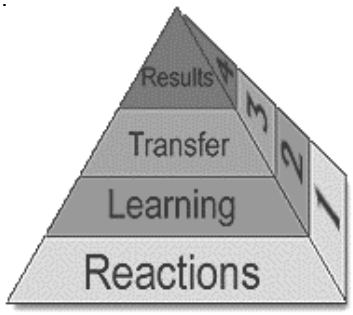
LESSON 29
METHODS OF EVALUATION

Kirkpatrick's Four Levels of Evaluation

Assessing Training Effectiveness

Often entails using the four-level model developed by Donald Kirkpatrick (1994). According to this model, evaluation should always begin with level one, and then, as time and budget allows, should move sequentially through levels two, three, and four. Information from each prior level serves as a base for the next level's evaluation. Thus, each successive level represents a more precise measure of the effectiveness of the training program, but at the same time requires a more rigorous and time-consuming analysis.



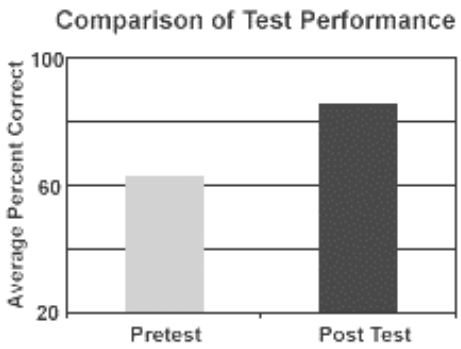
In Kirkpatrick's four-level model, each successive evaluation level is built on information provided by the lower level

Level 1 Evaluation - Reactions

Just as the word implies, evaluation at this level measures how participants in a training program react to it. It attempts to answer questions regarding the participants' perceptions - Did they like it? Was the material relevant to their work? This type of evaluation is often called a "smilesheet." According to Kirkpatrick, every program should at least be evaluated at this level to provide for the improvement of a training program. In addition, the participants' reactions have important consequences for learning (level two). Although a positive reaction does not guarantee learning, a negative reaction almost certainly reduces its possibility.

Level 2 Evaluation - Learning

Assessing at this level moves the evaluation beyond learner satisfaction and attempts to assess the extent students have advanced in skills, knowledge, or attitude. Measurement at this level is more difficult and laborious than level one. Methods range from formal to informal testing to team assessment and self-assessment. If possible, participants take the test or assessment before the training (pretest) and after training (post test) to determine the amount of learning that has occurred.



To assess the amount of learning that has occurred due to a training program, level two evaluations often use tests conducted before training (pretest) and after training (post test).

Level 3 Evaluation - Transfer

This level measures the transfer that has occurred in learners' behavior due to the training program. Evaluating at this level attempts to answer the question - Are the newly acquired skills, knowledge, or attitude being used in the everyday environment of the learner? For many trainers this level represents the truest assessment of a program's effectiveness. However, measuring at this level is difficult as it is often impossible to predict when the change in behavior will occur, and thus requires important decisions in terms of when to evaluate, how often to evaluate, and how to evaluate.

Level 4 Evaluation- Results

Frequently thought of as the bottom line, this level measures the success of the program in terms that managers and executives can understand -increased production, improved quality, decreased costs, reduced frequency of accidents, increased sales, and even higher profits or return on investment. From a business and organizational perspective, this is the overall reason for a training program, yet level four results are not typically addressed. Determining results in financial terms is difficult to measure, and is hard to link directly with training.

Level four evaluation attempts to assess training in terms of business results. In this case, sales transactions improved steadily after training for sales staff occurred in April 1997.

Methods for Long-Term Evaluation

- Send post-training surveys
- Offer ongoing, sequenced training and coaching over a period of time
- Conduct follow-up needs assessment
- Check metrics (e.g., scrap, re-work, errors, etc.) to measure if participants achieved training objectives
- Interview trainees and their managers, or their customer groups (e.g., patients, other departmental staff)

The Four Levels of Training Evaluation
(The Kirkpatrick Model)

