# TRAINING AND DEVELOPMENT RESEARCH CENTER

Project Number Nine

# FINANCIAL ANALYSIS: A Review of the Methods and Their Application to Employee Training

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January 1986

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## Introduction

More and more, training and development is becoming a crucial element for business and industry. Increased competition has caused many firms to realize that employees are resources that must be maintained and developed (Taber, 1985). Norman Willard (1973) encouraged management to accept training as a business function, the purpose of which is to increase corporate earnings through cost-effective training. Similar sentiments have been expressed by Springborn (1977) who stated that most American industries have learned that investment in skills training is as important as investment in plant resources because it does little good to invest in computers, numerically controlled machines, tools, or other sophisticated devices if a skilled work force is not available to operate and maintain them.

Odiorne (1979) predicted the following demands for trainers in the 1980s:

- induction (orientation/socialization) training for 26 million new employees who will replace those leaving the workforce;
- skills training for 6 million new workers and retraining for an undefined number of current workers who need to learn new skills; and

- o upgrade training for 3 to 4 million managers--both those entering the managerial ranks for the first time and those making upward or lateral moves that require new skills.

The American Society for Training and Development estimated that U.S. employers are spending between $30 and $50 billion annually to train their employees. If expenses and lost wages are included in these estimates, the cost doubles ("Industry spending," 1985).

A recent analysis of a supplement to the January 1983 Current Population Survey indicated that about 36 million employees or approximately 33 percent of all employed people received either formal company training or informal on-the-job training (Carey & Eck, 1984).

With increasing monetary and human resources being allocated to training and development, it is important for businesses to evaluate these programs in the same way other large investments are evaluated--in terms of the costs and benefits. Swanson, Lewis, and Boyer (1982) suggested that training and development must be tied to the financial, profit-making goals of the corporation. Less-than-competent employees may reduce productivity and consequently they may reduce profits. Decisions that are made outside this context of productivity and profitability are destined to be short-lived (Douthat, 1970). Within this context, training becomes another tool for economic survival and decisions about training programs must be based on the cost and benefits of each program.

Olson (1983) suggested five ways in which human resource development groups can respond to changes in technology, job content, and the labor market. One of these is to be "prepared to prove with hard data that corporate training and development raises productivity. This includes developing accurate, meaningful measures of productivity and relating the 'value added' of products and services to the levels and types of training" (p. 40). The authors mentioned above are recommending the application of financial analysis methods commonly used in the private sector to help make capital investment decisions.

The purpose of this paper is to examine the application of financial analysis methods to training and development programs. The first section provides the background for such a critique by providing a brief overview of some financial analysis techniques used in the private sector; the second section is a review of financial analysis in training and development; the third section contains conclusions; and the fourth section has recommendations.

## Financial Analysis Techniques

When managers are called upon to make decisions regarding capital equipment purchases, land acquisition, or plant locations, they generate alternative courses of action and select the best course of action from among the alternatives. The goal of alternative selection should be acceptable from a financial efficiency standpoint as well as an engineering efficiency standpoint (Taylor, 1980). Financial analysis techniques are tools that help managers make sound financial decisions that contribute to general corporate objectives.

Gurnani (1984) reviewed 21 studies on capital budgeting practices and Moor and Reichert (1983) conducted a survey of 298 Fortune 500 firms to determine which financial analysis techniques are used most frequently. Independently, both studies found that the most commonly used techniques were payback time, average rate of return, present value or present worth, and internal rate of return. Each of these will be described, but two other concepts--economic life and time value of money--that are central to understanding the techniques must be defined first.

Economic life, in capital budgeting terms, refers to the period of time that will elapse before equipment is displaced from the intended service and replaced by more economical equipment. The causes of replacement are deterioration and obsolescence of equipment.

Time value of money refers to the effects of inflation, deflation, or interest. For example, $1,000 invested today at 10% will be worth $1,100 in one year; $1,210 at the end of two years; and so on. Time value affects both costs and returns. Although costs and returns may occur over several years, the values of each must be computed to reflect a specific point in time. This is called "discounting" and the general formula is:

$$\sum_{t=1}^{n} \frac{C}{(1+r)^{(t-1)}}$$

where C = costs, t = time or interest period, and r = interest rate.

Financial analysis methods that account for the effects of time are being used more frequently in capital investment decisions. Moore and Reichert (1983) found that the percent of firms using time-adjusted capital budgeting techniques rose from 9 percent in 1955 to 86 percent in 1981. Similar results were found by Gurnani (1984).

**Payback**

The payback period is simply that period in which the amount invested is recovered by financial returns. Moore and Reichert (1983) found that it was the most frequently used capital budgeting technique. The payback period has several advantages when choosing among alternatives. It is relatively free from the influence of long range projections and it is not biased toward large or small projects. It is advocated not only for capital budgeting but also for management information systems (Guimaraes & Paxton, 1984) and employee training (Barta, 1982; Furst, 1970; Roden, 1984).

