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"MONEY SPENT NOW TO TRAIN SOMEONE WILL KEEP COMING BACK IN FUTURE YEARS IN THE FORM OF GREATER EFFICIENCY AND, THEREFORE COULD WELL BE VIEWED AS AN INVESTMENT."

COST EFFECTIVENESS: A MODEL FOR ASSESSING THE TRAINING INVESTMENT

BY JAMES G. CULLEN, STEPHEN A. SAWZIN, GARY R. SISSON AND RICHARD A. SWANSON

Evaluation of training costs may be divided into two major categories: cost effectiveness and cost benefit. Cost benefit (CB) is the analysis of training costs in monetary units to benefits derived from training in nonmonetary terms. Examples of nonmonetary benefits would be trainee attitudes, health and safety. Cost effectiveness (CE) is the analysis of training costs in monetary units as compared to benefits derived from training in monetary terms. Monetary benefits such as production increases, production waste, scrap savings and production down-time savings, are considered.

Throughout training literature, money spent on training is defined as a monetary "cost." This term seems to automatically denote a loss of revenues for the company. This dire connotation may be softened in the minds of production managers by using the term "investment." This term denotes money and time used as an investment to help the company. Therefore, the gains or losses derived from training are identified as the "returns." These returns as compared to the investment result in the subsequent cost benefits or cost effectiveness of the training.

Whether training costs are technically "expense" or "investment" is a moot question. Money spent now to train someone will keep coming back in future years in the form of greater efficiency and in other ways and, therefore, could be viewed as an "investment." However, it also requires recurring expenses to maintain and continue training which provides immediate return, and, therefore, could be seen as an "expense."

Financial experts and industrial managers view money spent for training in a way that fits their particular technical definitions. Whether it is viewed as expense or investment is academic, except for tax considerations. The important thing to realize is that money spent for structured training will be returned many times over, and this was the whole point of the Industrial Training Research Project at Bowling Green State University.*

The usefulness of the comparison of the investment to the return is the simplicity of the comparison and the specificity of the terms and units used in the comparison. These terms must be definable and in measurable units. This is most important in the cost-effectiveness comparisons. The cost benefit can also be in measurable terms such as attitude surveys, health and safety accident reports, and an increase in the complexity and re-

*An experimental study under the direction of Dr. Swanson at Bowling Green State University. Mr. Sawzin served as principal investigator on the project. The origins of the project and its financial support came from Johns-Manville Corp. Both Mr. Cullen and Mr. Sisson had continued involvement in the conceptualization and conduct of the research.

sponsibility of work tasks assigned to the better-trained employee.

The literature abounds with CE models clouded in statistical models and mathematical formulas. Usually these models can be used only by the companies developing them. This is not to underestimate the complexity and importance in recording and accounting for training dollars. But, this complexity of formulas keeps the reader from fully understanding and utilizing the usefulness of the CE model. The reader stumbles through trying to first understand the statistics and mathematical language. Basically, this cost-effectiveness model reduced down to a comparison and analysis of the training investment to the training return.

To accurately estimate the resources that should be allocated to industrial training, the expected gains (returns) of that training must be known. One source of controversy over training is the inadequate knowledge of its economic returns. At face value, training costs appear to be an economic burden which reduces company profits. With some form of training being mandatory to maintain production, an economic cost-effectiveness model is needed in order to determine the relative economic returns of varying training strategies.

The calculating of training costs and returns is complex. There is no single formula. There are arguments for and against any formula or model. It appears that the one that works best for a given situation is the one to use. The model used in the Industrial Training Research Project[6] combined the economic reasoning of three cost-effectiveness models that have been utilized in the training profession.[4,5,7]

Definition of Terms

Analysis Time: Total people hours to produce analysis of the job.

Design Time: Total people hours to design the training program.

Material Cost: All material costs incurred from onset through completion of one training program. These costs include supplies to facilitate training-program development (secretarial, graphics work, travel, duplicating, display boards, training aids, etc.).

Reproduction Costs: All costs incurred in duplicating additional copies of the completed training program for training purposes.

Trainee Time: Total people hours and resulting salary costs incurred for trainee to reach job competency.

