

impossible task for the boss to rate the trainees. The trainee will be rated such as the one that is least applicable and the most applicable.

EVALUATION

An evaluation program of training in business or industry is not a simple process nor is it an easy task if the job is to be done completely. The evaluation must determine what changes have taken place in the employee as the result of exposure to experiences called "training". An analysis must be made to determine if the best, most economical training was conducted. A diagnostic study of training methods and techniques is in order to determine whether or not organizational effectiveness has been attained.

Evaluation of training, therefore, generally has three major aspects.

1. An assessment of the change in employee behavior.
2. An analysis as to whether or not the training program further the achievement of organizational goals.
3. An evaluation of the training methods, and techniques.¹⁰⁷

¹⁰⁷Denova C. Charles, "Is this any way to evaluate a training activity? You bet it is!", Personnel Journal. Volume 47, July 1968. pp-488.

The employees behavior is estimated by evaluating his progress in trainin. The supervisor will estimate his change of behavior during his training progress. One of the most important steps in the learning process is the periodic measurement of the progress of trainees and the evaluation of the results of training program.

Most training is evaluated by written test, performance and observance of practical exercises being accomplished by the trainee tests are given for the following reasons.

1. To measure the trainees achievement and understanding.
2. To diagnose trainee difficulties.
3. To give the trainer incentive.
4. To discover weakness in the instruction and program.¹⁰⁸

In most cases, however, no numerical grade was assigned, test performance was used as a communication device. Evaluating the over-all program sometimes create greater difficulties than evaluating performance of an individual for training people, tests can be extremely valuable aids to evaluate the trainee and improve the methods of the trainee's quality.

¹⁰⁸Ibid., p. 489.

Historically speaking the goals of training program proceed from the organization and have been concerned with meeting organizational needs. However today we are operating in an entirely different environment where individual and societal goals have become as important considerations in the development and conduct of training programs as are organizational goals. The organization responsible for training programs must establish a reputation for employing and maintain a highly qualified instructional staff. More and more employees have come to realize that participation in training can increase the job security, opportunity for advancement, status, prestige, personal satisfaction, etc. Organizational training goals that have been primarily concerned with such things as increased performance, creation of a manpower pool for promotion, improved safety, etc., must now take into careful consideration and desires of individual and society.¹⁰⁹

An individual during his training program may spend a certain portion of time at various projects and work assignments. In a practical way the company can benefit primarily in these projects. The accuracy of training evaluation is dependent upon how carefully each of the above steps is accomplished.

¹⁰⁹ Leonard Ackerman, "Training Programs: Goals, Means & Evaluations," Personnel Journal, Volume 47, October 1968, p. 725.

In many cases increased skill and knowledge to be gained from training programs have become important fringe benefits in attracting the employees to an organization.

It is becoming increasingly apparent that organizational self-interest alone will dictate that business, industry, and government make wider use of their training programs to provide opportunities to those who lack marketable skills and knowledges. The tenor of many training programs specifically in the areas of human relations and management training, appears to be overly concerned with "legislating attitudes" and increased student "self-knowledge."¹¹⁰

Individual, social and organizational goals must be taken into consideration in establishing the programs. Each individual possesses skill and knowledge before instruction begins. Perhaps this is the most important function in evaluating the person.

One of the important steps in the learning process is the periodic measurement of the progress of trainees and the evaluation of the results of a training program. Most training is evaluated by written test, performances test and observance of practical exercises being

¹¹⁰Ibid, pp. 725-727.

accomplished by the trainee. The value of training methods and materials during instruction are unknown until their effects are measured. Measurement is essential to the trainee's progressive learning capacity. If a learner's abilities and capabilities are not measured, a knowledge of him is impossible.¹¹¹

The tests can be very helpful for the trainee in assisting to improve his skill and knowledge during his training programs. The trainee should always be prepared and supply with the idea in mind that they are effective teaching devices. In order to carry out this purpose, the instructor must review each test thoroughly. Later on the papers will be scored and returned to the trainees. The most important is that, this be done as early as possible after supplying the test so that trainee may be corrected as early as possible in his incorrect thinking if any.

A test is a measuring instrument. Achievement tests can be used to measure the ability of the learner to recall ideas, correct ideas in an appropriate situation, or apply principles in the solution of problems. This can also be used to measure skills. Achievement tests are frequently given for the purpose of "grading" trainees

¹¹¹Denova C. Charles., op cit, pp. 489-491.

during his training program.¹¹²

If proper training is given to the trainee, an aptitude tests are used to estimate the capacity of an employee to develop his skills on certain jobs. Achievement tests measure the amount and direction of learning, as well as identify areas in need of additional training. Individuals should be tested on the equipment identical to that used on the job.

The individuals responsible for the training programs must conduct survey to determine the impact on the company services as well as on the participants in the various training programs. There should be an analysis of the employees progress, and the correlation between training and supervisory appraisal should be investigated.

The evaluation process is an orderly method by which staff members may consciously improve their service to the company. Evaluation of instructors, methods, techniques, classes and programs is done by almost everyone and goes on continuously.¹¹³

Evaluation of training is both practical and as well as necessary. The amount and direction of learning and

¹¹²Ibid., pp. 489-491.

¹¹³Ibid., p. 491.

the on the job effects of training are more difficult to measure in training efforts directed, for example, toward improving decision making, increasing personal effectiveness, or changing attitudes than they are in skills training.¹¹⁴

The evaluation of training programs has both advantages and disadvantages. Most education and training is carried out in groups. A trainee should check back to see if he is using the correct method in a given performance. Many companies have benefited by this training program.

Generally speaking training programs are designed little or no thought as to how they will be evaluated. Evaluation of training and development must be conducted in such a way that it is consistent with goals, objectives and purposes of the training activity and is in accordance with accepted and proven principles of evaluation.

Evaluation is important to training and development activities, just as it is to any other organizational element. Evaluation is critical in determining the value of training and development programs and activities to the enterprise and of appraising the efficiency and effectiveness of the functions performance of the tasks

¹¹⁴ Training: A handbook for line managers., Proctor and Thornton.

set for it. Evaluation provides trainers with a means of determining the efficiency, effectiveness, and utility of both management and operation. Evaluation provides a starting point for the design of an improved program. Goals of training and development is the first step in meeting these obligations.