The payback method also has a number of shortcomings. According to Taylor (1980), it disregards:

- o all savings after the payout period;
- o the economic life of the equipment;
- o the time value of money;
- o the rate of return on investment; and
- o the minimum required rate of return.

With these shortcomings, the payback period may favor the selection of the incorrect (i.e., not most profitable) alternative.

## Average Rate of Return

Average rate of return (AROR) is a simple method of determining which alternatives will yield a higher return per dollar invested. One common approach is to assume that the investment is amortized or depreciated uniformly over the economic life of the project or equipment. The average investment is computed by dividing the original investment by two. The average benefits are the net gain (i.e., returns after the initial investment has been recovered) divided by the economic life.

The results can be used to make accept/reject decisions (i.e., accept all investments with an average rate of return of some predetermined amount or more) and to rank alternatives.

The major deficiency of the AROR is that it does not reflect the timing of returns. Because the returns can be reinvested, investments that offer returns earlier are more desirable than those that offer late returns.

## Present Value

Present value or present worth techniques discount all cash flows to the present using a common interest rate and the discounting formula shown earlier. The net present value (NPV) or discounted returns minus discounted costs can be interpreted as the profit (or loss) of a project if the investment had to be borrowed at the given interest rate and any cash flows were reinvested at the same rate (Guimaraes & Paxton, 1984).

When all the alternatives under consideration have the same economic life, the present value comparisons can be made for this common period. When the alternatives have different economic

lives, the comparisons must be made for a period less than or equal to the shortest-lived alternative.

Present value comparisons have the distinct advantage of taking into account the time value of money. It is, however, sensitive to the size of the investment, with larger projects generally showing higher NPVs.

Internal Rate of Return

The internal rate of return (IRR) method determines the interest rate required to make the present value of the cash flow equal to zero. It represents the maximum rate of interest that could be paid if all project funds had to be borrowed and the company was to break even.

Two advantages of the IRR method are that it takes into account the time value of money and that it is not affected by the scale of the project. It can be used to rank alternatives, and by specifying a minimum rate, IRR can be used to make accept/reject decisions.

The major weakness of the IRR method is that it assumes that all returns are reinvested at the same internal rate of return. This can make an investment alternative with a high rate of return look even better than it really is and a project with a low rate of return look even worse.

Example

To see how these four measures work, the following example is provided. Two projects, A and B, have the same initial investment of $50,000. The returns to project A are $10,000 in year

1; $15,000 in year 2; $25,000 in year 3; and $10,000 in year 4. The returns to project B are $45,000 in year 1 and $5,000 in year 2. A third project, C, has an initial investment of $100,000 and returns of $50,000 in year 1; $30,000 in year 2; and $20,000 in each of years 3 and 4. The payback period, average rate of return, net present value, and internal rate of return are shown below.

| PROJECT | PAYBACK | AROR | NPV(10%) | NPV(6%) | IRR |
|---|---|---|---|---|---|
| A | 3 yrs | 10% | (2,899) | 1,695 | 7.4% |
| B | 2 yrs | 0 | (4,959) | (3,097) | 0.0 |
| C | 3 yrs | 10 | (1,066) | 6,054 | 9.4 |

If payback period had been used as the selection criteria, project B would have been chosen; yet, the other values show it to be the least attractive of the options in terms of monetary return on investment. Project C, the least attractive in terms of initial investment, is the most attractive in terms of return on investment. Project C also illustrates the sensitivity of NPV to the size of the project. It looks only one-third as bad as A when the discount rate gives a negative return but it looks nearly four times as good as A when the discount rate gives positive returns.

**Cost-Benefit Ratio**

Another measure of return on investment is the cost-benefit ratio which comes from the larger arena of cost-benefit analysis. Cost-benefit analysis began with the United States Flood Control Act of 1936; it since has been used in a number of projects, primarily in the public sector. The cost-benefit (or benefit-cost) ratio is the ratio of the discounted benefits to the discounted costs. It is more common to represent the ratio as benefits over

costs so that a ratio greater than one indicates that benefits are greater than costs. The cost-benefit ratio can be used to compare and select among two or more alternatives.

**Financial Analyses in Training and Development**

As more skilled, administrative, and technical employees are required in corporations, substantial costs are being incurred for recruitment, selection, and training. Briscoe, O'Neil, and Cook (1982) suggested that considering these costs as long-term investments can have a strong positive impact on the types of decisions a corporation will make regarding its human resource development.

As suggested , financial analysis can be a valuable tool for training and development managers who must justify investments in various programs. The same applications used to justify investment in capital, land, or other resources can be used to justify training and development on the basis of improved productivity and profitability.

