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"Cost-Benefit" Analysis Applied to Personnel/Human Resource Management Decisions

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Abstract

[Excerpt] Every model for improving quality in manufacturing or service emphasizes the need to understand customer or client needs, measure achievements in terms of those needs, and use measurements to adjust processes so that the needs are better met. For many clients of the personnel functions, such as line managers and shareholders, meeting their needs means demonstrating competitive return on investment. In a very real sense, the resources used to support human resource programs/processes could also be used to buy new equipment, pay stock dividends, or purchase raw materials. Thus, the results of personnel investments must produce enough value to justify shifting the resources from these other purposes. Cost-benefit analysis provides a framework and system for understanding what information best reflects the needs of clients, and how to organize and use that information so that progress toward meeting client needs is clearly evident. Cost-benefit analysis shifts the focus away from simply improving personnel processes and toward improving personnel business outcomes.

Keywords

CAHRS, ILR, center, human resource, job, worker, advanced, labor market, satisfaction, employee, work, manage, management, training, cost benefit analysis, personnel, decision, management, HRM

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"COST-BENEFIT" ANALYSIS APPLIED TO PERSONNEL/HUMAN RESOURCE MANAGEMENT DECISIONS

Answers to Common Questions, and a Case-Study Application

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by

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What is "Cost-Benefit" Analysis?

Cost-benefit analysis is a decision-making technique that involves explicitly considering the position outcomes (benefits) as well as the negative outcomes (costs) of different decision alternatives. It is used to make decisions more consistently, systematically and correctly. It is also useful in communicating about decisions with others.

Traditionally, such analysis has been used in many areas of management (such as Marketing, Finance and Operations), but has received much less attention in Human Resource Management (HRM). Often, this means that decisions about HRM programs are presented in less quantitative terms than decisions in other management areas. Faced with limited resources, top managers may allocate resources to the management functions that can "come up with the numbers." This may mean that resources are not allocated to HRM programs even when they offer very attractive organizational payoffs. Recently, Human Resource Management professionals and scholars have begun to develop approaches for evaluating the payoff or usefulness of human resource management programs and decisions.

Though many of these techniques focus on dollar values, the main purpose of cost-benefit analysis is to improve decisions and to use information more effectively. Thus, cost-benefit analysis is simply any technique that helps to identify the positive as well as negative outcomes of decision options to improve decision quality, efficiency and communicability.

What kinds of questions does cost-benefit analysis attempt to answer?

Though the approaches vary, my own view is that HRM managers make decisions about human resources. They are the stewards of one of the largest and most important resources available to accomplish organizational goals. It is their responsibility to help line managers make decisions that manage this resource in a businesslike way, to accomplish strategic goals.

Cost-benefit analysis addresses questions like:

* Is the return to our expenditures on HRM programs adequate to justify these investments?

* Is it worth investing some resources to improve the quality of our human resources?

* How can a manager choose between different options for managing human resources (such as training versus selection, or two different compensation systems) in a way that maximizes the return to the investment?

* How can we manage with uncertainty about program outcomes, and yet avoid becoming paralyzed by our reluctance to take risks in our human resource programs?

* How can we better determine when we know enough to make a decision, and when to invest resource in better measuring/forecasting human resource program outcomes?

Are these cost-benefit models compatible with financial analysis?

Yes. Just like any management decision, human resource management decisions involve using organizational resources (such as money, time and facilities) in the hopes of affecting employee productivity (or some other desired outcome). Just as we can analyze an investment in a new tool or plant in terms of the expenditures necessary and the expected change in productivity that results, so we can analyze investments in human resources in terms of the expenditures necessary to develop and implement programs, and the expected resulting effect on work force value.

In fact, one can apply a "cash-flow" analysis to human resource decisions that parallels traditional cash-flow analysis in financial management. Often, human resource programs emerge as lucrative investment opportunities. Such analysis is compatible with "value-based management."

