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AUTHOR Swanson, Richard A.; Geroy, Gary D.
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ABSTRACT

Analysis of the economics of training has become one of the most important issues of the decade for business and industry. Unfortunately, managers typically digress to a simple cost analysis and ignore the realities of cost-benefit analysis and the potential of large financial benefits to the organization. A proposed model to forecast training costs and benefits identifies generic categories of training costs for summarizing those costs that may be unique to the reader's organization. Categories for costs incurred from losses of time, material, and production/performance are included. An important part of the Training Benefit Forecast Method (TBFM) is the value of performance. Performance value is defined as the worth of performance units produced in dollars. Making valid comparisons of alternative training options requires the analyst to set a base time period to be used in calculating performance values for each training option. A case study is provided of the benefit analysis of three training options under consideration by a manufacturer. Tables illustrate the cost and benefit analyses. (YLB)

TRAINING AND DEVELOPMENT RESEARCH CENTER

PROJECT NUMBER ONE

FORECASTING THE ECONOMIC BENEFITS OF TRAINING

Richard A. Swanson
Gary D. Geroy

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university of minnesota
DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION • ST PAUL, MINNESOTA

Forecasting the Economic Benefits of Training

The concept of cost-benefit analysis has been with us for decades. Despite this, it is a concept which management continues to use selectively. When it comes to capital outlay, it is relatively easy to forecast costs and benefits with the traditional methods that are available. Furthermore, depreciation schedules and return-on-investment expectations are locked into the capital investment perspective. Decision makers do not have the equivalent forecasting tools available to them when it comes to investing in the employee training or human capital side of the enterprise. As a result, managers typically digress to a simple cost analysis when it comes to budgeting for employee training. They ask "How much will it cost?", "How much did we spend last year?", and "How much do we want to spend this year?"

These simple cost questions avoid the realities of cost-benefit analysis and the potential of large financial benefits to the organization. It is not surprising to find organizations in almost all economic sector and size categories that are making training financial decisions with no investment forecasting information.

A medium-sized manufacturing company that produces electronic circuit boards has had a steady and profitable life. Even with high employee turnover and an unacceptable product rejection rate, they have been making money. The idea of investing in training had never entered management's mind. Consciously spending any money on training was a departure from normal practice. The $20,000 proposed by an outside consultant for training ten assembly workers seemed extravagent beyond reason. The company was not even aware that in just a 40-day period there was over

$200,000 to be gained.

Only recently did a Fortune 100 manufacturing firm learn their lesson. They had a stable and experienced productive workforce that had been trained by trial-and-error job experience. A closer look through cost-benefit analysis forecasted significant benefits from training. The actual results from four separate training efforts supported the forecasted benefits. As a result, the corporation is considering an orchestrated human and capital investment program throughout the organization.

A corporation manager of training located in a large metropolitan area found himself confronted with more training options than he expected. The engineering content could have been handled in-house by his staff, by three training vendors, or two public institutions. Will any or all the training options yield a benefit? Of those predicting a benefit, are there differences? How does a manager choose between rival training options?

Square Pegs and Round Holes

Managers face a major problem. Knowledge of the economics of training, one of the major human capital arenas, is limited. Beyond a few studies (Cullen, Sawzin, Sisson, & Swanson, 1976; Rosentreter, 1979; Thomas, Moxham, & Jones, 1969), attention to the micro-economic analysis of training has been minimal. Searches through the literature on the costs and benefits of training uncover large voids in the areas of economic descriptions of training efforts, forecasting of training costs and benefits, and experimental assessment of the economic factors of training. The capital investment cost-benefit alternatives available to management continue to be applied to employee training. This practice is analogous to fitting square pegs in round holes.

Forecasting Training Costs and Benefits

Organizations exist to make gains. Decision makers determine what gains will be pursued by establishing goals. They then allocate resources (financial or human) to attain the goals. In attempting to improve organizational performance, decision makers at the strategic planning level may choose to support training or non-training options. The training option includes both unstructured on-the-job training and structured training programs. Both incur costs.

There are alternative views of costs. Accountants perceive costs as the outlays necessary to achieve a given set of outcomes. Financial managers perceive costs as the value of the alternatives foregone in order to pursue a particular course of action. For example, by taking a worker off the job to receive training, the organization foregoes the worth of that worker's potential productivity had the worker remained on the job. Conversely, to retain an inadequately trained worker on the job eliminates expenditures for structured training while accepting below acceptable productivity until the employee finally reaches competence.