A two-part study by Medoff (1982a, 1982b) suggested that training and development can contribute to national productivity. Medoff pointed out that the U.S. currently has a labor force imbalance--the match between available skills and those needed is very poor. He conducted a study to determine the effects both in-house and out-of-house training had on productivity. In the first part, he developed a production function to calculate output as a function of labor and machine capital. Using data from the Survey of Adult Education conducted by the Bureau of the Census in

1969, 1972, 1975, and 1978, Medoff demonstrated that formal training has a positive effect on labor productivity and that, at least for the manufacturing sector, training provided at the place of work has a more positive effect than training provided away from work.

In the second part of the study, Medoff examined five years of training, performance, and other personnel data for two large manufacturing corporations. The analysis focused on white male exempt employees (primarily managers), and the results indicated that there was a positive association between attendance at formal training programs and performance as reflected in performance appraisals and salaries.

In a much smaller survey of six underground coal companies, Holoviak (1982) found productivity levels in those companies that offered primarily or exclusively company-sponsored management development programs to be higher than the productivity levels in those companies that offered no training or training only from unaffiliated organizations such as colleges and universities.

Unfortunately, studies of this type are not commonly conducted or reported by individual firms. Cantanello and Kirkpatrick (1968) surveyed 154 firms to determine how training and development programs were evaluated. Kirkpatrick's (1958) four-level model for training program evaluation, shown below, was used as the framework for the study.

1. Reaction--how well the trainees liked the program;
2. Learning--to what extent the trainees learned the facts, principles, and approaches that were included in the training;

3. Behavior--to what extent the job behavior changed because of the program; and
4. Results--how the training affected the bottom line (e.g., reduced turnover, improved production, etc.)

Of the 110 organizations that responded, 78 percent said they measured reaction, while approximately one-half of the respondents said they measured learning behavior, or results. A second survey was sent out to those firms that measured learning, behavior, or results; 47 questionnaires were returned. Of those, 43 firms indicated they measured learning, 21 indicated they measured behavior, and only 16 indicated they measured results.

In a later survey of 112 training directors conducted by Personnel (Wagel, 1977), only 15 percent of the 50 respondents indicated that they did any sort of return on investment analysis. Approximately 75 percent of the companies appeared to have no formal methods of evaluating the effectiveness of their training programs.

Although the literature since the Cantanello and Kirkpatrick (1968) and the Personnel (1977) studies contains an increasing number of articles on how to determine costs and returns (or benefits) of training programs, few studies have been reported. In her review of the literature on summative evaluation in training and development for 1980-1983, Parker (1984) reported that 46 percent or 19 articles addressed issues of accountability in terms of costs and benefits and only three articles referred to using budgets as an evaluation tactic.

## Specific Cost-Benefit Studies

According to some authors (see, e.g., Swanson, Lewis, & Boyer, 1982), there are four benchmark cost-benefit studies in training and development. Meissner (1964) studied the effectiveness of "bagmanship" training in 20 grocery store experiments. The first two weeks were "control weeks" in which bag inventory counts were made at checkstands, produce departments, and backrooms to determine the "normal" level of bag costs per $1,000 of store sales. The third week was the training week in which all full- and part-time baggers and checkers received a one-hour training session on bagmanship. Bag counts were taken throughout the final three weeks, and during the final two weeks, supervisors watched to be sure the rules of bagmanship were being followed. Results showed that by adopting a mix of three carry-bag sizes and following the rules of bagmanship, costs could be reduced an average of 15 percent. Meissner also estimated the average costs, returns, and net returns per bagger; he found a net return of 789 percent when cost of materials was included and 1,136 percent when costs of materials was excluded. Meissner did not provide information about the breakdown of the costs for developing and implementing the training, but he did indicate that the overall bill for research and training at a national level would be about $5 million.

Thomas, Moxham, and Jones (1969) conducted an in-depth study in Yorkshire, England, to compare the effects of a revised instructor training program on clothing machine operators. For many years, the firm had transferred experienced workers to instructor

positions and the new instructors learned from the more experienced ones in a learn-by-doing approach. In 1965, the firm implemented a new specialist course for the instructors and lengthened the training time for new machine operators. The study compared the costs of training with the benefits as measured by output and labor turnover for the periods from 1961 to 1965 (representing the old training system) and 1965 to 1967 (representing the new system).

The authors computed a single cost-benefit ratio that represented the aggregate benefits of the new system over and above the benefits of the old system compared to the additional cost of the new system over and above the costs of the old system. Results indicated that the ratio of nondiscounted benefit to cost was 8:1. Because the benefits were spread over a four-year period, a 10 percent discount rate was applied. This reduced the ratio to 6.5:1.

The authors determined that, of the net benefit due to the training innovation, about 25 percent was accounted for by higher output and about 75 percent was accounted for by reduced labor turnover. Although the focus of the study was the firm, the authors noted that of the 25 percent gain due to output, about half of the benefit was received by the employees in the form of higher wages.