Is cost-benefit analysis different from human resource accounting?

Yes. Cost-benefit analysis focuses on human resource management decisions. It is designed as a tool for managers to organize and communicate their decisions more systematically and rationally.

Human resource accounting typically focuses on computing the "value of human assets" or on "putting human assets on the balance sheet." This has proven to be difficult, and no generally acceptable procedures have emerged. Moreover, even if such estimates were available, human resource accounting provides no framework for using such information in decision making.

In contrast, cost-benefit analysis begins with the decision. It focuses on determining which alternative is the best resource investment by specifying the alternatives to be considered, the resources each alternative requires, and the likely changes in work force value that each alternative will produce. Thus, cost-benefit analysis focuses on the decisions to be made, and their effects on a dynamic work force, rather than on procedures for estimating the value of human assets at one point in time.

Don't you need very precise information to do cost-benefit analysis?

Management decision information is never perfect. Every management decision contains educated guesses and ranges of possible outcomes. This has long been accepted in financial, marketing and operations decisions.

The key is to focus on the decisions being made, and the value of information for such decisions. If imprecise information is likely to lead to wrong decisions about important issues, then it may be appropriate to invest in better measurement. However, if cost-benefit analysis based on existing (and imperfect) information suggests that the decision would be the same for a wide range of values, it probably doesn't matter as much if your information is imperfect.

How does cost-benefit analysis fit with "Quality" enhancement?

Every model for improving quality in manufacturing or service emphasizes the need to understand customer or client needs, measure achievements in terms of those needs, and use measurements to adjust processes so that the needs are better met. For many clients of the personnel functions, such as line managers and shareholders, meeting their needs means demonstrating competitive return on investment. In a very real sense, the resources used to support human resource programs/processes could also be used to buy new equipment, pay stock dividends, or purchase raw materials. Thus, the results of personnel investments must produce enough value to justify shifting the resources from these other purposes. Cost-benefit analysis provides a framework and system for understanding what information best reflects the needs of clients, and how to organize and use that information so that progress toward meeting client needs is clearly evident. Cost-benefit analysis shifts the focus away from simply improving *personnel processes* and toward improving *personnel business outcomes.*

What does cost-benefit analysis imply for automated personnel information systems?

First, automated information systems allow us to gather, process and disseminate personnel information more quickly, accurately and efficiently. This can make it feasible to conduct cost-benefit analyses that might have been prohibitively costly without easy access to data.

Second, the cost-benefit framework helps us understand where automated systems can add the most value by supporting business-related decisions. Automation can sometimes add value by reducing the costs of processing and administering information. This clearly adds value when the information must be processed and administered to satisfy Government or other requirements. However, much of the information included in automated systems is not gathered to satisfy Government or other requirements--it is gathered because someone inside the organization presumably uses it. This second kind of information is "discretionary" because no one requires that it be kept or disseminated. Examples of this second kind of information include salary surveys, attitude surveys, turnover rates, and performance ratings.

What determines the value of "discretionary" information?

Discretionary information adds value only if it satisfies two requirements: (1) Having the information must correct future decisions; and (2) The consequences of the corrected decisions must be important. In simplest terms, the number of corrected decisions multiplied by the difference in value between being correct and incorrect equals the value of the information. While it is seldom possible to calculate this value precisely, it is often possible to use these principles to diagnose areas where the value of information can be enhanced, or where valuable information exists but is not being used effectively.

Once the value of the information has been identified, it must be compared to the costs of gathering, processing, disseminating, and using that information. These costs can be lowered through automation, but it does little good to lower the costs of producing useless information. Value and cost must be considered together.

Can cost-benefit analysis be used to measure the value of compensation information?