Cost Considerations

Training costs and, therefore, training budgets may be inaccurately identified by managers and trainers. All the costs which an organization can identify and associate with its structured or unstructured training must be counted. Employees who are performing at the level of their performance goals are not incurring training costs. Training costs appear when any of the following situations exist:

1. A new employee arrives on the job performance site.
2. An experienced employee is transferred or promoted to a

different job, which requires the acquisition of additional skills or knowledge or a change in attitude.

3. An experienced employee's job is modified and performance of the job requires transfer of skills, knowledge, and perhaps different applications of subject-matter expertise.

4. An experienced employee has a loss in knowledge and skill.

An analysis of training costs must include the measure of the value of production units not produced or performance not accomplished during the period of training. Such training costs may be measured by comparisons of production lost among alternative training options. Training costs also include measures of expenses directly and indirectly associated with the development and delivery of structured training. Finally, training costs include the salaries and benefits paid to trainees and others during the time they are engaged in the training process.

Measuring Training Costs

Managers, trainers, and accountants may not always agree on what specific items should be considered training costs. What is important is that analysis of training costs use identical criteria when costing each alternative under consideration. Furthermore, the time period for measuring costs should remain consistent in order to make valid comparisons of costs between training options.

The minimum measurable costs of on-the-job unstructured training is the value of employee performance that is below the performance goal during the training period. A Johns-Manville study (Cullen, Sawzin, Sisson, & Swanson, 1976) provides evidence to support the position that the average

performance per employee during the period of unstructured training is 50% of the performance goal.

The forecasting model proposed in this paper identifies generic categories of training costs for summarizing those costs which may be unique to the reader's organization. Categories for costs incurred from losses of time, material, and production/performance are included. General guidelines and examples of training costs are shown in Table 1.

Benefits Profiles

Positive returns on investments are benefits. The investment may be one of time or money or material, and the benefit derived may be quality (effectiveness) or quantity (efficiency) of product or service. Another type of benefit may be organization or individual performance gains to which value may be assigned. To illustrate, an increase in quantity of production per unit of time has a measurable value when viewed as time gained and available for producing additional products or services at a given performance level. Likewise, quality can be measured as a gain in the value of units produced (i.e., less rejects, lower service, and warranty costs) at the same level of performance. The value of performance is an important part of the training benefit forecast method (TBFM). Determining the value of performance requires that the total performance or performance units that make up the performance be identified. This is not always as obvious as one might first think and remains the critical task in each analysis effort.

Performance value is basically the financial worth of performance units in an enterprise. Performance units can be expressed in any manner indigerous to an organization. They should be judged on a common comparison time period

Table 1

Cost Analysis Categories

Cost analysis categories	Guidelines/Examples
Staff	Wages of clerical/secretarial, hourly or salaried subject matter experts, trainers or other employees involved in the training effort.
External Consultants	Fees and associated expenditures for externally hired subject matter and training design experts involved in the specific training effort.
Materials	Items which will either become a permanent part of the specific training effort or which will be consumed in the training related effort.
External Support Costs	Professional, skilled, or semi-skilled labor or services required to support any or all aspects of the training effort.
Trainee	Wages, mileage, lodging, and meal expenses associated with trainee attendance of training effort.

(table continues)

Cost analysis categories	Guidelines/examples
Facilities	Expenses associated with room or equipment rental, utilities, or facility modification directly related to the specific training effort.
Tuition/fees	Expenses directly related to school tuition, fees, books and materials, and lab costs associated with a given training effort.

when training options are being compared.

Training Benefit Forecasting Method

In its simplest form, training benefit forecasting requires that the increases in performance values, minus the training costs, and the resulting benefits be determined for each training alternative under consideration. When the performance value exceeds the cost, the training yields a benefit. If the costs exceed the performance value, no benefit results. The highest projected benefit among training alternatives leads the decision maker to the most desirable option (see Figure 1).