Cullen, Sawzin, Sisson, and Swanson (1976, 1978) conducted a study of the effects of structured and unstructured training for semi-skilled workers. An experimental design was used in which all trainees were given the Bennett Mechanical Comprehension Test; assigned to a structured or unstructured training program; and finally assessed with the Plastic Extruder Operators' Performance

Test and the Worker Attitude Inventory. Results showed that workers achieved competency about four times faster with the structured training than the unstructured training (4.5 hours vs. 16.3 hours); average production losses were 2.1 pounds for structured training and 9.4 pounds for unstructured training; and troubleshooting success rates were considerably higher in the structured training group (79.6 percent of problems solved vs. 33.1 percent). The costs of training were comparable for both groups.

Rosentreter (1979) conducted a study to assess the effectiveness of communication skills for department managers of the Maryland Cup Corporation. Sixty-eight managers were assigned randomly to either treatment or control groups. The treatment consisted of 15 hours of small group training over a one-week period. The purpose of the training was to develop communications skills for goal-setting by

1. increasing self-awareness regarding communication style;
2. helping identify effective responses to communications;
3. building a repertoire of responses to feelings and expressions of interpersonal communications; and
4. building a response repertoire that was concrete or specific, confronting, and respectful.

Multiple _t_-tests showed no significant differences between treatment and control groups on four dependent variables prior to the experiment. Similar tests after treatment showed significantly

lower employee turnover rates for the treatment groups, but no differences on the other three variables. Rosentreter estimated that the costs to replace a union employee were $25 for a physical examination, and $37.36 for training. At this rate, the savings for the six months after training was $3,429.80 minus the $1,300 for the training. Rosentreter did not provide information about how the cost of the training was computed.

Each of these studies employed an experimental design, thus controlling, for the most part, extraneous variables and providing replicable results. Unfortunately, only two of the studies included information about how costs were computed. Cullen et al. (1978) and Thomas et al. (1969) provided cost breakdowns for all direct costs to the firm. Thomas et al. also included the cost of capital, noting that these fixed costs must be allocated in some way over the length of its useful life, and used a discount rate to compute the new present value of the cost and benefit streams.

In the Cullen et al. (1976) study, the results were reported in terms of effectiveness of productivity instead of financial return. However, each of the three measures of effectiveness (time to reach competency, production losses, and troubleshooting success) could be easily translated into dollar values, providing appropriate data for either present worth or rate of return analysis.

## Frameworks for Financial Analyses

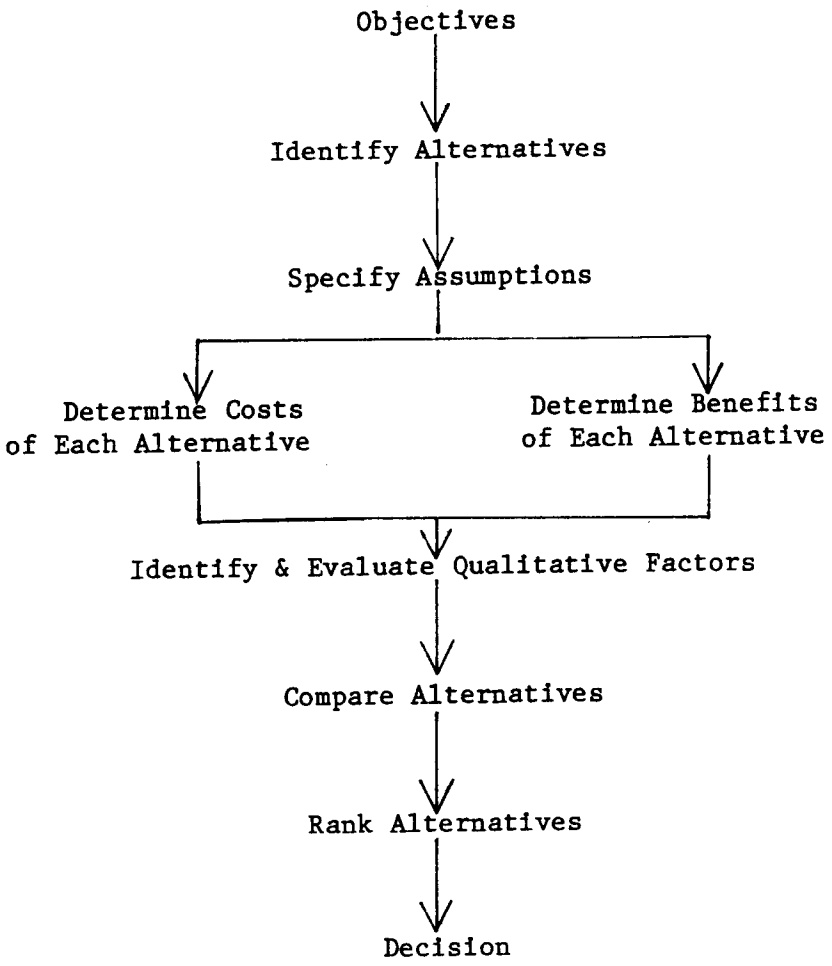
Texts and articles about financial or economic decision making provide excellent discussions of the various measures and concepts, but sometimes neglect to offer actual frameworks or methodologies for conducting financial analysis studies. Two frameworks were offered by Fauley (1975) and Berry (1982). Fauley (1975) defined five basic phases of a costing model.