Level	Definition	Advantages	Disadvantages
Level 1 - "Reaction"	Measures trainees' opinions about the course. This Is the most common way to evaluate student reaction to the course and provides a measure of immediate customer satisfaction with content, delivery, and environmental factors. Often referred to as "Smile Sheets."	Low cost and easy to administer. Provides insights to participant's personal feelings about the course. Provides quick feedback on successes and failures to the training provider.	Only reflects a quick reading of the participant while they are still in the class. Results should not be used as a solid basis for changing the educational content or strategy
Level 2 - "Learning"	Measures how well participants have mastered the course objectives. Can include tests of performance immediately before and after the course.	Compared to level 1, this provides more compelling evidence of whether the training program works.	Requires more time and money than level 1. Also requires greater insight to the evaluation process to develop valid measures of learning.
Level 3 - "Behavior"	Assesses practical value of training. Measures how well the knowledge, skills, and/or values from the course are used in the job. Typically measured 3-6 months after the course.	Provides stronger evidence that the investment in training yields the desired return. If designed properly, can also identify barriers and obstacles to improved performance.	Requires significantly more investment of time and money. Requires in-depth insight into performance interventions and root causes of performance deficiencies.
Level 4 - "Results"	Measures performance improvement, quality improvements, and cost savings to the organization. Measures the return on investment of the training course.	Provides strong evidence that training program has impact on organization. Addresses whether the performance is important to the organization's bottom line (e.g., production, safety, sales).	Substantial levels of investment and expertise are required to develop level 4. Often hard to decide whether or not this level is required. Linkage from training to org'1 results is hard to establish.

The Kirkpatrick Model of Training Evaluation

Donald Kirkpartick has been used since the late 1950s by the training community. The focus is on measuring four kinds of outcomes that should result from a highly effective training program.

I will discuss each of these steps in some detail, including how to design these evaluations.

Level 1—Reaction

Here your goal is to measure participants' reactions to the training program. You should measure their reactions immediately after the program. Level one evaluation should not just include reactions toward the overall program (e.g., Did you like the program?); it should also include measurement of participants' reactions or attitudes toward specific components of the program, such as the instructor, the topics, the presentation style, the schedule, audiovisuals, etc. Furthermore, each of these components can be further broken down into sub-components for evaluation (e.g., you can ask participants to evaluate specific characteristics of the instructor, the presentation, etc.). In short, level one evaluation is far more than just the measurement of overall customer satisfaction.

Learning (Level two outcomes) and transfer of learning (Level three outcomes) are unlikely to occur unless participants have positive attitudes toward the training program. Therefore, it is important to determine participants' reactions to the training program. Also, positive reactions are important because managers are more likely to eliminate unpopular training programs. Finally, the measurement of specific aspects of the training program can provide important information about what aspects of the training program can be improved in the future.

Level 1 evaluation relies on the measurement of attitudes, usually through the use of a questionnaire. It is important to include closed-ended items (including rating scales) as well as open-ended items on your questionnaire. Here are two open-ended items that I like:

- In your view, what were the three most important weaknesses of the program?
- In your view, what were the three most important strengths of the program?

It is important to learn the weaknesses, as well as the strengths, in order to improve a program. Do not be afraid to ask about program weaknesses!

When having participants fill out questionnaires, it is best not to have them put their names on the instruments because of the advantages of anonymity over confidentiality. If they do not put their names on the instruments, you can assure anonymity and they may be more likely to be more honest in their answers.

The level one questionnaires shown in Exhibit 4.3 and 4.4 are acceptable. The main changes I suggest are to put "neutral" rather than "agree" in the center of the 8-point rating scale used in the Exhibit 4.3 rating scale (actually, I'd probably recommend using a five-point rating scale) and include open-ended items about the program strengths and weaknesses. I don't recommend the questionnaires shown in Exhibits 4.1, 4.2, or 4.5.

The following point applies to all four levels of Kirkpartick's outcome evaluation, but I will only state it here: Evaluators should establish performance standards on the outcomes, when possible, so that the four steps in the logic of evaluation can be utilized and evaluative judgments can be made. Also, don't forget Kirkpatrick's last piece of advice to communicate the results because utilization of evaluation results will not happen without dissemination and communication.

Here are a few advantages of level one evaluation:

- You will know how the participants felt about the training event.
- It may point out content areas that trainees felt were missing from the training event.
- It will tell you how engaged the participants felt by the training event.
- It can provide information about overall participant reaction as well as participant feedback and evaluation of specific aspects of the training event.
- Detailed level one evaluation can provide formative evaluation information that can be used to improve future versions of the training program (e.g., you can fix the things the participants disliked about the program and add the things they felt was missing).