Today many of the companies have the most active training programs. Thus the young engineers is appraised, at one time, of how he stands in relation to his fellows, where his deficiencies lie and what subjects need additional work, and what his supervisors thinks of himself. Most of the companies reporting only brief reports from the trainees, and most of the companies fix maximum wordage limits. Final reports of course tend to be much more extensive, since they must cover everything the trainee has learned in a program which may be anywhere from one year to four years in length.¹¹⁵

Evaluation is one type of problem solving. First of all the need for evaluation is recognized, the areas to be evaluated. The procedures in the training program used in the evaluation are selected or developed.

Communication and co-ordination are essential during the training program. Every effort must be made to let

¹¹⁵How to traine engineers in industry, op cit, p. 46.

the trainee know what is planned. All personnel of the training and development activity must be directly involved in the evaluation.

In recent years, in-company training and development programs have grown rapidly, and there has been a phenomenal increase in the resources committed to them in most enterprises. Evaluation provides a starting point for the design of an improvement program.

The entire program is decided that each company will make a comparison of absenteeism, labor turnover and other objective factors after and before training. These comparisons will be analyzed and discussed by the advisory committee in order to get not only a measure of the success of this training regimen but guidance in setting up sequels to it. More detailed procedures, such as employee attitude surveys, such as developed for the future programs after more experience is gained, but it is felt that for the time being this is rather obvious evaluation will provide the necessary feedback.

SUMMARY

The purpose of training a trainee is to evaluate progress, for example, the instructor wants to know how well individuals are learning, are they getting enough time on a given subject. During the training program

a trainee must be encouraged to make criticism and suggestions. A trainee under the supervisor during his training programs evaluates trainees, attitude, quality of work performed, co-operation, attention to training and indication of future effectiveness as engineer. All these are important to a trainee to be qualified.

The evaluation acts an important role on the human behavior of the training program. The trainees will be judged and evaluated by the supervisors. The rotational assignments is by far the most important factor in arriving at a decision, the survey showed.

The evaluation of training programs is not a simple task, since we are dealing with the measurement of human behavior. We are trying to determine what changes, if any, have taken place in skills, knowledge, and attitudes of employees as a result of an experience called "training."¹¹⁶

Evaluation should start at the time program is being started. Evaluation should be designed into the total training program. It has a value throughout the training program. Trainees increase skill and knowledge from the training program. No training program can be conducted efficiently without frequent and accurate checks.

¹¹⁶Ibid, pp. 490-491.

Evaluation is and has been the stepchild of training program.¹¹⁷

Evaluation should be planned at the same time as the training program and should constitute an integral part of the total program from beginning to end. In other words, evaluation, like training, is not a one-shot proposition but must be a continual process.¹¹⁸

¹¹⁷Leonard Ackerman, op cit, p. 727.

¹¹⁸Bernard M. Bass & James A. Vaughan, "Training In Industry, The management learning," Wadsworth Publishing Co., Inc, California, 1966, p. 144.

CHAPTER VII

EFFECTIVE TRAINING PROGRAM

In the previous chapters, the basic essentials and a great need for an effective training program-primarily for engineers has been discussed. It was clearly enlightened as what an "engineer" is in to-days society, his responsibility to-wards organizational goals, and social problems and the need for an effective training program-mainly because the engineer, as an engineer and as a manager plays a big role in a society.

This is designed, to establish the guidelines in setting up an effective training program for engineers and to develop a program - in general.

Since every industry and business has different needs, it will not be possible to develop different programs in this paper. As such a general program which would be common to most of the industries and to the business will be developed in this chapter. Specific companies may find that they should add more to it.

Before developing any training program, a base or foundation must be built, upon which, the complete structure must rest. The most important basis for any program is that management must support the entire undertaking one hundred percent. Without the assistance

and interest of top management, it is fruitless for any company to have a training program. If possible the management should assign a representative who should attend all the training courses and conference, and approve the materials and procedure to be used for training.

GUIDELINES

Setting up the guidelines is and should be the first and foremost function of every industry. The following guidelines will help both the management and training department to establish an effective training program.

1. To assign the job on an individual basis.
2. To maintain good communication with every individual - regarding the company policy, his progress and should also identify the individual weakness and send him to proper training.
3. Recognition of talents and consequent rewards to be given at proper time.
4. Arrange for qualified individual to attend the seminars to increase his potential.
5. Fair treatment to his subordinates is very essential.

All these five factors will be a motivating factor to any individual. Many reports and papers started

recognizing the favoritism of the supervisors to-wards a particular individual which will be a death blow to the creative engineers. Because creative engineers are very sensitive and they will be the first one to recognize this.

There are many supervisors in industry who are depressed because "They did not move up any further", will tend to show the same attitude to-wards their sub-ordinates. Therefore the management should recognize this and use the job rotation technique so that the individual supervisor with this attitude will not have a chance to influence this attitude to his sub-ordinates.

The first and foremost function is to establish a means to introduce every fresh graduate engineer to the factory floor from the academic atmosphere. In order to do this the training department should establish a orientation program varying from few days to few weeks depending on the size of the company.

The author proposes four phases of training for graduate engineers.

1. Orientation program.
2. On-the-job training.
3. Classroom work.
4. Continuation of training.

This proposed training program is a combination of

both a formal training programs and an on-the-job training program.

ORIENTATION

The main purpose of any orientation program for college graduates is, to acquaint them with the company practice, to enable them to become familiar with the layout of the company, to gain practical experience in the engineering field and to give him a chance to decide as where he fits in best.¹¹⁹

A brief and effective introduction by an impressive speaker should be given on the first day, explaining the difference between the academic atmosphere and the industry atmosphere. A sincere speech with truth and some field photographs will establish a solid background to make it clear as what kind of atmosphere he would be working in. It is also necessary to explain the engineer as what percentage of work is dedicated to what.

The function of the company and its responsibilities to the society in solving social problems should be made clear to the trainee since every industry is creating pollution, so it is there sincere responsibility to bring their social problems to the engineers. By this way the will start recognizing the importance of their responsibility

¹¹⁹ Answered questionnaire.

to-wards the society.