1. Ask Fundamental Questions
2. State Basic Assumptions
3. Calculate Anticipated Costs
4. Determine Projected Savings
5. Determine Return on Investment

Fauley advocated a cost-benefit ratio for the fifth step, but any return on investment measure could be used in this model.

Fauley's model has two major shortcomings. First, although he took the position that trainers must be able to justify training programs on the basis of their financial impact, he failed to point out that financial decisions are made between or among alternatives. If a specified amount of money is to be invested, it will be invested in something. The first question may be whether to invest in physical capital or human capital. Further questions are whether it will be invested in training or some other program and, if it is invested in training, which training programs should be supported. Second, Fauley neglected the notion of the time value of money; there is no mention of the idea that the funds might be spent or that the returns might be seen over several time periods.

Berry's (1982) framework was similar to Fauley's, but it included two important differences. Berry's model, shown below, included a step for identifying alternative solutions to the problem and determining the costs and returns for each. He also noted that when the costs and benefits for each alternative are being determined, the economic life of each project must be considered and that when the alternatives are being compared and ranked, all costs and benefits must be discounted to a single point in time.




**Berry's Discretionary Cost Model**

## Determining Costs

Considerably more has been written about determining costs on training and development than about determining financial returns. The articles range from descriptions of general concepts to presentations of specific guidelines and step-by-step instructions.

One early article focused on the general concepts of fixed and variable costs (Wheeler, 1969). Wheeler noted that fixed and variable costs are used to account for expenses and investments related to training. Managers typically try to control the costs of a program through the variable costs. Wheeler suggested that ratios such as fixed-to-total costs and variable-to-fixed costs and indices such as unit cost and annual unit cost rate could be useful in comparing and controlling the costs of education and training.

Most articles took more of a "how to" approach and several include outlines or worksheets to be used when calculating costs. Cullen et al. (1978), for example, proposed five categories for training program costs for their structured training program.

1. Training Development
   - A. Analysis time
   - B. Design time
   - C. Material costs
2. Training Materials (expendable)
   - A. Reproducing copies of materials
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. Materials losses

The unstructured training program costs included only trainee time and production rate and material losses. The structured training costs included most of the direct and indirect costs that could be encountered in developing and delivering such a program. The costs for the unstructured program, however, do not include the time or lost production for the worker who trains the new employees.

The models from Mirabal (1978) and Head and Buchanan (1981) are quite comparable. Both include the following:

- o student costs born by the firm (salary, travel, per diem);
- o instructor costs (salary, travel, per diem);
- o facilities costs (utilities, space, maintenance, rent etc.); and
- o instructional development costs (salaries, consultant fees, materials, evaluation).

Head and Buchanan included two items that Mirabal did not. One was lost opportunity costs for the instructor and students which refers to the value of productivity being lost because the students are not on the job and the instructor is not creating new programs. The other was a category of administrative costs (line

management, line clerical, and staff management within training department). This model includes all the direct costs to the firm and the overhead and lost production indirect costs. The Mirabal model is less comprehensive in that it does not address any of the indirect costs to the firm.

Swanson and Geroy (1983) proposed a cost analysis framework based on the Training Technology System (Swanson, 1980). This framework comprises six phases: needs analysis/planning, work behavior analysis, design, development, implementation, and evaluation. The authors provided a worksheet and a page of definitions that implies that the direct costs to the firm are covered, but that the indirect costs are not.

Deming (1979) included a cost component in a larger training program evaluation plan. His cost worksheet contained trainee costs (salaries and travel), instructor costs (salary and travel), facilities costs, equipment (amortized), development costs, contract fees, and production costs. He included most of the direct costs that are part of training costs, but did not include the indirect costs.

Weinstein (1982) identified three levels of training costs. Level 1 contains classroom expenses that are associated with a particular classroom learning exercise. It includes instructor's salary, fees, and travel; instructional materials and learning aids; facilities fees; and meals and refreshments. Level 2 contains administrative expenses including administrator salary and fringe benefits; typing and clerical expenses; curriculum development;

telephone, postage, and shipping charges; and so on. Level 3 contains general organizational costs which include expenses incurred incidentally to the training function such as accounting or finance department, payroll, maintenance, and security. Because of the differing opinions about how participant compensation should be handled, Weinstein used a separate category for participant compensation or lost time away from the job.

Weinstein's framework also covered all the direct costs to the firm and overhead and foregone production from the indirect costs. However, he left out the depreciation of capital and foregone interest.

Kearsley and Compton (1981) presented a resources requirement model that was quite similar to those just discussed. They defined four categories of resources--personnel, equipment, facilities, and materials--and suggested that the total training costs are the sum of the costs in those four categories across all stages of the training cycle. They did not, however, discuss the need to discount those costs over that same time period.