Level 2—Learning

Here your goal is to determine what the training program participants learned during the training event. Because the training instructor should have specific learning objectives, one hopes to find clear learning outcomes. Learning outcomes can include changes in knowledge (e.g., What are the key differences between Windows 95 and Windows ME?), skills (Can the participant upload a new operating system to a computer), or attitudes (Have participants' attitudes toward computers improved?). Some training events will emphasize knowledge, some will emphasize skills, some will emphasize attitudes, and some will emphasize multiple learning outcomes. The evaluation should focus on measuring what was covered in the training event (i.e., the learning objectives).

Level two evaluation should be done immediately after the training event to determine if participants gained the knowledge, skills, or attitudes. A couple of issues here are (a) how shall one measure knowledge, skills, and attitudes, and (b) what research design should be use to demonstrate improvement in level two outcomes?

First, let's talk about the measurement of level two outcomes. Knowledge is typically measured using already available or instructor constructed ***achievement tests*** (i.e., tests designed to measure the degree of learning that has taken place). In the training environment, these tests are usually criterion-referenced. Note that ***norm-referenced tests*** are traditional standardized tests that are constructed to maximize individual differences and to allow comparison of individuals to an external norming group. A normal curve often characterizes the performance distribution of the norming group. In contrast, ***criterion-referenced tests*** are constructed to determine whether learners have mastered one or more learning objectives and these tests include a cutoff point (pass/fail). The results of criterion-referenced tests often take the form of a negatively skewed curve, where the vast majority of the learners have reached or surpassed the criterion or cut-off point (i.e., the point at which one must reach in order to pass the test) and only a few learners have lower scores. In constructing a criterion-referenced test, you should develop a pool of items potentially measuring the content, have a panel of experts examine the items, pilot test the selected items, and analyze each item for item difficulty (i.e., the percentage of people who answer the item correctly), item discrimination (i.e., the high performers should be more likely to get the item correct than low performers if it is a good item), and distractor effectiveness (are the distractors working well?). Eliminate items with poor performance on difficulty (i.e., items that are too hard or too simple), discrimination (i.e., items that the low/less knowledgeable performers are more likely to get correct than the high/knowledgeable performers), and items whose distractors do not work well (e.g., an item where all incorrect responses are for only one distractor). Note Kirkpatrick's brief example of a knowledge test on page 44.

Skills typically require some kind of motor or manual response on the examinee's part, or some kind of manipulation; therefore, a ***performance test*** is used. A performance test is just a test that requires the test taker to create a product or demonstrate a process. Obviously the goal is to determine whether each person can perform the skills they have been taught in the training event. For example, if the learning objective was to learn to make repairs to computers, a performance test would be required to determine whether a person can install a power supply or a computer chip in a computer. If the learning objective was to learn how to make effective public speeches, the participants would need to be evaluated on actual speeches that they give to the group. Some performance elements can be included on traditional paper-and-pencil tests (e.g., essay writing, drawing skills, etc.). In the training environment, performance tests are likely to be criterion-referenced (i.e., participants' scores are compared to a cutoff point).

Attitudes are measured with questionnaires similar to the questionnaires described for level one evaluation. You will typically have the participants give their ratings for various items (responding with Strongly Agree, Agree, Neutral, Disagree, or Strongly Disagree or with other rating scales), and you should include some open-ended items to allow participants to respond in their own words (e.g., How do you feel about diversity in the workplace?).

Second, Kirkpartick also briefly discusses the issue of research design. He suggests that you include a control group in your design when possible, and he briefly mentions using a pretest measure when possible.

To give you a better idea of the design issues here, I will review several experimental research designs. For more information on these designs, go to Johnson/Christensen's Educational Research and/or read about them in the lectures on the homepage for our textbook (at http://www.coe.usouthal.edu/bset/Faculty/BJohnson/Homepage/Supporting/textbook.htm)

Visual Depiction of the Design	Design Name
X O_2 O_4	Posttest-only nonequivalent control group design
O_1 X O_2	One-group pretest-posttest design
O_1 X O_2 O_3 O_4	Pretest-posttest nonequivalent control group design
R O_1 X O_2 R O_3 O_4	Randomized pretest-posttest control group design (Note: this design has random assignment to groups)
O_1 O_2 O_3 O_4 X O_5 O_6 O_7 O_8	Interrupted time-series design

Here is the basic logic of analysis for each of the designs just listed. The counterfactual, discussed in an earlier lecture, is estimated slightly differently in some of these designs, which

means that the comparison may be different from design to design. Generally, you will check each of the following comparisons for practical significance.