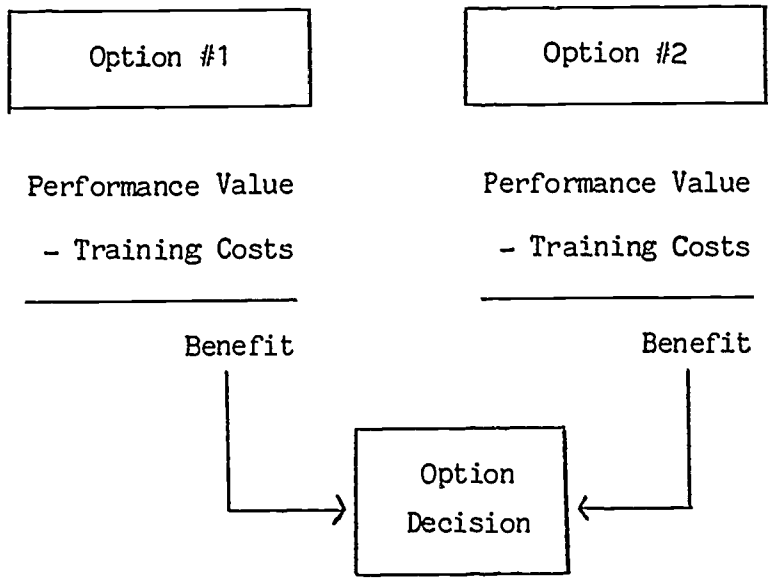


Figure 1. Cost-Benefit Forecasting Model

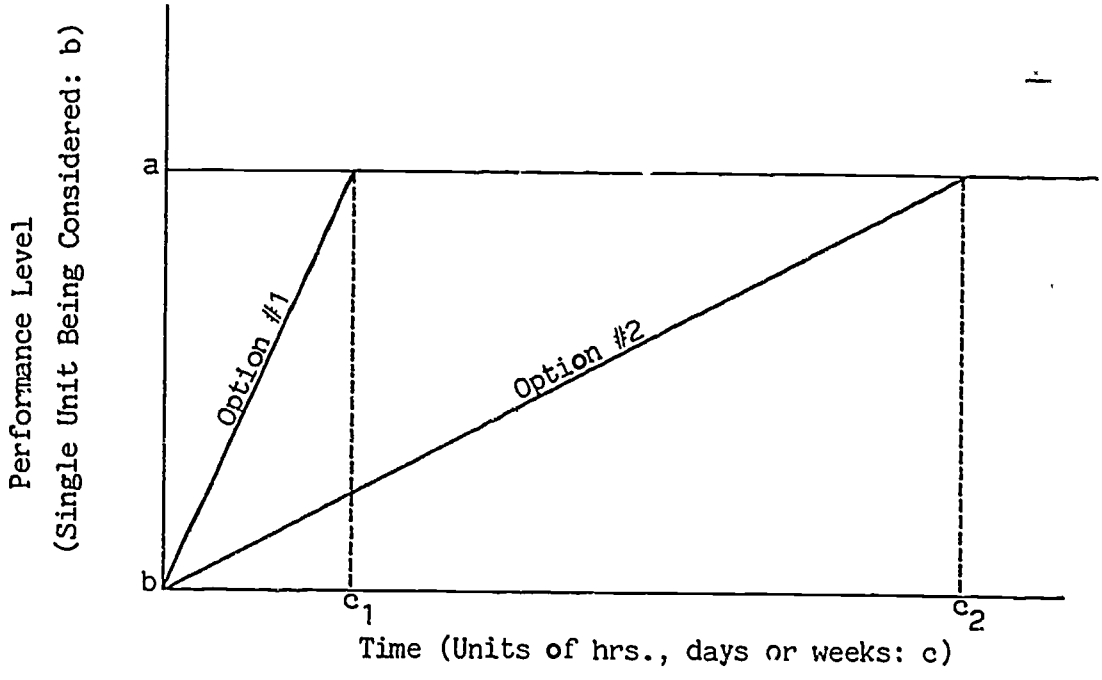
Analysis of Costs

In analyzing costs, care must be taken to include all the costs attributable to a specific training option. Costs are calculated for staff time, trainee time, consultants, materials, space, etc., needed to complete each step in the training process; needs analysis, work behavior analysis,

design of training, implementation, and evaluation. Accounting for costs may be expressed as total costs per training option or as costs per trainee in each option.

Analysis of Performance Value

Performance value is defined as the worth of performance units produced in dollars. Making valid comparisons of alternative training options requires the analyst to set a base time period to be used in calculating performance values for each training option. This time period is set at the longest period of time required by any of the training options under consideration to bring trainee performance up to the performance goal level (see Figure 2).



a. Performance goal

b. Existing performance level

c. Time of comparison period

Figure 2. Performance Level Over Time Comparison of Training Options

If on-the-job unstructured training is one of the options, this usually requires the longest time. The following data and calculations are required to determine the performance value gain part of the method.

Net Performance Value Calculation Worksheet

A. Data Required for Calculations

(a) What is the desired performance as a result of worker training? _____

(b) What unit(s) of measure will be used to describe the performance? _____

(c) What is the dollar value that will be assigned to each unit of measure? $_____

(d) What is the estimated training time to reach the goal? _____

(e) What is the current level of worker performance? _____

(f) How many workers will participate in the training? _____

B. Calculations to Determine Net Performance Value

(g) What is the estimated performance level during training?