Roden (1984) presented a model that takes a multi-year approach to determining costs. It included courseware development, courseware maintenance (assuming a 5 to 10 percent obsolescence rate per year), training support (personnel and facilities), training delivery (travel and salary for instructors and trainees and overhead due to time away from the job for all employees who would be trained) and hardware maintenance cost. He suggested that each of these costs should be calculated for five years. The Roden model

provides a new perspective from previous models; it assumes that training programs can be used for more than one year with proper maintenance. The major shortcoming of this model may be that it does not account for the initial purchase of capital.

In their study of trainer training for clothing machine operation, Thomas et al. (1969) proposed the following cost framework:

1. Initializing the training function;
2. Servicing and coordinating the training function;
3. Fixed training capital;
4. Working training capital;
5. Providing instruction;
6. Giving instruction; and
7. Wages of trainees, net of trainee output value.

With this classification, Thomas et al. noted several economic concepts mentioned earlier. Fixed capital, for example, includes buildings, machinery, and other nonexpendable resources needed for training. These costs must be allocated over the length of the useful life of the capital. The cost of providing instruction includes not only instructors' salaries, but also the opportunity costs of having the trainee-instructor away from an output-producing job and the output foregone during training. Finally, the wages of trainees should be adjusted for the value of their output. Usually trainee wages will be greater than the value of trainee output, resulting in a net cost to the firm.

Glenn Head's book on Training Cost Analysis (1985) provides what may be the most comprehensive guide to determining costs. He divided costs into five categories: student, instructor, instructional development, facilities, and maintenance. There are several sub-categories within each of these. He covered all the direct costs to the firm, as well as the overhead, and noted that all of the one-time instructional development expenses must be allocated over the life of the project. He did not discuss depreciation, foregone interest, or loss of production.

The general models in the literature on training and development represent a range of complexity. They usually are organized around the phases of analysis, design/development, and delivery. There is overall recognition of both direct and indirect costs and the importance of including both in any cost-determination activities.

Although most training programs are not intended to be given only once, only three articles suggested calculating costs for more than one year. One addressed the costs to the firm of depreciation of capital or the need to discount the cost streams over time.

**Determining Returns**

The literature on benefits is much less specific than the literature on costs. Authors tend to offer general guidelines but lack specific procedures. Spencer (1984) offered a good list of possible benefit measures, suggesting that benefits be measured according to time to do a task, materials needed or wasted, equipment downtime, employee retention/turnover, and people problems.

In the specific studies reviewed earlier, returns were always measures of productivity. Meissner (1964) used costs of bags per $1000 of store sales; Thomas et al. (1969) used output and labor turnover; Cullen et al. (1976, 1978) used time to competency, production waste, and troubleshooting success; and Rosentreter (1979) used employee turnover, grievances, tardiness, and performance appraisals. Each measure was or could be converted to a monetary value figure.

Swanson and Geroy (1983) and Geroy (1984) developed a Benefits Forecasting Method for forecasting and comparing the benefits of training and development programs. The method originally was developed for and validated in employee training, and it has had limited testing in organization development. It does not specify or suggest what possible benefits should be assessed, but rather allows the user to select any "unit of measure," assign a monetary value to that unit, and establish a "performance goal." A worksheet guides the user through a number of calculations to determine the "total value of performance." One unique feature of this method is its orientation toward forecasting (not reviewing) costs and returns to help managers justify their programs and make more informed decisions.

Wentling (1980) took a broader view of determining benefits and suggested that benefits may accrue to individuals, business and industry, and society. Most other frameworks focus only on the benefits to the firm itself. Wentling gave increases in salary as an example of individual economic benefits and lower unemployment rates as an example of economic benefit to society.

Utility Analysis

An approach that has been reported more frequently in the human resource development literature is utility analysis. Utility analysis has been used primarily for evaluating selection methods. Early work by Brogden (1946, 1949) took a cost accounting approach to determine the utility of selection devices. His formulation stressed the importance of the standard deviation in job performance in the utility of a selection procedure.

Cronbach and Gleser (1965) extended Brogden's work to more complex personnel procedures including classification, placement, and sequential selection. Although Cronbach and Gleser looked at average productivity gain per applicant, whereas Brogden looked at mean productivity gain per selectee, the resulting formulas are identical. The utility formula is:

$$U = (N)(T)(rxy)(SDy)(Zx) - C$$

where

U = the increase average dollar-value payoff that results from selecting N employees using a test or procedure (x) instead of selecting them randomly;

N = the number of employees selected;

T = the expected tenure of the selected group;

rxy = the correlation between predictor score (x) and the dollar-value payoff (y);

SDy = the standard deviation of the dollar-value payoff in the group of prescreened applicants;

Zx = the average standard predictor score of the selected group; and

C = the total selection cost for all applicants.

