Chapter 2

Forecasting ROI in Machine Operator Training

Canadian Valve Company

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Before funds can be allocated for major training programs, management sometimes needs information on the forecasted return-on-investment (ROI). In this case, which involves the training of machine operators, the proposed program included significant capital expenditures and the creation of a training facility. Prior to pursuing the project, an ROI was developed using a small-scale pilot effort. The ROI was developed using methods typically reserved for post-program evaluation. The results of the process can apply to almost any type of setting in which a major training expenditure is under consideration.

BACKGROUND

Canadian Valve Company (CVC) has enjoyed a long and profitable history as a family-owned business, serving the international industrial valve market. CVC machines, polishes, and assembles valves to be shipped to the worldwide market from several strategically located plants. The company has enjoyed tremendous growth in recent years, much of it is in foreign markets.

The company's growth and persistent employee turnover have always left a critical need for new machine operators. Unfortunately, the skilled labor market was unable to adequately supply trained machine operators, and CVC had to develop its own training program. Machine operators work

This case was prepared to serve as a basis for discussion rather than to illustrate either effective or ineffective administrative and management practices. The authors, dates, places, names and organizations may have been disguised at the request of the author or organization.

various equipment including lathes, drill presses, and milling machines. New employees recruited for the machining area were usually untrained, inexperienced operators who received on-the-job training by their supervisors using the regular production equipment. This approach had created problems because new trainees were not productive during initial employment, and production machines were virtually out of service during training. Production management considered the traditional on-the-job training methods not very effective, and the training time to prepare new operators appeared excessive. In addition, the problems of high scrap and excessive machine down time were often by-products of ineffective initial training provided to new employees. Too often a new machine operator, in the midst of frustration, left the company and became a turnover statistic.

The production division, led by Bob Merkle, was concerned about the approach to training and wanted some changes. The human resources manager, Jim Gates, thought that a separate area for training was needed along with a comprehensive training program. In an initial conversation, Merkle concluded that a structured training program taught by an experienced instructor away from the pressures of production should reduce costs, increase productivity, and improve the training process. Jim Gates saw an excellent opportunity to make a significant impact with training, and he wanted to use the resources of the Ontario Training and Adjustment Board (OTAB).

Jim Gates and the Opportunity

A 10-year employee with Canadian Valve, Jim Gates had worked in production before taking on the job of human resource development manager. He understood the company's business and was anxious to help the company solve problems. He had earned an excellent reputation for producing effective programs and saw the comprehensive program to train new machine operators as an excellent opportunity to show the benefits of training and boost his own career opportunities at CVC. He was becoming convinced that if there was any area of training and development in which a cost-benefit analysis could be forecasted, it would be with the machine operator training and he was very interested in pursuing this project.

Bob Merkle and the Challenge

A task-oriented production manager with an engineering degree, Bob Merkle joined CVC as a management trainee 20 years earlier and progressed to vice president of production. Most of his job assignments were in the production area. He was very concerned about the bottom line and took great pride in his cost-control methods and strategies to improve efficiency.

In all his years in production, Merkle was never completely convinced that training was worth the time and effort. He had supported it primarily because the president had a strong commitment to training and development. Although his employees had always participated in programs, both on and off the job, he was skeptical of the results they produced. He felt training was best accomplished on the job by the immediate supervisor.

In recent months, however, his own production supervisors had complained about the approach to training new machine operators and the problems that new recruits created for the various departments. The production supervisors wanted to hire experienced operators and often could not understand why they were not available. The employment office had tried unsuccessfully to find experienced machine operators, using a variety of recruiting strategies. The production departments had to settle with unstructured on-the-job training with inexperienced operators.

Gates had initially approached Bob Merkle about the idea of a separate training area utilizing off-the-job training. On a pilot basis, they borrowed a production machine from one department and prepared it for training. A relief supervisor was assigned the task of training new recruits. Gates and the supervisors were pleased with the experimental effort and the reaction from the union was positive. Consequently, they took the proposal to Merkle to consider establishing a comprehensive training program.