- For the posttest-only nonequivalent control group design you compare the two posttest means (i.e., O_2 with O_4)
- For the one-group pretest-posttest design you compare the pretest mean with the posttest mean (i.e., O_2 with O_1)
- For the pretest-posttest nonequivalent control group design you compare the change in the experimental group (O_2 minus O_1) with the change in the control group (O_4 minus O_3)
- For the randomized pretest-posttest control group design you compare the change in the experimental group (O_2 minus O_1) with the change in the control group (O_4 minus O_3). The word "randomized" in the title of this design means that the participants must be randomly assigned to the groups, which "equates" the groups on extraneous variables.
- For the interrupted time-series design, you compare the baseline series results (O_1 O_2 O_3 O_4) with the experimental series results (O_5 O_6 O_7 O_8), looking for differences in slope and differences in level of outcome.

Note that the posttest-only nonequivalent control group design is by far the weakest of the designs shown above (because you have no idea what group differences existed before the intervention), and the strongest design is the randomized pretest-posttest control group design because the groups are formed through random assignment (which makes the groups probabilistically equal on all known and unknown extraneous variables).

With the above review of the commonly used research designs, Kirkpartick's discussion of designs should make a little more sense. Kirkpartick tends to take a very pragmatic stance toward design, claiming that one should use the best design possible, but, at the same time, one should also consider what is cost effective and practical to use in the organization undergoing evaluation. He believes that some data are virtually always better than no data at all.

Here are few advantages of level two evaluation:

- Demonstrating participant learning should help trainers in promoting their training program.
- Knowledge of level two evaluation can help in interpreting the results of level three evaluation (e.g., if level three results do not occur, it may because of workplace factors and not because of any flaw in the training program).
- Detailed level two evaluation can provide formative evaluation information that can be used to improve future versions of the training program (e.g., you may find certain learning objectives that are not being met).

Level 3—Behavior

Here your goal is to find out if training program participants change their on-the-job-behavior (OJB) as a result of their having attended and participated in the training program. If the behavior change does not occur, you also want to find out why the change did not occur. The level three question is, Did the training have a positive effect on job performance? Level three evaluation specifically involves measuring the **transfer** of knowledge, skills, and attitudes from the training context to the workplace.

Remember that level one and level two outcomes are still important because participants generally need to react positively to the training program (level 1 outcome) and they need to learn the material (level 2 outcome) if they are going to be motivated and able to apply what they have learned when they return to their jobs.

Learning is likely to transfer only if the conditions in the work setting are favorable for transfer. In addition, there are obviously many things that trainers can do to increase the likelihood of transfer. In other words, transfer is affected by "training factors" before trainees go back to their workplace as well as "workplace factors" that operate in their workplace when they return. Here are two sets of factors that make transfer more likely to occur:

A. These are some factors in the training program or event that can help facilitate transfer of learning:

- The training or learning environment or context or culture is made to be similar to the actual work environment or context or culture of the organization (this is called ***situated learning***). Learning that takes place in "authentic" contexts is more likely to by used later.
- Provide real world examples and actual experience performing and practicing the behaviors.
- Make sure trainees understand the general principles behind the behaviors (called "transfer through principles").
- Explain the importance and applicability of the future on-the-job behaviors (i.e., motivate the trainees)

B. These are some factors in the receiving organization that can help facilitate transfer of learning:

- The organizational culture and climate support change.
- The participant's direct supervisor and others with whom he or she works support and/or facilitate the participant's new behaviors through direct extrinsic rewards such as help, encouragement, praise, increased freedom and responsibility, pay increases, and recognition.
- The participant gains intrinsic reinforcement from applying his or her new knowledge, skills, or attitudes (i.e., he or she likes what was learned and enjoys performing the new related behaviors).
- The participant has the opportunity to use his or her new knowledge or skills on the job.

So how does one design a level three evaluation? Here are Kirkpartick's recommendations:

1. Use a control group if possible. That is, use the strongest design that is feasible.
2. Allow time for the behavior change to take place.
3. Evaluate both before and after the program if practical. Again, use the strongest design that is feasible.
4. Survey and/or interview one or more of the following: trainees, their immediate supervisor, their subordinates, and

others who often observe their behavior. The more the evidence, the better.