Instructional Hardware: Shelf items that are purchased to facilitate the training program (e.g., production machine to be used just for training; filmstrip projector, tape recorder).

Instructional Software: Shelf items of instructional content that are purchased to facilitate the training program (e.g., manufacturer's operating manual; filmstrip/transparencies).

Investment: Money spent now, usually on a one-time, lump-sum basis, for a return that will keep being realized in future years without further expenditure, such as for equipment purchase.

Training costs can be split into three groups: fixed, variable and total.[7] The ratio comparisons of these costs then determine the economic benefits of a training program. This method provides a detailed analysis of training costs. A broader look at training economics involves a process of calculating an investment cost for training and comparing it to certain returns from that investment.[4] The cost-effectiveness model used for the Industrial Training Research Project included the use of both the above plans. Also, information unique to Johns-Manville Products Corp. cost-effectiveness terms and practices were considered.

For this model the costs for training are classified as either fixed or variable. Fixed costs are costs that do not vary even though numbers of trainees, training time or training program development vary. Variable costs are costs that change as the number of trainees, training time and training program development vary.[1] Example: If regular production equipment (which is a fixed cost for production) is used for training, the losses in production are considered a variable cost.

Structured Training Program Training Costs

The following are the training-cost categories for the structured training program as characterized in this study:

1. **Training Development**
   - A. Analysis time
   - B. Design time
   - C. Material costs
2. **Training Materials** (expendable)
   - A. Cost of reproducing copies of developed training program
3. **Training Materials** (nonexpendable)
   - A. Instructional hardware
   - B. Instructional software
4. **Training Time**
   - A. Trainee time
   - B. Trainer time

5. **Production Losses Resulting from Training**
   A. Production rate losses
   B. Material losses

The following are the training-cost categories for the unstructured training program as characterized in this study:

1. **Training Time**
   A. Trainee time
2. **Production Losses Resulting from Training**
   A. Production rate losses
   B. Material losses