The Project

After listening to the initial proposal from Gates, Merkle seemed to be interested in pursuing the process. Finally he said to Gates, “Jim, prepare a detailed analysis of the savings that this new approach to training would generate. Contact the Ontario Training and Adjustment Board to see if funding assistance is available to help with this type of program. Be sure to include a labor representative on your team. Calculate the benefits of this approach in terms of an expected return-on-investment. Based on the analysis we will go forward with it.” Merkle knew the president would support the project if the payback were sufficient.

Gates was pleased with the assignment and added, "This is an excellent project. We know we can deliver a top-notch training program that we all can be proud of, and one that will bring significant improvements. With the help of OTAB, we will complete the task and have the full proposal in two weeks." Gates assembled a task force to work on the project.

A major issue in developing the program was the question of where the training should take place. The task force concluded that training should take place out of the production environment where the trainee could learn under the close supervision of a professional instructor who was experienced with all the machines. As a result, Gates explored the possibility of locating a separate area in a remote section of the main production area. In his view, this assignment had three major tasks:

1. Develop a complete training plan detailing the type of training program duration, training outlines, training structure, and training organization.
2. Design a preliminary layout of the area planned for training and determine how to procure machines for training.
3. Estimate the expected benefits and costs for the proposed program.

Although challenging, the tasks were feasible and could be completed in about two weeks. Gates was very excited about this opportunity.

John McIntosh

Gates contacted John McIntosh, a consultant for the Ontario Skills Development Office (OSDO), who was assigned to a local college near Canadian Valve's main location. McIntosh provides training and development consulting services to local clients from this location. Having worked in a variety of training and manufacturing companies before joining the ODSO program, he is always eager to help his clients with training plans. Because of the sheer number of clients, however, he was limited with the amount of time he could spend with them to develop a cost-benefit analysis (CBA).

PROGRAM RESULTS

Although small in scale, the experimental pilot project revealed surprising results. Trainees were able to reach target levels of productivity much faster than expected, and their error rates were much lower than anticipated. In addition, the trainees seemed to be more satisfied with their jobs. In a

brief meeting with McIntosh, Gates and his staff identified several areas for potential cost savings. Most of these were developed after an analysis of the performance of the employees in the pilot training program when compared to the performance of the employees who had not participated in the training. Gates and McIntosh decided that they would drive the project evaluation with several important performance improvement measures. Other benefits could be identified as additional reasons for moving forward with the project. The expected improvements in productivity, scrap rates, safety, and maintenance expense. Other benefits were not so obvious. Previously, trainees had become frustrated when supervisors did not have time to work with them on a one-on-one basis to develop skills. The frustration led to a turnover statistic. The following performance measures were isolated:

- Reduction in time to reach a standard proficiency level (training time)
- Improvement in the scrap rate for new employees
- Improvement in the employee safety record (first-aid injuries)
- Reduction in equipment maintenance expense
- Reduction in turnover of new employees

These tangible benefits were to be used in the analysis. Gates and McIntosh could see other benefits. Low tolerance production could be performed in the training area as practice work for the trainees. Limited small-scale research and development projects could also be performed there. Although these benefits would be monitored, there would be no attempt to place a monetary value on them. They would be listed as intangible benefits.

Employees in training make mistakes and sometimes do not meet with friendly responses from their supervisors, so they were always frustrated during their initial stages of employment. This training program, if implemented properly, should improve employee satisfaction and engagement. Another benefit was improved absenteeism. When employees are frustrated and having difficulty on a job, they sometimes remove themselves from the frustration and take a day off. The anxiety or frustration may cause problems, leaving employees thinking they are actually sick when they are not. Finally, another advantage is a reduction in training responsibility for supervisors. With an influx of new employees in the shop, many supervisors have complained that they do not have time to train them. Consequently, they neglect other duties. This new approach to training

should free supervisors to perform what they do best—plan and coordinate the work of machine operators and keep them motivated. Because of the difficulty of measuring these additional intangible benefits, Gates decided not to use them in calculations of cost savings. Instead, he would rely on the improvements in the five tangible measurement factors listed earlier.