Consider an example in which an organization is considering development or purchase of a computer application to provide job evaluation information to compensation analysts. Job evaluation information includes descriptions of jobs and procedures to translate the descriptions into pay levels that logically relate to other jobs in the organization, and other similar jobs in competing organizations. Assume that the organization's job analysts evaluate about 100 jobs per year, and about 20 evaluations are incorrect because they are based on outdated information. The computer application system will correct 18 of these 20 wrong evaluations each year. Thus, the quantity of corrected decisions (Factor #1) is 18. Further, suppose that when a job is mis-evaluated, the organization knows that this increases the pay of at least 10 job incumbents by $2,000 per year, and that it takes about two years to discover this mistake. Each mis-evaluated job, then, costs $40,000 (that is, 10 employees times $2,000 times 2 years). Thus, the value of correcting each decision (Factor #2 above) is $40,000. Finally, suppose that development of a computer system that can actually help correct mis-evaluated jobs will require up-front development costs of $700,000 plus $60,000 per year maintenance and operation costs. If we evaluate the system over a five-year period, the total cost will be $1 million (or, $700,000, plus 5 times $60,000).

Does this computer application provide information that improves job evaluation enough to offset system costs? Is the system worth the $1 million investment required? To get the yearly value of the system, we simply multiply the number of corrected decisions in each year (18 decisions) by the value of each corrected decision ($40,000) to get a yearly value of $720,000. Over a five-year period, the new system will provide roughly five times this value, or $3.6 million dollars, at a cost of $1 million. This is a substantial return on the computer system investment. In fact, the investment would still pay off even if the system cost is substantially higher, or if the number of corrected decisions or the value of each corrected decision is smaller. While this example was simplified, and we assumed we had the numbers available to make the necessary computations, the principles embodied in the example can apply to more complex decisions or to decisions where the numbers are more doubtful.

A Case Study Applying Cost-Benefit Principles And Break-Even Analysis

Human resource programs are activities designed to increase the value of one or more groups of employees. Examples might include training programs, tests or interviews, career counselling, merit-based compensation, team building or benefit programs. This case study illustrates how to implement a cost-benefit approach to such decisions. It follows a ten-step process that helps to identify and organize decision information, and present it in a way that is systematic and compatible with other financial and managerial systems, such as "value-based strategic management." As you consider applying this technique, you will realize that you may be unable to make precise estimates for many of these factors. Don't be concerned. The main purpose of these concepts is to provide a framework for organizing your thinking. Informed judgments, where necessary, are perfectly consistent with managerial decisions. In fact, one advantage of this approach is its ability to provide analysis without perfect precision.

Ten Steps in Applying Cost-Benefit Analysis To Identify Break-Even Relationships

Step One: **Define the Decision Issue, Relevant Stakeholders, Target Group and Objectives.**

Step Two: **Define the Decision Options**

Step Three: **List the Potential Outcomes of Each Option**

Step Four: **Estimate the Total Cost of the Options**

Step Five: **Calculate the Leverage (Number of Person-Years Affected) of Each Option**

Step Six: **Compute the Total Payoff Formula for Each Option**

Step Seven: **Compute Break-Even Values For Each Option Individually**

Step Eight: **Compute the Decision Rules for Choosing Among Options**

Step Nine: **Compare the List of Outcomes from Step Three to the Decision Rules and Break-Even Values**

Step Ten: **Evaluate Whether Additional Information Would Produce Improved Decisions**

Step One: Define the Decision Issue, Relevant Stakeholders, Target Group and Objectives.

Decision Issue:

First we must state the decision issue or strategic problem that you want to examine in your cost-benefit analysis. This should be an issue that is important, strategic and related to competitive advantage, but also a specific gap between current and desired conditions. A one or two-sentence descriptions is sufficient. It is often helpful to state the issue in the form of a question. For this case study we are faced with the strategic goal of increasing skills, so we express the general decision issue as:

"What is the best method for enhancing equipment maintenance skills among our operator work force?"

Relevant Stakeholders:

Relevant stakeholders are those who care about, or are affected by the outcome and effects of the human resource management decision. In this case, they include the human resource program initiators, the employees affected by the decision, their supervisors, others who work with the employees, and possibly customers and suppliers.