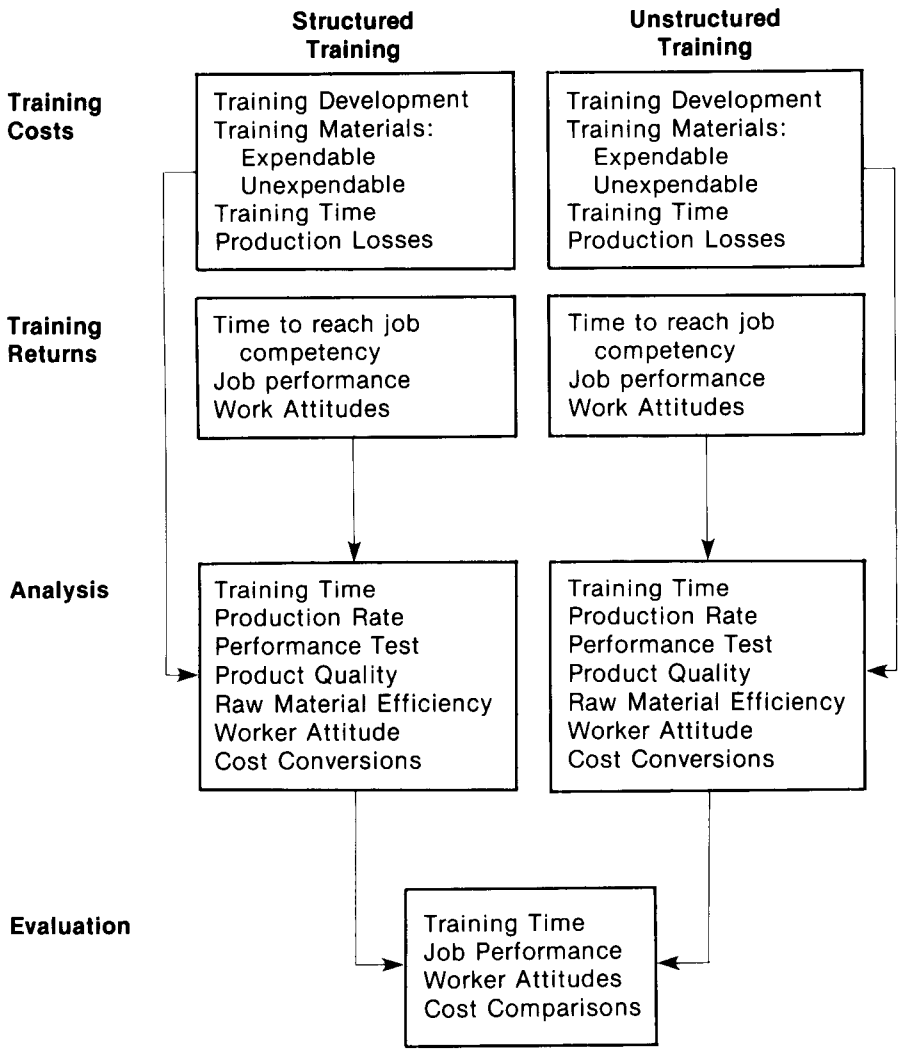
Training Returns

The training return of the training program (either structured or unstructured) is a competent production worker. To evaluate a competent production worker, one must detail the competencies and evaluate them. The combined component evaluations determine the total evaluation. The following outline is utilized to summarize the procedures for assessing the returns of training. The third-order headings contain information unique to the specific job of a plastic-extruder machine operator.

1. **Production Task Performance**
   A. Trainee has reached job competency via training (structured or unstructured training program)
      1. Trainee can successfully perform job startup
      2. Trainee can maintain set standard of plastic tubing
      3. Trainee can successfully perform in production malfunction performance tests
      4. Trainee can successfully perform job shutdown
   B. Trainee is satisfied with his or her training and the job
2. **Collect Data on Task Performance Returns**
   A. Measurements of task performance
      1. Time (to reach competency, production curtailed, startup)
      2. Production rate
      3. Performance test
      4. Product quality
      5. Raw material usage

Figure 1.

INDUSTRIAL TRAINING COST-EFFECTIVENESS MODEL



B. Measurement of trainee attitudes toward his or her training and the job

3. **Monetary Value of Returns**
   A. Convert trainee performance data to a monetary value
   B. Returns of structured training program and unstructured training program are totaled

Data Collection Procedures (Extruder Operator)

1. *Time-job time* (time clock)

2. *Production Rate:* Number of three-foot lengths of quality pipe per hour of production (count the number of lengths per hour, clock time for each bundle).

3. *Trouble-Shooting:* Reaction to injection of machine malfunctions via performance test (down-time, loss of tubing, time of malfunction injection *vs.* time to respond to malfunction, time to correct malfunction).

4. *Training-Program Costs:* List total costs to develop structured and unstructured training materials and program.

5. *Production Down:* Time production is completely halted or interrupted.

6. *Material Efficiency:* Weight of raw material supplied to the machine versus weight of scrap and amount of quality product produced (weight raw material supplied, scrap, and hour bundles of quality tubing).

7. *Training Time:* Time consumed to train a trainee to reach job competency.

Data Analysis and Evaluation

The following comparisons will be used to evaluate the effectiveness of the two training methods:

1. Training time required of the unstructured training program as compared to training time required of the structured training program to produce a competent production worker.

2. A comparison of levels of production worker competency by time intervals between the two industrial training methods.

3. The total development costs and returns of the structured training program as compared to the costs and returns of the unstructured training program.

4. The production losses of the structured training program versus the unstructured training program.

5. The reactions of the structured training program operators to production problems (malfunction performance test) versus the unstructured training program operators.