Converting Data to Monetary Values

One of the most difficult tasks in completing an ROI evaluation is estimating the expected benefits from the program. This calculation is more difficult to do than a post-program evaluation, where the results can be compared to a before-and-after situation. With this assignment, Gates had to estimate the benefits, relying on two sources of information. First, the pilot program, which was conducted quickly, presented some measurable improvements, and this information was used in each of the five tangible benefit areas. As part of the analysis of the pilot results, Gates asked the relief supervisor, who was responsible for the training, and his department manager if there had been other factors that had contributed to the results. The answer was negative.

Next, Gates and McIntosh consulted production supervisors who were involved in early discussions of the concept of the program. In a focus group format, they discussed the benefits of the new approach to training and provided estimates of the extent of potential improvements When combined, these two approaches formed the basis for estimating the potential improvements that would be related directly to the new approach to training.

Training Time

As a standard practice, supervisors recorded the production shortfall with new employees until they reached the standard rate for a machine. These losses were essentially lost production as a result of trainees taking time allowed to learn to operate a machine at a standard rate. Company records indicated that more than $65,000 was charged to trainee losses in the machining areas during the previous year. The pilot program showed a 64 percent reduction, and the supervisors estimated that trainee losses could be reduced by 50 percent with a structured training program in a separate area. The lower value was used, resulting in a projected savings of $33,000.

(Note that all dollars are in Canadian funds.)

Turnover

The turnover rate in the machining area was eight employees per month. Because of the smaller numbers of employees involved in the brief pilot program, there was no turnover. Because of this short period, turnover reduction data were inconclusive. The supervisors felt that a significant percentage of the overall turnover was directly related to ineffective or insufficient training, or both, and they estimated that a new approach to training could reduce this turnover rate by at least 30 percent. This value was used in the analysis. The turnover of eight employees per month translates to 96 employees per year. The estimated cost to recruit and train a new employee was $4,000, representing a total annual cost of $384,000. A 30 percent savings would be $115,200.

This estimate was considered conservative. The $4,000 cost to recruit, employ, and train a new employee includes unproductive time in the first week of employment. On average, new employees who left the company during the training program worked longer than one week. Therefore, the cost to the company was probably greater than $4,000, because some lost production occurred after the first week

Safety

Most accidents in the machining area were not lost-time injuries, but were first-aid injuries treated in the company's medical facility. First-aid injuries were used in the analysis. The pilot program reflected a 25 percent reduction. The supervisors estimated that accidents could be reduced by 30 percent with an effective training program that emphasized safety practices. The number of first-aid injuries in the machining area was 86 the previous year, with the majority of them involving new employees. The total cost of these accidents (including outside medical costs, workers' compensation, and first aid) was $57,000. The 25 percent value resulted in an annual savings of $14,250. The 30 percent value is $17,000. The lower value was used.

Maintenance Expense

Effective training of new employees should result in reduced maintenance on production machines. A part of the current, unscheduled machine

downtime is caused by new employees improperly operating equipment during their training period. The pilot program showed a dramatic reduction of 45 percent. However, the supervisors estimated that the unscheduled maintenance expense could be reduced by 10 percent each year with the implementation of the training program. The lower value was used. Last year, the unscheduled maintenance costs for the machining areas were $975,000. The annual savings would be $97,500. This estimate was considered very conservative.

Savings Summary

The total projected annual savings are as follows:

	Pilot Results ($)	Supervisor Estimate ($)
Training time	41,600	33,000 √
Machining scrap	76,500	45,000 √
Turnover	N/A	115,200 √
Accidents	14,250	17,100 √
Maintenance expense	438,750	97,500 √
Total	$571,100	$304,950

The values with the check (√) were used in the benefits calculation, resulting in a total of $304,950. To ensure that top management bought into the process, Gates and McIntosh reviewed the benefits analysis and the assumptions, including the logic, with all the supervisors and the managers in the machining area and with the accounting manager. Collectively, they felt the estimates were conservative and supported the projected savings.