Will trainee produce during training?

____ No = 0

____ Yes = $\frac{a + e}{2}$ _____

(h) What is the length of the period being evaluated (at a minimum this will be the longest "d" of all options under consideration)? _____

(i) What is the estimate of the total number of units (b) that will be achieved during training? [d x g] _____

(j) What is the estimate of the total individual performance for the evaluation period? [(h - d) x a] + i _____

(k) What is the value for the total performance for the evaluation period? [c x j] $_____

(l) What is the net performance value gain? [k - (e x c x h)] _____

(m) Do you want to calculate the total net performance value of all trainees?

____ Yes = [l x f] $_____

___ No = Net Performance Value of 1 trainee which is value of (l)

A Cost-Benefit Forecasting Case Study

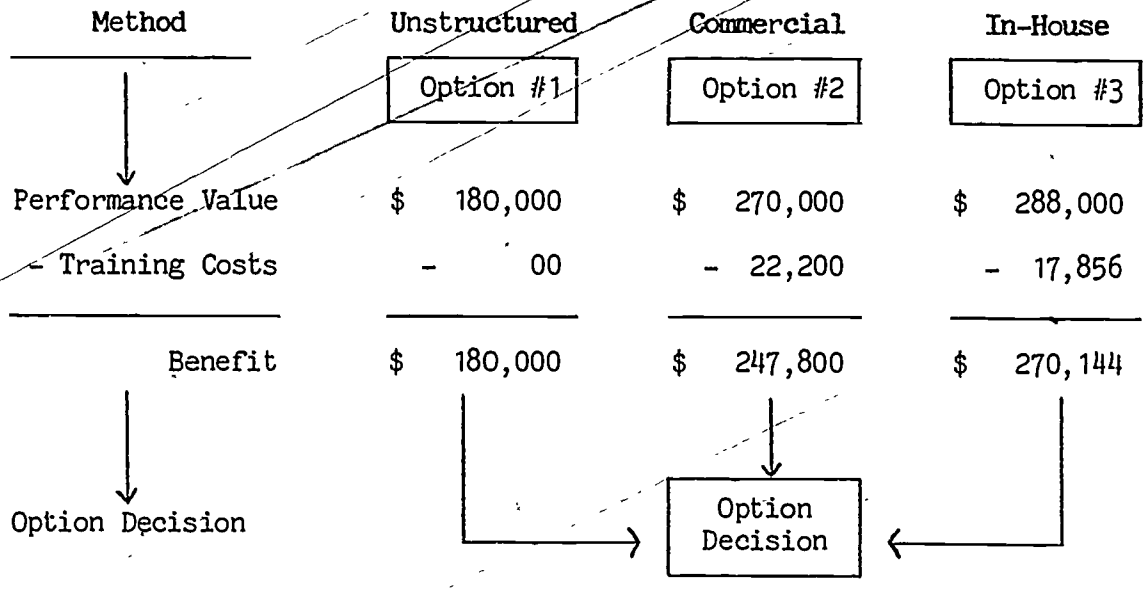
In this real-life case study employees of a manufacturer of specialized circuit boards for electronic equipment have been trained by an unstructured on-the-job method. The firm's circuit board assembly workers read at an average level of seventh grade, and they all experience difficulty in understanding the English language. Approximately forty (40) working days are required for a new assembly worker to reach the acceptable performance level of three good circuit boards every two days. Each circuit board is valued at $600. Assembly workers are paid $9 per hour. Once workers reach the performance goal level, they generally experience a rework rate of one (1) circuit board out of eighteen (18) because of poor soldering or incorrect

positioning of one or two installed parts. Management is considering designing or contracting for a training program to decrease the time required for new assembly workers to achieve the current acceptable level of performance. They are considering the use of a commercially available ten-day training course at a cost of $1500 per trainee. This course provides training in basic soldering technique, component identification, blueprint reading, instrument calibration, basic circuitry design, theory and practice, and systems diagnostics.

Additionally, management hired a training consultant to do a training needs assessment and propose content for an in-house training course as a possible alternative to meet the manufacturing skill needs of the company. The consultant submitted a report and a bill for $2,200. The consultant recommended that in order to meet the manufacturing skills needs of the company, the training should cover basic soldering techniques, identification of components for the circuit board, and electronic circuitry blueprint reading. He further recommended that the workers be provided with job aids to help them in identifying correct components and proper installation. The consultant recommended that the job aids should be 8" x 10" color photos of correctly built circuit boards. He felt this would facilitate workers' continued learning of the proper identification and placement of components. The consultant also recommended that the total training time would need to be eight working days at the conclusion of which the new assemblers should be able to produce at the rate of three boards every two days at the current quality level. Management believes that development and delivery of the in-house training course could be handled by the in-house training staff and the chief electronic engineer. Temporary clerical support will be hired

to assist during the analysis, design, and development steps.