6. The attitudes of the trainees in the structured program toward

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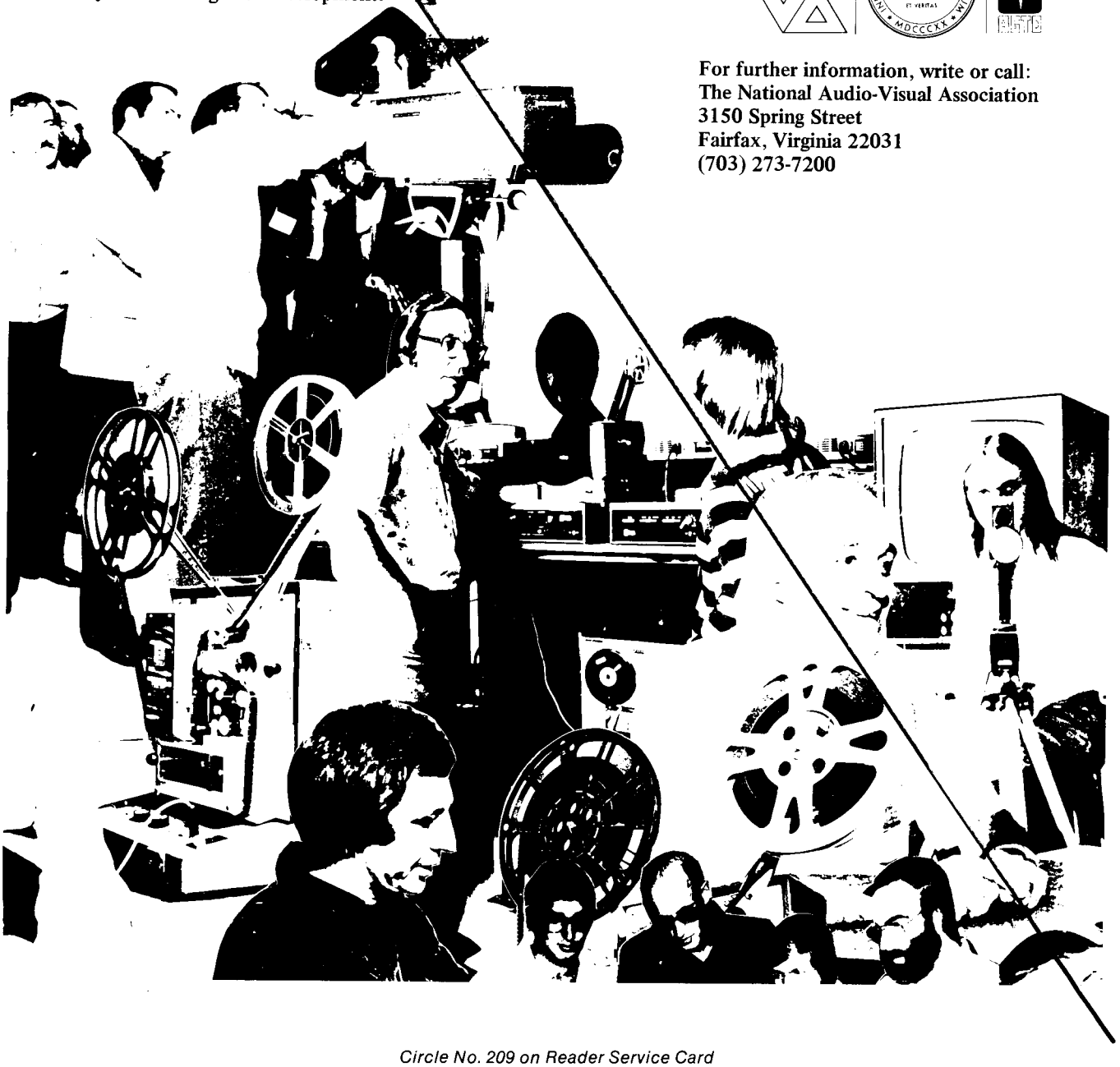

their training, trainer and job versus those in the unstructured program.

The following is the overview program procedure and model for evaluating the cost effectiveness of industrial training programs. The specifics of the costs, returns and analysis have been discussed previously. The graphic representation of the model is presented in Figure 1. For both the structured and the unstructured training programs, each variable under training costs and training returns should be quantified. For those that are expressed in nonmonetary indexes (e.g., time), their monetary equivalency should be calculated whenever possible. These figures can then be used for the analysis and evaluation stage.[2]

The cost-effectiveness comparison between the structured and unstructured training programs is determined by analyzing the training variables, converting them to monetary equivalents, and then conducting a cost comparison. Obviously, individual variables such as "time taken to reach competency" can also be compared and reported as separate indexes of effectiveness. This cost-effectiveness model developed and reported here has been utilized in several practical situations and has been proven workable.

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