The importance of how much the truth is spoken, will give a clear understanding in the mind of the engineers and will not be depressed when he was placed on the job. This approach will be successful in having a happy group of engineers. It is better to tell them what they will be doing instead of telling him "feel it by experience."

In-department training

On the first day the supervisor should explain as what the function of department is, their aim is and then tour the trainee in the shops if any. During this programs, which is primarily an orientation to the various departments. The trainee is expected to learn as much as possible about the group the trainee is with in terms of its general functions, the type of work performed, how it is performed, and why it is performed in a particular way.

Length of the training in every department should be just enough to learn a job thoroughly while not lasting so long that one becomes completely bored and disgusted.

The trainee should keep a weekly log coverin his activities with his suggestions and comments. A report at the completion of each phase of training should be held after each phase of the training to check progress.

During his stay in the department, the trainee should be told to gather as much as information as which basis he is going to decide where he wants to work. The supervisor should evaluate the trainee on day to day basis and should report to the personnel. At the end of training in that particular department, the supervisor should have a formal type of interview with the trainee and use valid techniques to make sure whether the supervisor is interested in him or not.

This kind of training in departments serves dual purpose.

1. To get the trainee exposed to all departments so that he will decide as what he wants and where he best fits in.
2. By getting exposed the trainee would know as where he should go if he wants particular information.

Supervisors as trainers

Supervisors have an important role to play as trainers. Because trainees are assigned to their departments to for varying periods to observe the work being done and to participate directly in it.

Supervisors should welcome the trainees, show them around, set tasks for them, check their work and do

everything they can to make sure that the time the trainees spend in their departments is time well spent.

Supervisor as an efficient trainer can promote important company goals.

Plan objectives

Basic objectives of this type of training should be both short-range and long range.¹²⁰

Short-Range

1. To provide meaningful job assignments that are challenging to each trainee's interest and ability.
2. To provide each trainee with a fundamental technical knowledge, an understanding of the functional procedures of the operating departments, and an appreciation of the economic and social aspects of the business.
3. To acquaint the trainee with the basic policy and goals of the company, the products manufactured and how they are manufactured, the marketing of the products, and the personnel of the organization.
4. To give trainee opportunity to determine areas of his particular interest and abilities.
5. To allow trainee to gain appreciation of the skills and performance of employees.

¹²⁰ Answered questionnaire with supplement.

6. To provide a broad exposure to all phases of manufacturing and related functions.
7. To get trainee accustomed to the disciplines of the employment relationship.

The above objectives agree fairly well with the results of the questionnaire sent out to industries in connection with this thesis.

During this orientation program provision should be made to arrange for seminars and lectures in the following areas, which is common to all the engineers in to-day's industry.

1. Finance.
2. Safety.
3. Social Problems.
4. Purchasing.
5. Inspection.

At the end of this program if any individual is interested in the departmental training in any of the above areas, he should be assigned to a certain length of time in the interested department.

Through out the orientation program any suggestion should be appreciated by the management. A recognition of a valid suggestion must be shown on his personnel records.

After completions of the basic training program which may last few weeks to few months depending on the size of the company, the trainee should be assigned in the field the company thinks he is best suitable with his consent. After assigning the trainee, the supervisor should carefully watch his progress and his weakness for six months. Meanwhile he should be evaluated very carefully for his potentials. Immediately after six months of assignments he should be exposed for more training which will be of long-term objectives.

Long-Term

1. The long-term objectives is to get a number of the graduates started toward jobs in management.
2. To give trainee an opportunity to prepare himself for managerial responsibility.
3. To provide an adequate number of men of capacity with the will to succeed in management.
4. To anticipate the manpower needs of the company based on its planned long-range objectives.
5. To develop in the trainee an understanding of the principles of sound business management and to become professionally oriented in their implementation.
6. To provide a basis for evaluation of individual performance and potential.¹²¹

¹²¹ Answered questionnaire.

Once the trainee is assigned in a department, the trainee is going through on-the-job training.

ON-THE-JOB TRAINING

Since the trainee has gone through orientation program it will no be necessary to explain the trainee as wherehe should go for timely help. After going through the intensive orientation program and having acquired the necessary knowledge, it would be easier for the trainee to analyze his practical job. With the excellent background achieved from orientation program the trainee will now build the practical job knowledge derived from working within the departments of an organization. The supervisor will be the trainer and has the responsibility of training the trainee. The supervisor as the trainer is the one who is responsible for the trainee'a progress. This has several advantages.

1. Since the trainer is trainee's supervisor, it is only natural that an active interest will be taken in the well being and progress of the trainee. He should begin to feel a sense or pride as the trainee progresses through the training.
2. Since the trainer will work so closely with the trainee, it will be easy for him to observe learning progress, and there by spot any deficient

areas that would require re-emphasis.

This is a important stage in the phase of training. The supervisor is responsible for assigning the trainee and evaluating him. During this process, the supervisor should try and evaluate the effectiveness of the "orientation program."

If he is exposed to effective learning then naturally the trainer will perform his assignment efficiently. Recognition of this with a reward would motivate the trainee, which will thrive him to increase his ability and creativity of this technique will definitely increase the organizational effectiveness.

If he is not exposed to effective learning then the supervisor will have no problem of recognizing this. When this is found a careful analysis should be made and take the appropriate steps. The suggested steps are:

1. Expose him to efficient learning process
2. Job rotation
3. Send him for further training

CLASSROOM WORK

At the end of six months the trainee should be sent for further training. This training would consist of classroom work, and seminars.

The trainee should be sent to 'tailor-made' courses along with the following courses.

1. Effective Communication
- c 2. Social Problems

Effective Communication

The American Management Association, in a training booklet in their personnel series.¹²² has this to say:

"All management contacts are with people. The sole instrument of these contacts is communication. Thus communication becomes the central core around which a successful enterprise develops. Without communication we are as if alone on a desert island. Communication then is the central nervous system of all society. The quality of any management can be fairly well determined by the quality and degree of flow of communications. Specialization makes communication both more difficult and more important."

"Nearly everyone in business says communications is one of our greatest problems."¹²³

The course should be developed to serve the following purpose:

1. Emphasis on upward and downward communications.
2. Communications is far less a technique than an attitude.
3. Emphasize the importance of "Empathy"
4. The single most important technique in better communication 'feedback.'