In spite of the fact that the utility concept and equation have existed for at least 20 years, few studies have been published in this area. Roche (1961) computed the correlations between four selection tests and the performance (payoff values) of 291 beginning level radial drill operators. Utility was computed only for the selection device that showed a significant correlation with payoff values. Results indicated that the company would realize an average gain in profit of $4,056 by selecting drill operators on the basis of test scores rather than selecting them randomly.

Lee and Booth (1974) examined the validity of a weighted application blank using two samples of intermediate-level clerical employees. Weights were developed on one sample and used for predicting turnover on the other. Results showed that the maximum savings could amount to $250,000 during a 25-month period.

Schmidt, Hunter, McKenzie, and Muldrow (1979) studied the utility of the Programmer Aptitude Test for selecting programmers in the federal government. Utilities were computed for nine selection ratios (ranging from 0.05 to 0.80) and five validity coefficients of the previous selection procedures (ranging from 0.0 to 0.50). The estimated productivity increases ranged from $5.6 million to $97.2 million.

Cascio and Silbey (1979) applied the utility concept to assessment centers using a hypothetical company. Six parameters

were varied systemically: the validity and cost of the assessment center, the validity of the ordinary selection procedure, the selection ratio, and standard deviation of the criterion in dollars, and the number of assessment centers. The payoff of the assessment center was then compared to an ordinary selection procedure and to random selection.

Schmidt, Hunter, and Pearlman (1982) extended this model to apply to any program that would improve job performance of those who participated in the program. Their formula is:

$$\Delta U = (N)(T)(dt)(SDy) - C$$

where

U = the increase in utility resulting from the program;

N = the number treated;

T = the duration of benefits in the treated group;

dt = the true difference in job performance between participants and non-participants in standard deviation units;

SDy = the standard deviation of dollar-valued job performance among the employees; and

C = the cost of training N employees.

Although utility analysis may add a new, bottom-line dimension to personnel research, it contains some problems that have inhibited its use. Schmidt et al. (1979) suggested three problem areas: concern that personnel data do not meet the assumptions of linear homoscedasticity; the belief that personnel decisions are situation specific; and the difficulty of obtaining all the

information for utility analysis--especially the estimate of the standard deviation of job performance.

With regard to the first two issues, research reviewed by Schmidt et al., (1979), and Cascio (1982) suggests that personnel data do fit the underlying assumptions of the decision theory and that generalizability may be more common than specificity. In addition, other studies (Eaton, Wing, and Mitchell, 1985; Schmidt et al. 1979; Schmidt et al., 1982;) have suggested relatively easy ways to measure the standard deviation of job performance in dollar terms. Eaton et al. (1985) and Schmidt et al. (1979) used the difference (in dollars) of the productivity of performers at the 50th percentile and the 85th percentile or at the 50th percentile and the 15th percentile. This method requires that experienced supervisors estimate the differences and that the estimates of all supervisors be averaged to maximize reliability and accuracy. Schmidt et al. (1982) suggested that an easier way to estimate the standard deviation of job performance simply was to use 40 percent of wages.

Even with these clarifications and simpler estimates of the standard deviation of job performance, the utility analysis method has shortcomings. Boudreau (1983), for example, pointed out that these models fail to take into account variable costs, taxes, and discounting. Decisions to increase productivity (e.g., to adopt a new selection method or a new training program) frequently involve changes in the variable costs associated with productivity. These changes must be added to or subtracted from the total value.

Boudreau suggested that because taxes affect both costs and returns, the after-tax costs and returns should be used for decision making. He also pointed out that most personnel programs take place over time and the costs and returns should reflect that time dimension. Boudreau used a present value approach for discounting.

**Conclusions**

It is not clear why so few financial analysis studies are conducted--or at least published, particularly given the current need to show how training results affect the productivity or profitability of the organization. Mangum (1984) reported that although training directors recognize the importance of cost considerations in selecting among training options, the analysis of costs and benefits usually takes the form of "gut feelings" or "seat-of-the-pants" calculations rather than being based on the collection and analysis of hard numbers. These are not unlike the three popular methods for making other capital investment decisions described by Taylor (1980). In the intuitive method, management hunches are substituted for mathematical analyses. With the squeeky-wheel method, the proposition is judged by the amount of sound that accompanies it; whereas the necessity method consists of waiting until the existing equipment must be replaced or the plant will shut down.

Some possible reasons for lack of reporting in this area are:

- o many aspects of training are difficult to quantify or value monetarily;

- o there is no readily available model or tool for cost-benefit analysis;
- o the time lag between training and results; or
- o HRD managers do not understand the concepts of cost-benefit analysis.

Several financial analysis models and studies have been reviewed. Each takes a slightly different approach to analyzing costs and benefits, but all show an orientation to overall corporate goals.

There appear to be two major recurring omissions in cost-benefit studies of training and development. One is the tendency to leave out the indirect costs to the firm such as depreciation of capital and foregone interest. The other is the pattern of not discounting costs and benefits over the life of the project.