Target Employee Group:

This is the group of employees directly affected by the programs being considered. The description should include the number of employees, their work description, and their organizational position. It should also include their average tenure or the length of time the program is expected to affect their value to the organization. For the skill-enhancement issue the target group is:

"This program would enhance the skills of 1,000 process operators, by adding skills in maintenance as well as operations. These operators monitor and adjust various manufacturing tools and machines. They are in non-supervisory positions. These operations and maintenance skills remain important to job performance for five years, after which time they must be updated to reflect technological changes."

Broad Objectives:

These are the objectives of the program (that is, the gaps, needs or problems the program is designed to address). Keeping in mind the critical business needs identified earlier, plus the internal and external stakeholders, we describe behaviors or results the program should affect. The skill-enhancement issue objectives might include:

"(1) Cost reduction through enhanced ability to switch employees between operation and maintenance tasks; (2) Improved quality through more complete job awareness; (3) Shorter machine down time."

Step Two: Define the Decision Options

Now that we have precisely stated your strategic decision issue, the target employee group, and the general program objectives, we identify the set of choices or "alternatives" available to you for addressing the issue. These represent specific alternative approaches that might be used to address the issue described above. If possible, the description should include:

1. Activities required to develop the alternative programs.
2. Activities involved in carrying out the ongoing program.
3. Number of employees affected by the program in each future time period.
4. Required off-the-job time of participants (if any).
5. Off-site and on-site facility requirements.

Include any other factors that might be related to cost and benefit differences between alternatives. Try to clearly distinguish each alternative from the others.

For the skill enhancement decision, we might identify two alternatives:

Option A:

Use staffing to hire 200 new process operators per year over the next five years. The new hires would have two-year degrees or equivalent experience in skills required for maintenance (e.g., electronics, mechanics, etc.), in addition to the previous requirements for process operators. This option would involve establishing additional screening requirements, some interview training, and recruiting targeted to different educational institutions. Orientation activities would also be enhanced to reflect increased job scope including maintenance as well as operations. Program development would require 300 hours of personnel staff. Ongoing staff requirements would include an additional 10 hours per hired operator, or 2,000 additional staff hours per year. Attracting highly-qualified employees would require that new hires be paid $2/hour more than regular entering process operators (plus 50% in benefits). Better-selected employees would be assigned to jobs where these operations and maintenance skills remain important to job performance for five years, after which time they must be updated to reflect technological changes."

Option B:

Continue to hire new process operators without advanced skills, but institute a training program for existing process operators to upgrade their skills commensurate with maintenance. This would involve having operators attend advanced technical training trough a one-year program developed with a local University. The program would involve 100 hours of development activity requiring a personnel staff member working with the University. Three-hundred operators per year could be trained during the first three years, and 100 in Year four, to reach the desired total of 1,000. University tuition would be $1,500 per person. Classes would be half off-site during work hours. Approximately 10 hours per week for 40 weeks per person is required for the training. Candidates would volunteer for the program, but would also be paid an average of $2/hour more than regular process operators after training. Better-trained employees would be assigned to jobs where these operations and maintenance skills remain important to job performance for five years, after which time they must be updated to reflect technological changes."

Step Three: List the Potential Outcomes of Each Option

In this step, we identify the potential positive and negative outcomes of each option. We don't have to know for sure exactly what the effect will be, but we want to list as many of the possible important consequences as we can. We use this step to ensure that we have thoroughly considered the ramifications of our decision.