¹²²AMA, Inc., Personnel Management in a Competitive Economy, #159 Personnel Series

¹²³Harold Mayfield, "Communication, What's the Real Problem?", Supervisory Management, October 1967, p. 16

5. Art of careful listening.

Social Problems

The course should be designed to broaden the engineer's aim-to break away from the traditional concept of narrowly-oriented "technicians" toward a "new breed of engineer" who is fully conscious of the impact his efforts may have on his fellow workers and the responsibility he bears to his community and all of society.¹²⁴

The purpose of this course is to enlighten the existing problems, establish the importance of the problems and establish a sound relation between his job assignment and his responsibilities to the society.

Principles of classroom training

1. Decide which media can be used to best advantage in presenting the material. Keep in mind learning is most effective when the students receive information in a variety of media - literature, question/answers, visual, dynamic, static, voice, etc.
2. The training should be practical, and extremely helpful in performing the job assignment more efficiently.
3. The material should be carefully designed to minimize classroom lectures.

¹²⁴Western Electric news briefs background, "Engineers" impact on society reflected in New CEC courses, Feb 21. 1972, p. 12.

4. Establish steps to efficient learning.

Steps to efficient learning

1. Set learning goals.
2. Teach both ideas and facts.
3. Recognize when the trainee behaves properly.
4. Define the language the trainee is expected to know.

Evaluation of the trainer and the training program by the Trainee

As it was explained in the chapter four, a well trained trainer as a teacher and as liaison will train engineers effectively.

At the end of the training the trainee should be asked to evaluate the training program and the trainer on a prescribed form and sent it to the training department. These forms should be analyzed by training specialists and forward the analysis to either the committee who is responsible for reviewing the program nor to the director of training department. A positive approach should be taken to-wards this analysis.

Evaluation of trainer

Just like the trainee needs a change, the trainer may also need a change. As such based on the evaluation made by the trainees, the training department should take

appropriate actions in training the trainers replace them or change the assignments.

Evaluation of training program

The accuracy of training evaluation and trainer is dependent upon how carefully each of the answers are analyzed and the consideration of this analysis is the training department.

Training evaluation provides the basis for sound decisions. With the assumption that each individual is placed in the right type of department with a challenging assignment after the completion of orientation program, it is not very easy to evaluate specific training programs as being generally good or bad but appraise them on the basis of how nearly they tend to conform to the needs of the individual graduate.

Based on the analysis from trainee's evaluation sheet and the appraisal, the training courses should be reviewed and take action.

Evaluation of the trainee

The trainer should evaluate the trainee on a prescribed form and send it to personnel. This should be made available only to the concerned supervisors.

Completion of three phases of training

By now the trainee has completed three phases of the

training program.

1. Orientation.
2. On-the-job training.
3. Classroom work.

At this stage it is very essential to evaluate the effectiveness of this training program.

Evaluation of effectiveness

The result of the survey shows that twenty five companies measure the effectiveness by means of engineering performance and five companies by means of creativity.

"I suppose we would, if someone would come up with a quantitative method of evaluating creativity."¹²⁵

The effectiveness could only be evaluated by measuring the learning, by measuring ability to perform, and by measuring creativity, but the question is what tools are available to measure these quantities.

There is no one test which can screen trainees for all types of training or gauge the effectiveness of all types of learning.

Measuring the learning

This is rather easy to measure by means of tests and group conference.

¹²⁵ Answered Questionnaire

The written examinations developed by the training specialist will satisfactorily measure the learning. It is reasonable to expect an engineer, satisfactorily trained, to respond correctly to 80%, or 70% or 90% of the items in the examination.

The group conference with few training specialist will measure the learning by means of open questions and answers.

These guidelines then become the way to evaluate the quality of training and the degree of effective learning.

According to the famous Psychologists the written examinations sometimes brings tension to the trainee as such this may not be a true measure of his learning. To overcome this group conference will ease the tension and the trainee would be in a better ease to participate in the conference.

Measuring the ability to perform

This is done by the supervisor either on day-to-day basis or on project basis. A good supervisor will measure the ability much faster. A good comparison of measurement before and after the training will be the guideline to decide whether the training was effective or not

Sometimes increased performance could also be noticed

by means of motivation.

Measuring the creativity

In order to measure the creativity the first step is to establish a climate for creative engineering and then measure the performance.

There are number of positive steps that management can take to ensure a climate for creative engineering. These are¹²⁶

1. Give engineers achieve of problems to work on within their field of interest.
2. Delegate considerable freedom to responsible engineers.
3. Allow time and freedom of thought for new ideas to incubate.
4. Foster a climate in which it is permissible to just sit and think without having such action being interpreted as a waste of time.
5. Recognize all new ideas promptly.
6. Conduct seminars where informality rules, and where engineers and researchers can meet for cross-fertilization of ideas.

What counts is the total number and value of new ideas per year and not the number of poor ideas per day.

¹²⁶Delmar W. Karger & Robert G. Murdick, "Managing Engg & Research, "Industrial Press Inc. N.Y. 1969, pp- 96-97.

After measuring the learning, ability to perform and creativity, a report should be prepared in a written form indicating the degree of effectiveness and send it to the training department.

The training department should appoint a committee, comprised of qualified supervisors and training specialists. This committee shall be functionally responsible for the analysis of the effectiveness of the training program. Having the data supplied by the supervisors on a written form a careful and effective analysis should be done.

CONTINUATION OF TRAINING

After the engineer has been assigned to perform a job it is necessary to continue training procedures.

The engineers should be send to this phase of program as when it is needed.

This program should consist of the following:

1. Job rotation - to expose him with variety of job assignment.
2. Tutition-Aid Plan:- to earn advanced degrees.
3. Seminars:- to learn the new techniques, exchange ideas and to increase his professional potential.
4. Advance Classroom Courses:- this must be tailor-made to suit the needs of the individual or the department he is assigned.

5. Group Conference within the plant:- to learn the latest development in their business.

The duration of this is subject to the discretion of the individual companies.

It will be a part of management policy to review the above program and offer them before the engineers reach the stagnation.