Program Costs

The cost for the proposed program involved the acquisition of the necessary equipment, the salaries and expenses of two instructors, and the additional administrative overhead expenses connected with the training program. The most efficient approach was to use space in a remote, currently unused part of the plant. A nominal rent of $10,000 per year was to be charged to the project. The initial program development cost was estimated to be $15,000. This amount was spread over two years. The equipment cost less than expected. Most of the equipment planned for the new facility was

surplus from the production line that was modified and reconditioned for use in training. The total equipment cost was estimated at $95,000. This figure included $7,000 initial installation expenses. The cost included the equipment for staffing two cubicles for the instructors and providing them with various training aids, including audiovisual. This investment was prorated over a five-year period. The salaries of two instructors plus benefits and expenses were estimated to be $80,000 per year. The overhead costs, which include normal maintenance, were estimated to be $15,000 each year.

The total annualized costs are as follows:

Equipment (prorated)	$19,000
Space (rental)	10,000
Program development (prorated)	7,500
Instructors	80,000
Maintenance	15,000
	$131,500

Although there may be other costs, Gates and McIntosh thought that these were the most significant ones and covered what would be necessary in the proposal. As with the benefits, cost figures were reviewed with production managers as well as the finance and accounting staffs to ensure complete support for the numbers. With minor adjustments, they were ready to move forward and calculate the return.

As part of the funding assistance available from OTAB, a reimbursement of one-third of the development costs and instructor costs was available. However, to ensure that the costs are fully loaded, this reimbursement was not considered in the analysis.

Calculating the Expected Return on Investment

A comparison of costs with the savings yields the following calculations. The benefit-cost ratio (BCR) is:

$$\text{BCR} = \frac{\$304,950}{\$131,500} = 2.32$$

The first-year net savings are as follows:

Annual gross savings	$304,950
Less program costs	131,950
Net savings	173,450

The expected ROI for the first year is:

$$ROI = \frac{\$173,450}{\$131,500} \times 100 = 132\%$$

The investment in the equipment and the program development was spread over several years (five years and two years, respectively). This approach assumes a useful life of five years for the building, equipment, and program development.

This estimate of BCR and ROI seemed to be a little high but was expected in this case. Gates attributed high value of this ratio to the following reasons:

- The equipment costs were low, using the salvage value plus costs for reconditioning. New equipment would cost much more but have a longer useful life.
- There was no additional investment in a new facility, which would have added to the start-up costs.

However, several items make a case for the BCR and the ROI to be undervalued:

- The cost savings were probably understated because the lower value was used when two values were available. Pilot program results were usually greater.
- The reimbursement of a portion of the costs from OTAB was not considered in the analysis. Thus, the actual project costs are overstated.
- The potential monetary benefits from the intangible measures could add to the cost savings.

Presentation of Results

With calculations developed, the project was ready for presentation. The training program details had been designed with input from production supervisors and the training staff. Both Gates and McIntosh contributed to the final arrangement for the proposal. The engineering department assisted in the layout and workflow. Gates set up a meeting with Merkle and the production managers and presented the proposal in the following order:

- Program design
- Equipment procurement and layout
- Program benefits
- Costs
- Expected return-on-investment and cost-benefit analysis
- Intangible benefits

Although there were a few questions, the methodology, assumptions, and calculation were fully supported. The managers were particularly impressed with the conservative approach used in the analysis and the involvement of the supervisors. The project was approved in the meeting.

As Gates left the meeting, he felt a great sense of accomplishment in demonstrating the potential benefits of training on a forecasted basis. He knew that now the challenge was up to his group to show that the project would realize the benefits forcasted. He would use a comprehensive measurement system to track the performance measures used to estimate cost savings and would report on results in six months.

Questions for Discussion

1. How credible is the process? Explain.
2. Without the information from the pilot program, would the ROI be credible? Explain.
3. How would you critique the methods used in converting data to monetary values?
4. An important part of any ROI calculation is to account for other factors that may influence output measures. How is this issue addressed in this case?

5. Are projected program costs reasonable? Explain.
6. How realistic are the values for BCR and ROI. Explain.
7. How helpful is the role of OTAB in this process?
8. How important are the intangible benefits? Could other intangible benefits be identified? Should they be converted to monetary benefits?