For the skill enhancement decision, the two options obviously differ in the number of operators with enhanced maintenance skills. In addition, however, it might be anticipated that the campus program would have a different effect from reassigning existing operators and hiring new ones to replace them. We can express the outcomes in the form of a matrix as follows:

Outcome	**Option A**	**Option B**
Operator Reaction	Negative	Positive
Supervisor Reaction	Positive	Moderate
Reduced hiring	40 per year	60 per year
Increased product quality	5% per year	7% per year
Less machine down time	100 hours less/year	100 hours less/year
Maintains promotion from within	No	Yes
Production Speed	10% Improved	7% Improved

Step Four: Estimate the Total Cost of the Options

Now, we estimate the cost elements for the alternatives identified above. For some of these cost factors, records may provide fairly precise information. For others, you may not have precise information. Keep in mind that exact cost information is not usually necessary to enhance decision making. Therefore, we do the best you can (even if it involves making educated guesses about some factors).

A "cost" is the value of any resource you must use in order to pursue an alternative. Some costs are direct expenses which require out-of-pocket payments to employees or third parties. Some costs are opportunity costs that do not require out-of-pocket expenses, but do involve using organizational resources that could have been used for other purposes (such as the lost time on the job of trainees, trainers, or interviewers). These costs are estimated by considering the value that the resources would produce in their next best alternative use.

It may also be helpful to consider initial development costs (those that occur only once at the beginning of the program) as well as ongoing costs (those that occur as the program is carried out, and continue as long as the program continues).

For the skills-enhancement issue might write the following analysis (this is just an example, these numbers are hypothetical, and an actual analysis would include more cost factors):

Cost Factor	Option A	Option B
Development Fees (Year 1 only)	$20,000	$30,000
Staff Program Development Time (Year 1 only)	$15,000	$5,000
Extra Staffing Administration (5-Year total)	$250,000	None
Recruiting/Selection Materials (5-Year total)	$50,000	None
Increased Compensation Costs (5-Year total)	$18,720,000	$23,712,000
Trainee Time (Assuming $10/hour pay level)	None	$4,000,000
Trainee Materials (5-Year total)	None	$25,000
Training Tuition (5-Year total)	None	$1,500,000
Five-Year Total Cost Estimate	**$19,055,000**	**$29,272,000**

Step Five: Calculate the Leverage (Number of Person-Years Affected) of Each Option

The costs and benefits of a decision depend on its scope. A decision that will affect productivity for many years, that affects many employees, or that affects critical employee characteristics has a larger scope.

The scope of a decision is the number of employees and time periods it affects the value of the work force. It is often easiest to think of a program's scope in terms of employees and years. Human resource decisions may affect work force value for decades, but it is usually feasible only to explicitly consider the first five or ten years for planning purposes, and then make some assumptions about the later years. A five-year analysis will be shown in the skill-enhancement example, but your time frame may differ.

In the skill enhancement example, Alternative A would select 200 new process operators per year. Alternative B would train 300 process operators in the first three years, and 100 in Year Four. For simplicity, let us assume that 10 previously-selected or trained process operators would leave in each future year. The Leverage of each decision is 2,850 total person-years for Option A, and 3,650 total person-years for Option B, calculated as follows:

Option A

Year	Number Added	Number Leaving	Total Affected in the Work Force
1	200	10	190
2	200	10	380
3	200	10	570
4	200	10	760
5	200	10	950
Totals	1,000		**2,850 person-years**

Option B

Year	Number Added	Number Leaving	Total Affected in the Work Force
1	300	10	290
2	300	10	580
3	300	10	870
4	100	10	960
5	0	10	950
Totals	1,000		**3,650 person-years**

Step Six: Compute the Total Payoff Formula for Each Option

Based on the above analysis, the payoff functions for the two alternatives may be written as follows:

Payoff A = [2,850 X P_A] - $19,055,000

Payoff B = [3,650 X P_B] - $29,272,000

Where:

P_A is the unknown average increase in work force value produced by Option A per person-year, and

P_B is the unknown average increase in work force value produced by Option B per person-year.