SUMMARY

It is very hard to design a program which will satisfy all the trainees expectations, because of individual differences.

The orientation program, in which the trainee goes through all the engineering departments, attends the seminar and the interested departments, lends itself particularly well to the graduate who is unsure of his vocational direction. Many of the graduates who receive degrees in majors that business considers 'academic' are interested in securing employment with a company offering such a program.

After going through the orientation program the graduate trainee 'finds' himself in the company and gets a clearer idea of the job for which he is best suited.

The constant movement from department to department

will be exciting and challenging. Working in various areas will make the complex system seem simple, and also working with new people gives a good insight into the type of people and their feelings about the bosses, the system, and their particular jobs.

Then the graduate goes through on-the-job training which is favorable to him, because he went through this and selected this on his own willingness.

After having six months of on-the-job training the trainee will go to classroom courses where he will take only tailor-made courses along with the other two courses which is helpful to his job and his future. Since he is motivated to choose his own type of work, and works in a department where he likes, he would be in a position to evaluate himself and come to a conclusion as what he should learn. This evaluate the effectiveness of the orientation program. The degree of effectiveness will increase in the process of on-the-job training. As such it is imperative to say that the batch of engineers goes to classroom training after completing the first two phases of training are bound to learn effectively in the classroom training. Thereby the effectiveness of the training program will increase to a favourable limit.

The batch of trainees who comes back to the department after going through these three phases of training

program are bound to be effective engineers.

The industry has the responsibility to its own progress as well as to its engineer trainee to raise his technical competence to the highest possible level by assisting him to earn advanced academic degrees or to take further studies which will increase his knowledge in the fields of his greatest interest.

The above training program will equip the engineers with the background necessary to perform the duties. It is recognized that the companies has to develop 'tailor-made' courses to suit their needs. A careful design of these 'tailor-made' courses, using the guidelines will meet the objectives established in this chapter. There is no doubt in the author's mind that this program will be successful in training the engineers effectively.

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

In the preceding chapters, the author has strived to present the importance of effective training program. The need for an effective training program was clearly indicated and in an effort to establish the program, some of the important fundamentals has been highlighted.

It is imperative to say that, the conclusions and recommendations to be presented are not necessarily the last word, nor are they necessarily the only results that might be inferred from the available information on the problem. The conclusions and recommendations are based upon the assimilation of a diverse selection of sources relevant to the field under study.

As a result of the foregoing work in the field of training, the author considers the following items to be of significance in optimizing a training program and thus increase the effectiveness.

Guidelines

Establishing the guidelines is a function of top management. These guidelines will serve dual-purpose:

1. To establish a systematic approach in designing an effective program.

2. To help the trainer in establishing sound techniques to train the trainee.

Primary Goal

The primary goal of this thesis has been one of seeking the answer to the problem of effectiveness of training. To simply answer the problem, it can be stated that an effective training program can effectively motivate the individuals to self-development which will increase the ability to perform, his creativity and can effectively change the attitudes and behavior of individuals. Thus the individuals will become more effective in his job-assignment.

Plan Objectives

Setting the objectives is one of the prime responsibility of the management. A well planned program with the sound objectives will become the basic tool for efficient learning, increased ability, increased creativity, change in attitude and behavior, motivate to gain self-knowledge, and thus increase the effectiveness of the training program.

For a company either cotemplating or in the early theories of establidhing a training program, it is extremely important that there be a specific objective or objectives in mind for which the training program is designed or

'tailored' to meet. Based on past industrial experience, this is a prerequisite to the success of the program. A program taken off the 'stock' shelf or borrowed from other industries will have difficulty in achieving success.

The Training Department

The training department could be either centralized or decentralized depending on the size, structure and economy of the company. In either case the director of training will delegate his organization in developing a effective training program. The training department is primarily responsible for

1. designing the program
2. reviewing the program
3. establishing a means to evaluate the effectiveness
4. selecting and training the trainer
5. reporting the progress of the trainee to the personnel department.

The Trainer

The trainer is responsible for establishing the techniques to be used for training. He should

1. Set goals for each step.
2. Evaluate progress.
3. Feedback progress or lack of it to the student.
4. Supply information.
5. Recognize achievement, and inform the concerned member of the management.

Orientation Program

An effective orientation program should stress the importance of learning and its ultimate results on individuals progress within the company. A clear concept of this will serve two or more purposes, eg., motivate the individual, create enthusiasm, participate willingly, and efficient learning to achieve success are the obvious end result of the program. These factors seems to be in favor of the company.

On-The-Job Training

Since the trainee chooses the department where he best fits in, will be like acceptin the challenge. He cannot blame others for any impervious reactions. The supervisor with the positive attitude could effectively utilize the individuals. Effective utilization of an individual will motivate him to increase his self-knowledge-will also increase his ability to perform and his creativity. This change in attitude and behavior will enable his sub-ordinates to follow the footsteps. Thus organizational effectiveness could be increased. Effective utilization seems to be the most powerful motivator.

The effectiveness will also depend upon the individuals expectations. But this could be pointed out very soon by the supervisor. It is imperative to make it clear to the trainee as to what degree the effectiveness would be used

in future for two or more purposes, e.g., salary administration, promotability, transfer, lay-off, or dismissal are commonly used objectives. Utilizing the effectiveness of the training program for more than one objective is good sound business economics and appears to be currently in favor.

Classroom Training

This phase of training will effectively increase individuals communication and his level of performance-considering the importance of his responsibilities towards society. Having achieved the advanced knowledge the trainee will come back to his department and will look forward utilize that he has learnt in the training. This will increase the performance which inresult proves the effectiveness of the training.

Evaluation Of Effectiveness

Obviously a company that expends time and money to offer and administer a training program is interested in evaluating its effectiveness.

As it was mentioned before this could be measured by measuring: the learning, the ability to perform and the creativity.

Continuation of training

Management thinks that training is terminated when

its trainees have been assigned to a department. New techniques are continually being developed and utilized, and only by training the engineers expect to obtain maximum knowledge of these new techniques. As such this phase of the training is equally important as the others. There is always something new to be learned in the field of engineering, and only through this technique of training, the management can expect the organizations to operate at optimum efficiency.