Management must decide whether ten new employees will receive the in-house training, whether they will attend the commercially available training course, or whether they will be trained on the job as in the past. A benefit analysis of the three training options under consideration--unstructured, commercial course, or in-house training--will lead the decision maker to the highest projected benefit, which in this case is option #3, in-house training (Figure 3). The forecasted benefit was $270,144. Table 2 illustrates the cost analysis and Table 3 the performance value analysis that lead to benefit analysis and option decision.



#1 Choice = Option #3: In-House Training

#2 Choice = Option #2: Commercially Available Training

#3 Choice = Option #1: Unstructured Training

Figure 3. Benefit Analysis for Circuit Board Training

Table 2

Cost Analysis

Option:	Commercial	In-house
1. Needs analysis/planning		
Staff	$	624
External consultant costs		2,200
Materials		400
subtotal $	0	3,224
2. Work behavior analysis		
Staff		410
External consultant costs		0
Materials		100
subtotal $	0	510
3. Design		
Staff		2,440
External consultant costs		0
Materials		500
External support costs		600
subtotal $	0	3,540

(table continues)

Option:	Commercial	In-house
4. Development		
Staff	$	270
External consultant costs		0
Materials		100
External support costs		750
		600
subtotal	$ 0	1,720
5. Implementation		
Trainee (#10)	7,200	5,760
Facilities		
Tuition/fees	15,000	0
Staff		294
Materials		2,000
subtotal	$ 22,200	8,054
6. Evaluation		
Staff		208
External consultant costs		600
subtotal	$ 0	808
Total costs	$ 22,200	17,856
Cost per trainee	$ 2,220	1,785

Table 3

Performance Value Calculation Worksheet

Data Required for Calculations	Unstruct	Commercial	In-house
(a) What is the desired performance goal as a result of worker training?	1.5/day	1.5/day	1.5/day
(b) What unit(s) of measure will be used to describe the performance?	# Boards	# Boards	# Boards
(c) What is the dollar value that will be assigned to each unit of measure?	$600	$600	$600
(d) What is the estimated training time to reach the goal?	40 days	10 days	8 days
(e) What is the current level of worker performance?	0	0	0
(f) How many workers will participate in the training?	10	10	10
Calculations to Determine Net Performance Value			
(g) What is the estimated performance level during training? Will trainee produce during training? ___ No = 0 ___ Yes = $\frac{a + e}{2}$	.75/day	0	0

(table continues)

	Unstruct	Commercial	In-House
(h) What is the length of the period being evaluated (at a minimum, this will be the longest "d" of all options under consideration?	40 days	40 days	40 days
(i) What is the estimate of the total # of units (b) that will be achieved during training? [d x g]	30	0	0
(j) What is the estimate of the total performance per individual for the evaluation period? [(h - d) x a] + i	30	45	48
(k) What is the value for the total performance for the evaluation period? [c x j]	$ 18,000	$ 27,000	$ 28,800
(l) What is the net performance value gain? [k - (e x c x h)]	$ 18,000	$ 27,000	$ 28,800
(m) Do you want to calculate the total net performance value of all trainees? Yes ___ = [h x f]	$ 180,000	$ 270,000	$ 288,800
No ___ = Net performance value of one trainee which is calculated value of (l)			

This was the first in a series of industry-based studies being conducted by the Training and Development Research Center, University of Minnesota and funded by Onan Corporation. Studies presently underway include forecasting the benefits of geometric tolerancing training, welder training, secretarial grammar and punctuation training, and manager writing skills training using the Training Benefit Forecast Method.

Conclusion

Analysis of the economics of training has become one of the most important issues of the decade for business and industry. The quality of the analysis tools available to managers and training professionals will affect the quality of their training decisions. The benefit forecast method described in this article demonstrates that training decisions can be made on the basis of rational thought and economic analysis.

Training benefit forecasting methods, such as the one presented here, are important decision-making tools in the workplace. Managers and trainers who can discuss training activities in economic terms will be at an advantageous position in contributing to the strategic plans for the human capital in their firms. As management thinks more seriously about human capital and about strategic planning for human resources, the training function will become more central to the firm. Furthermore, those who understand the economics of training will be in a better position to contribute to the vitality of their organizations.

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