Step Seven: Compute Break-Even Values For Each Option Individually

Dividing the cost by the leverage for each alternative, we get the value of the unknown payoff per person-year that would cause the option's total value to just cover its total costs. These are called the break-even payoff levels:

Break-Even Payoff for Option A (P_A) = \$19,055,000/2,850 = \$6,686 per person, per year

Break-Even Payoff for Option B (P_B) = \$29,272,000/3,650 = \$8,020 per person, per year

This suggests that as if we believe that the effects of Option A will be to increase employee quality by at least \$6,686 per person-year, and that Option B will increase employee quality by at least \$8,020 per person-year, we will cover the costs of investing in one of these programs. Notice that these values are much lower than the cost per trainee, which is \$19,055 for Option A and \$29,272 for Option B.

These break-even values are informative, but if both programs are expected to produce benefits exceeding their break-even values, then we need to determine how much better the more expensive program (Option B) must be to justify investing in that program instead of Option A.

Step Eight: Compute the Decision Rules for Choosing Among Options

We need to know when to choose the more expensive option (Option B) instead of the less expensive option (Option A). So, we calculate a formula representing the Total Payoff from Option B minus the Total Payoff from Option A. When this formula is positive, B is the better investment, and vice versa.

$$\text{Payoff B - Payoff A} = (3{,}650 \times P_B) - (2{,}850 \times P_A) - (\$29{,}272{,}000 - \$19{,}055{,}000)$$

$$= (3{,}650 \times P_B) - (2{,}850 \times P_A) - \$10{,}217{,}000$$

This difference equals zero when: $P_B = (.78 \times P_A) + \$2{,}799$

So, Payoff B > Payoff A if: $P_B > (.78 \times P_A) + \$2{,}799$

When P_B is greater than this, the payoff from the more expensive Option B justifies doing it. When P_B is less than this, it is more cost-effective to do Option A.

The Decision Rules are:

1. If P_A is less than \$6,686 per person-year, eliminate Option A.
2. If P_B is less than \$8,020 per person-year, eliminate Option B.
3. If rules #1 and #2 do not eliminate either option, then
   Do Option B if: $P_B > (.78 \times P_A) + \$2{,}799$
   Do Option A if: $P_B < (.78 \times P_A) + \$2{,}799$

Step Nine: Compare the List of Outcomes from Step Three to the Decision Rules and Break-Even Values

Although we can never forecast the future perfectly, we now know more precisely what information our outcomes must provide to justify the more expensive program. For example, if we feel that the list of outcomes for Option A suggest a payoff of $5,000 in value per person-year among the newly-hired operators, then the payoff from Option B must be greater than $6,699 [or (.78 X $5,000) + $2,799] to justify using Option B instead. As the presumed payoff from Option A gets larger, the payoff from Option B must also get larger, but at a decreasing rate. Thus, when the quality increase per person-year from Option A is high (e.g., $15,000 per person-year), Option B can produce equal total payoff at a smaller per-person quality increase (e.g., 14,500 per person-year), due to its higher leverage value. The result of this comparison is the business case for investing in either Option A or Option B.

In the skill-enhancement decision, we would now return to our list of outcomes in Step Three, and evaluate whether that list suggests an obviously superior choice considering the formulas above.

Step Ten: Evaluate Whether Additional Information Would Produce Improved Decisions.

We can now determine whether we need to gather more information to make the estimates from Step Three more precise. Additional information will be valuable to the extent that we believe it will show us something to change our minds, and that the change will be valuable for Kodak. For example, if we were very unsure about the reduction machine down time using the Option A (external hiring) rather than Option B (internal training) we might do a pilot study or confer with organizations that have tried both options. However, if it is clear that Option B's work force quality increase will exceed that of Option A, we might conclude that gathering such information is not worth the effort.

Conclusion and Implications

Though this decision involves large cost-benefit implications, and a good deal of uncertainty, we have managed to systematically analyze it as an investment. We have produced a set of formulas that show explicitly the effects of our data and assumptions, in terms that line managers can easily relate to their bottom-line considerations. Moreover, this formulation allows us to judge whether more information will help us make a better decision, and to communicate our decision more clearly and efficiently.