SUMMARY

Effective training calls, in the first place, for clarity of objectives and means. In that respect it is just like a manufacturing process. Both the ends and the means must be appropriate to the purpose.

In its relationship to its graduate engineers, industry should accept their new role willingly and train them effectively. By developing an effective training program and train them to increase their professional potential and make use of them efficiently to the maximum extent.

To sum up, it may be stated with a certain degree of certainty that careful planning and adminster of a training program. This program will be an excellent one in achieving the purpose of this paper.

Even an effective program such as this needs periodic evaluation and revision of the program, to insure the effectiveness.

The author considers it necessary for the individual industry to use recommended program in chapter seven along with a well designed 'tailor-made' courses to suit their changing needs for the maximization of its effectiveness.

RECOMMENDATIONS

As it was mentioned before, there is no intention of recommending a set procedure to increase the effectiveness. At the same time the author feels that the recommendations with the developed training program would establish a sound basis to revise the current training programs to meet the changing needs and thus establish as effective training program.

However it must be stressed that the trainee's participation and the sincere approach by the company will only add to achieve the success. If anything goes wrong there is no way to prove who is "right" and who is "wrong". Instead of wasting the precious time in proving this, it would be worthwhile to appraise both the program and the trainee, to reensure the effectiveness.

Every individual is different and so is the company.

But one thing could be easily identified that is 'respond to learning'. If this could be identified systematically, then the burden of thriving for end results would be achieved much faster.

The careful evaluation of trainee by the supervisor as a trainer will establish a sound basis to judge the trainer's choice of his fitness to a particular department. But this expectation may not mutually agree all the time if there is a wide variation in the organization and techniques - will call for reassessment.

The effectiveness of the orientation program could be measured by judging the increasing co-operation and interchange of information which is gradually raising the level of all such programs.¹²⁸

On-the-job training will have a greater impact on the trainee's learning. Depending on the individuals background, and his interest proper job assignment should be given. The supervisor as a trainer will play a big role in establishing his place in the organization. In this phase of training the trainee is expected to change his attitude and behavior, which will depend on the supervisor's role and the organization as a group. The supervisor's prime responsibility is to motivate the

¹²⁷op cit, p.69

individual to go through this process effeciently

The individuals reaction should be observed carefully. Because different subordinated respond differently to the same supervisory stimulus. The individual's reaction to an experience is two fold: depending upon his perception of it, as well as the relationship between his perception and his expectations.¹²⁸

As it was mentioned before every individual is different in his perceptions and expectations. The perceptions and expectations of an individual are, of course, dependant upon his particular background, including environment and previous experience. It is also dependent on his present social relationships in the organization and community.

The classroom training with minimized use of lectures will give a optimum result. The effective use of this training is dependant on the trainer and his techniques.

The management is responsible for creating and maintaining a sound working conditions, which will inspire the individuals perform efficiently.

The particular combination of training techniques which are employed in a training program seem to have a direct bearing on the effectiveness.

¹²⁸Likert, Rensis, "Effective supervision: An Adaptive and relative process, "Personnel Psychology, Vol 11. Autumn 1958, pp. 317-32.

The management is primarily responsible for developing an effective training program.

The following is a procedural sequence that a typical large company employing many engineers can utilize in establishing the author's recommended training program.

1. Determine the need for training.
2. Determine the goals and objectives.
3. Establish the company policy regarding its training program.
4. Estimate the dollars available for this purpose.

Establish the program

6. Review the current programs for its effectiveness.
7. Select the training techniques to be used.
8. Set up a committee consisting of training specialists and qualified supervisors.
9. Develop the program to train engineers effectively.
10. Determine the procedure to select and train the trainers.
11. Establish means to evaluate the trainees and the trainer.
12. Establish means of evaluating the program effectiveness.

Administer the program

13. Analyze the effectiveness regularly.

14. Review the program periodically-modify if necessary.
15. Keep the engineers informed about their progress.
16. Conduct a periodic survey of the program by sending a prescribed form to the trainees-primarily for recommendations.
17. Conduct a periodic refresher course for the trainers.
18. Conduct periodic survey to increase the learning process.
19. Keep abreast of new training techniques.
20. Revise the program if necessary to maximize effectiveness.

CHAPTER IX
CRITICAL EVALUATIONS

**Western Electric**

100 Terminal Avenue
Clark, N. J. 07066
201 381-4500

Clark Shop

May 4, 1972

MR. V. C. RAJASHEKAR

Dear Raja:

I read with interest your thesis titled "Effectiveness of Training Programs for Graduate Engineers."

I well appreciate the volume of research you engaged in to prepare this comprehensive evaluation of a difficult subject--difficult in the sense of defining the parameters of any management training program for professional engineers, difficult in the sense of delineating effective training methods and most particularly, difficult in evaluating any such training program.

Of particular interest to me was the chapter devoted to "Training the Trainer." I believe you hit the mark in your conclusions on this facet of the study.

I was extremely interested in the questionnaire you sent to 101 companies, and in your analysis of the returns and of your discussions with the representative of one of the three companies you visited. I wish you had reported more specifically on the discussions you had with Companies B and C in the same detail as you did with Company A. I am not surprised at the results of your questionnaire which ring loud and clear that most companies either do not have good training programs for engineers or wish they had a better one. Lack of good evaluation techniques, as you point out, will continue to plague company managers who have an inner feeling that training is necessary but who do not have ready answers as to what constitutes a good training program, and how do you evaluate such a program to ascertain its worth, if you do have one?

Thank you for giving me the opportunity to review your thesis.

Sincerely,

V. M. KRYGOWSKI
Assistant Manager, Engineering

VMK:HJH

MR. V. C. RAJASHEKAR - 83410

Dear Raja:

I have appreciated the opportunity to review your thesis entitled "Effectiveness of Training Programs for Graduate Engineers". I assure you I have read your report in detail and this combined with my involvement in engineering training as a job responsibility makes me feel qualified to pass along various comments.

First of all I was happy to see you stress the evaluation process which you correctly described as a benefit to both trainer and trainee. I see this as a most important part in the "feedback loop" of any training program.

The training of professional employees is without doubt a most serious undertaking and, as you stated, requires the most detailed of preparations to assure derivation of maximum benefits. Indeed, a properly assembled training program encourages the employee to continually seek challenging and rewarding job experiences.