Indirect costs are very important and frequently overlooked in training and development cost analyses. A sound, economically-based cost analysis must provide for the depreciation of capital over its lifetime, just as capital for production is depreciated over its lifetime. Foregone interest on the funds that are allocated for training or development also must be included. Because these funds will be used for training, they will not available for other options, the most attractive of which is usually investment in Treasury bills or some other interest-earning source.

Most training and development programs are intended to be used over several years. There will be one-time development costs, recurring maintenance and revision costs, and on-going delivery

costs. Likewise, there will be on-going benefits throughout the life of the program; indeed, in some cases the benefits may not be noticeable until some time after training has been completed (as when the measures selected are employee turnover or number of grievances filed or when the number of trainees is so large that it will take several months to train them all). These cost and benefit streams must be discounted at an appropriate rate.

Only two references (Thomas et al., 1969; Wentling, 1980) addressed benefits that might accrue to individual trainees. While these benefits are important to the individual trainees, and may even affect their willingness to participate in training and development programs, most firms are concerned only with the costs and benefits accrued to the firm itself.

Reddy (1979) pointed out another shortcoming of most cost-benefit analyses of training. Unlike cost-benefit analyses of public investments, which are almost always done as forecasts to guide decision makers and to rank order programs, most financial analyses of training and development are done after the training. As such, they can be supplementary evaluations but may not be of much use in deciding among alternative new programs to implement.

**Cost Analysis**

In general, more has been written about costs than about returns. If one looks at the continuum from models to methods to technologies, several authors (see e.g., Cullen et al.; 1978; Head & Buchanan, 1981; Kearsley & Compton, 1981; Mirabal, 1978; Swanson & Geroy, 1983) have provided models or classification schemes for costs, and many (see, e.g., Head, 1985; Kearsley, 1982; Mirabal,

1978; Roden, 1984) have developed methods to accompany these models. However, as mentioned before, none of these models or methods is complete.

Head's (1985) book on cost analysis is the most comprehensive, easy-to-read, easy-to-follow set of guidelines for determining costs. It is the closest to a technology or working system (as opposed to a theoretical model) of any of the articles and books reviewed. However, it does not account for some indirect costs and for discounting the cost streams over the economic life of the program. Further work needs to be done in the area of cost determination to help training managers understand the concepts of economic life and time value of money.

**Returns Analysis**

At present, there are only two models for forecasting benefits or returns on investment. Swanson and Geroy (1984) offered their benefits forecasting method (BFM) that focuses on forecasting costs and benefits for the purpose of selecting among program options. It lacks a provision for discounting the benefit streams, and research using the BFM (Prifrel, 1985; Geroy, 1984; Sleezer, Swanson & Geroy, 1985) suggests that although the forecasts are valid, the method is difficult to understand, and is resisted by training professionals.

The utility analysis method has not been tested with training professionals. To date, it has been applied to only a few human resource decisions and all the mathematics have been worked out by the researchers. In addition, it has been applied either hypothetically or after the fact.

Both of these methods need further validation and testing to determine the scope of their application, their receptivity to training professionals, and the direction and form of enhancements leading to the development of a technology.

**Recommendations for Research and Development**

This review has pointed out several weak areas in the current approach to making financial or economic decisions in training. Some areas for further research and development are discussed below.

In general, there needs to be more research and publication of actual decisions regarding return on investment to training programs. There is a dearth of information about how training managers and others determine the costs and returns of their programs. Sharing this kind of information will allow for the testing of existing methods and the development of new ones.

The BFM needs to be used in more validation studies to determine the scope of its application. It has been shown to be valid in skills or technical training, but still needs to be tested for management training, motivational training, and wellness. Using the BFM to predict the benefits of organization development projects needs to be further researched. The BFM is still a model and it needs to be expanded into a technology. A clear, simple set of directions, examples, and questions would make it much more attractive to training professionals.

Utility analysis must be tested with actual real training decisions and with training professionals. These studies should focus on three areas: the scope of its application to different

types of training; the validity of the percentile differences or percent of wages estimates of the standard deviation of job performance; and the ease of use by training professionals. Furthermore, it should be tested as a forecasting tool. Only after these areas have been examined and appropriate revisions have been made, should attention be given to developing a technology from this method.

Another area for research is the development of a benefits classification scheme. Training professionals may not be aware of how training outcomes can be expressed or converted to reflect monetary returns. A benefits classification scheme or taxonomy that includes not only an explanation of outcomes associated with various types of training programs but also directions and examples of how those outcomes can be monetized would be a valuable tool for training professionals as they try to justify their training efforts.

**Integration**

Ideally, the outcome of this research and development should be an easy-to-use system that contains both cost and return determination and some of the alternative return on investment measures presented at the beginning of this paper. Much of what is available now focuses only on costs and advocates making decisions only on the basis of costs (see e.g., Head, 1985); yet, it is clear that economic decisions must be made on the basis of both costs and returns for the life of the project. Furthermore, it is desirable that the system be suitable for following actual dollars and for predicting costs and returns.

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