I would emphasize that I strongly feel that our engineers today are "reporting" to the business world with a broader background of high technical competence combined with a strong awareness of employee-management relations. Equipped with these credentials, he is a much more complex individual requiring - and rightly so - a rather sophisticated means of maintaining his technological awareness and, of course, developing to the fullest his overall abilities.

Sincerely yours,

KEITH G. MALLETT
Department Chief, Engineering
Personnel Relations and
Training

:pk

CHAPTER X

BIBLIOGRAPHY

BIBLIOGRAPHY

- "A Profile Of The Engineer," Research Report, a service of Deutsch and Shea Inc., pp. 2-10.
- Ackerman Leonard., "Training Program: Goals, means and evaluations," Personnel, Octo 1968, pp. 725-727.
- Ault Education Association, "Training In Human Relations," (Washington D.C,) Leadership pamphlet no-16, 1959 pp. 27-33.
- Alan E. Nouse, James C. Webbert, "So you want to be an engineer," Harper Row Co.
- Alan G. Rude, "The educational in business," Advanced Management Journal, April 1968.
- American Management Association, Inc., Personnel Management in a competitive economy, Personnel Series, #159.
- Ansher Melvin, "The Management Of Ideas," Harvard Business Review, July-August 1969, pp. 99-107.
- Bernard M. Bass & James A. Vaughan, "Training In Industry: the management learning," Wadsworth Publishing Co, Inc, California, 1966.
- Bristol.L.H, Jr., "Developing The Corporate Image," Charles Schribnerb Sons, N.Y., 1960.
- Broadwell M. Martin, "Training The Trainers," Personnel, Sept-Oct 1966, p. 50-53.
- Buckley W. John., "Programmed instruction in industrial training," California Management Review, Winter/1967, pp. 71-79.
- Cangemi P. Joseph., Kenneth T. Cann, "Peter's Principle Principle," Personnel, Nov 1971, pp. 872-9.
- Carliss Oswald, "Management Frontiers In Engineering,"- The challenge of the 70's, S.A.M., Advanced Management Journal, April 1971, pp. 10-9.
- Case.F.E., "Business & the urban scene," Management Review, Summer 1969, p. 4-7.
- Chris Argyris., "T-Groups For Organizational Effectiveness," Harvard Business Review, March-April 1964.

- College Graduates Assess their Training Program, National Industrial Conference Board, 1963, pp. 2-5.
- Darr W. John, "Motivation and Morale," Two Keys to Participation, Personnel Journal, June 1968. p.389
- Davy. J., The Environmental Crisis, Management Today, Sept 1969, p.66
- Delmar W Karger & Robert G. Murdick, "Managing Engineer & Research," Industrial Press Inc, N.Y., 1969, pp. 96-97.
- Denova C. Charles, "Is this any way to Evaluate a Training Activity? You bet it is!", Personnel Journal, Volume 47, July 1968, p. 488
- Drucker F. Peter, The effective Executive.
- Douglas H. Fryer, Mortimer R. Feinberg, Sheldon S. Falkind, "Developing People In Industry," Harper & Brothers, N.Y., 1956.
- "Engineers" Impact on Society Reflected in New CEC Courses, Western Electric News Briefs Background, Feb 21, 1972, p. 12
- Fendock. J.J., The Business of Business, Personnel, Sept 1969, pp. 8-9.
- Frank A. Dephillips, "Management of Training Program," Richard D. Irwin Inc, 1960.
- Guion.R.M.. "Personnel Testing," 1965
- Habbe Stephen, "College Graduates Assess their Company Training," National Industrial Conference Board, N.Y. 1963.
- Harman. W.W., "Abstract report of the Stanford University Committee on Evaluation of Engineer Education," The Journal of Engineer Education, Vol 44, Dec 53, pp. 258.
- Harold Mayfield, "Communication, What's the Real Problem," Supervisory Management, October 1967, p. 16.
- Hazel Henderson, "Should Business Take Society's Problems?" Harvard Business Review, July-August 1968, p.77.
- How to train engineers in industry. "The National Society of Professional Engineers," Washington, D.C. 1955.

- Hunt J.G. and Hill J.W., "The New Look in Motivation Theory for organizational research," Human Organization, 28 100-9 Summer 1969.
- Dr. James R. Bright, "Evaluating Signals Technological change," HBR, Jan-Feb, 1970.
- Jay Anthony, "Management & Machiavelli."
- John F. Mee, "The Essential Nature of Objectives," from Management Philosophy for Professional Executives, Business Horizon, Indiana University, Dec 1956, pp. 5-7.
- Johnson W.E., "What industry can do to develop creative ability," Creative Engineer, 1944, pp. 10-11.
- Keating S.F., Managements Role in the Urban Crisis, S.A.M. Advanced Management Journal, 1969, p. 19.
- Lawrence Stessin, "Young Managers: 'IMMEDIACY' sets the tone," Personnel, Nov-Dec 1971.
- Leonard Ackerman, "Training Program: Goals, Means & Evaluation," Personnel Journal, Volume 47, Oct 1968, p-725.
- Likert, Rensis, "Effective Supervision: An adaptive & relative process," Personnel Psychology, Vol 11, Autum 1958, pp. 317-32.
- Machine Design, "College Students Trained for Mundane Jobs," Nov-1970, p-8.
- Marrow A.J., "Behind the Executive Mask," American Management Association Inc, 1965.
- Miller I., "Business has a war to win," Harvard Business Review, March-April 1969, p. 68.
- Miner B. John, "The Management of Ineffective Performance," McGraw Hill Co, 1963,
- Morgan S. John, "Improving your creativity on the job," American Management Association Inc, 1968, pp. 18-45
- Morse E. Gerry, "Mandate for Education & Training," Personnel, Nov- Dec 1971, p-8.
- Nash M. Michael, "Intelligent Reading for Self Development," Personnel Journal, Nov 1971, pp. 861-866.
- Odiorne S. George, "Training by Objectives," The McMillan Co, London, 1971

- Prieve E. Arthur, Wenrof A. Dorothy, "Training Objectives-Philosophy or Practice ?" Personnel Journal.
- Silber B. Mark, "Synergy-----Behavioral Sciences, Organization Effectiveness and The Training Professional," Personnel Journal, Feb 1971, p. 151.
- Stephens C. James., & Jacobs C. Gilbert., "The Engineer Manager", Personnel, March 1954, pp. 375-6.
- Stevenson A.R., Jr., "Creative Engineer," American Society of Mechanical Engineer's, 1944, p. 1.
- Suojanen W. Waino, Stephen Brooke., "The Management of Creativity," California Management Review, Fall/1971/Vol XIV/ No 1, pp. 17-23.
- Stevenson L. Arthur, "Moratotium On Motivation," S.A.M. Advanced Management Journal, April 1971, p.25.
- Thad B.Green, & Frank J. Schilagi, "Information for Management: The Trainer As Liaison," Personnel July-Aug 71, pp. 50-51.
- Thiede Wilson, "Evaluation & Education," (Adult Education Association Washington, D.C., 1964) pp.296-297.
- Dr. Vanneval Bush, "Science is not enough," 1967.
- Training: "A handbook for line managers" Proctor & Thorton.
- Wadia Scott, Foresman, "The Nature & Scope of Management,"
- Walter S. Wilkstrom, "Developing Managerial Competence," (A Research Report From The Conference Board), 1964.
- Warren W. Malcolm, "Training For Results," Addison - Wesley Publishing Co., Mass.1969.
- William McGehee, "Training In Business & Industry," John Wiley & Son, 1961.
- Wohlking Wallaew, "Attitude Change, Behavior Change," California Management Review, winter/1970/ Vol XIII/No. 2, p-45.
- Yoder D., "Innovation Is In," Stanford Graduate School of Business Bulletin, Volume 36, No. 1, 1967.

APPENDIX

CHART

MASLOW COMPARED TO HERZBERG

MASLOW'S NEED - PRIORITY MODEL COMPARED WITH

HERZBERG'S MOTIVATION - HYGIENE MODEL

MASLOW

HERZBERG

Self-Realization &
Fulfillment

Esteem & Status

Belonging & Social
Activity

Physiological Needs

MOTIVATIONAL
FACTORS

HYGIENE FACTORS

Work Itself
Achievement
Possibility of Growth
Responsibility

Advancement
Recognition

Status

Interpersonal Relations
Supervision
Peers
Subordinates

Supervision - Tech.
Company Policy &
Administration

Job Security
Working
Conditions
Salary
Personal Life

104 Goodman's Crossing
Clark, New Jersey 07066
September 29, 1971

Dear Sir:

I am writing to you to obtain information regarding any training program that your company has for engineers.

I am a graduate student at the Newark College of Engineering, Newark, New Jersey, and am presently engaged in writing a thesis as a requirement toward my degree in Master of Science in Management Engineering. My thesis objective is to develop an Effective Training Program for engineers.

Current and past literature in the field has been studied to acquire the history, the development, and the framework of a Training Program. Now it is an essential phase of my thesis to obtain information regarding the current training programs for engineer's in today's industry. To this end I am conducting a survey of approximately 100 large progressive industrial concerns throughout the United States to determine the actual training programs.

I would sincerely appreciate receiving a copy of your training program, (including trainee evaluation program charts) and having your answers to the questions (regarding said plan) appearing on the attached form. Your training program will not be identified with your company in any way, unless you specifically request me to do so. The information that I receive will be held in strictest confidence. I fully realize that there are more important and constant demands upon your time and attention. However, I hope you will bear with me, and grant me the assistance that I need.

Should you so desire, I shall be most happy to furnish you with a summary of the survey results.

Very Truly Yours

V. C. RAJASHEKAR

QUESTIONNAIRE

Please answer as many questions as permissible (check only those that apply).

I. TYPES OF TRAINING PROGRAMS USED

_____ On-Job Training. _____ Off-Job Training
_____ Class Room Training _____ Formal Training
_____ Informal Training

II. TRAINING PROGRAMS ORIENTED TOWARDS

_____ Basic Principles _____ Theoretical Training
_____ Practical Training

III. ENGINEERS COVERED BY TRAINING PROGRAMS

_____ Newly Graduated Engineers
_____ Newly Hired Engineers (with experience)
_____ Experienced Engineers (within the company)

IV. EXPECTED END RESULT OF TRAINING PROGRAM

_____ Promotion _____ Greater Job Proficiency
_____ Increased Responsibility

V. HOW DO YOU MEASURE THE EFFECTIVENESS OF THE TRAINING PROGRAM?

_____ Engineering Performance
_____ Creativity

VI. FREQUENCY OF TRAINING PERIOD FOR ENGINEERS

Once In _____ Months.
Once In _____ Years

VII. TRAINING IS RELATED TO THE TYPE OF WORK

Engineer Performs _____ Yes _____ No

VIII. SOURCE OF INSTRUCTORS FOR TRAINING PROGRAM

_____ 100% Outside Instructors
_____ 50% Inside and 50% Outside Instructors..

IX. _____ Engineers Are Trained At Each Session Of
_____ Weeks.

X. _____ % Of Engineers Are Attracted Because Of Our Training Program.

XI. OBJECTIVES OF YOUR TRAINING PROGRAM

(Few Sentences Please).

XII. _____ % Engineers Willing To Go Back For Training

_____ % Engineers Appreciative Of Your Training Program

XIII. HOW OFTEN THE TRAINING PROGRAM IS REVIEWED.

ONCE IN _____ YEARS.

XIV. ARE YOU PLANNING TO MODIFY THE TRAINING PROGRAM. _____ YES _____ NO.

IF THE ANSWER IS YES PLEASE GIVE A BRIEF DESCRIPTION OF THE CHANGE.

XV. PERCENT OF ENGINEERS LEAVING THE COMPANY

_____ Dissatisfied With Work

_____ Dissatisfied With Training Program

DO YOU WISH YOUR COMPANY TO BE IDENTIFIED? _____ YES _____ NO.

MAY PORTIONS OF YOUR PROGRAM BE USED IN MY THESIS? _____ YES _____ NO.

WOULD YOU LIKE A SUMMARY OF THE SURVEY RESULTS? _____ YES _____ NO.