5. Get 100 percent response or a sampling.
6. Repeat the evaluation at appropriate times.
7. Consider cost versus benefits.

Level three is often harder than level one and level two evaluation because behavior changes at the workplace are often harder to measure than reaction and learning directly after the training event. You must give the behavior time to transfer and collect data at the workplace.

Probably the most common design used for level three evaluation is the one-group pretest-posttest design (i.e., get a baseline measure of the behavior you plan on training, train the participants, and then measure the participants' behavior again after the training). If you are able to include a control group, you will be able to use the pretest-posttest nonequivalent control group design (i.e., in addition to measuring the training participants before and after the training, you also find a set of similar people, who do not undergo training for the control group, and you measure these control group participants' behavior before and after the training program). Earlier (above) I showed the comparisons you make for the different designs during data analysis.

In the one-group pretest-posttest design the estimate of the counterfactual (i.e., what would have happened to the participants if they had not participated in the training) is the participants' pretest measure. In the pretest-posttest nonequivalent control group design, the estimate of the counterfactual is the change taking place in the control group. Remember: you want the change in the training group to be greater than the counterfactual change.

Note that it would be really nice to be able to use the randomized pretest-posttest control group design; however, usually, random assignment to the training and nontraining groups will not be feasible.

Kirkpartick also discusses another popular design for measuring transfer of learning (i.e., for measuring level three outcomes). He never labels the approach, but it is formally called the ***retrospective survey design***. He points out that you can survey (using questionnaires or interviews) the training participants, the participants' supervisors or managers, and the participants' subordinates. The design is called a "retrospective" design because you are asking the participants (or the others) to think back (i.e., in retrospect) to their behavior before the training program and then compare it to their current level of behavior, and, finally, to decide if the behavior has changed. You should ask for specific examples behavior changes. You can also use the retrospective survey design with the training participants' managers and subordinates, asking them if the participant's behavior has changed. The more corroboration you get across the different sources, the stronger the evidence of transfer.

The retrospective survey design is generally is a weaker design than the experimental designs discussed earlier because the actual pretest behavior is not measured directly. However, the retrospective survey can still provide useful and sometimes convincing data. Kirkpatrick speaks highly of the retrospective design, probably because it is so simple to carry out and because it tends to be cost effective (i.e., it doesn't cost a lot of money to administer questionnaires). Kirkpartick gives a couple of actual forms in Exhibit 6.1 (a retrospective interview) and Exhibit 6.2 (a retrospective questionnaire).

Here are a few advantages of level three evaluation:

- Provides measurement of actual behavior on the job, rather than only measuring or demonstrating positive reaction and/or learning. This is important because you want to have actual on-the-job results from the training program.
- Level three outcomes are required for level four outcomes (i.e., they are the intervening variables or factors that lead to level four outcomes); therefore, it is good news when level three outcomes are found.
- Most level three outcomes are intrinsically useful, even if level four outcomes (i.e., final organizational or business results) are never fully demonstrated (e.g., it is useful to have managers who are effective listeners and supportive, or employees who know how to do basic work on their computers, or employees who act respectfully toward employees from different ethnic or cultural groups).
- In many situations, evidence of level one outcomes, level two outcomes, and level three outcomes will be sufficient evidence of the merit and usefulness of a training program. This is especially true when all of these provide evidence of positive results of the training program.

Level 4—Results

Here your goal is to find out if the training program led to final results, especially business results that contribute to the "bottom line" (i.e., business profits). Level four outcomes are not limited return on training investment (ROI). Level four outcomes can include other major results that contribute to the well functioning of an organization. Level four includes any outcome that most people would agree is "good for the business." Level four outcomes are either changes in financial outcomes (such as positive ROI or increased profits) or changes in variables that should have a relatively direct effect on financial outcomes at some point in the future.

Here are some examples of different kinds of level four outcomes:

- Improved quality of work.
- Higher productivity.
- Reduction in turnover
- Reduction in scrap rate (i.e., less wasted resources).
- Improved quality of work life.
- Improved human relations (e.g., improved vertical and horizontal communication)
- Increased sales.
- Fewer grievances.
- Lower absenteeism.
- Higher worker morale.
- Fewer accidents.

- Greater job satisfaction.
- Increased profits.

Here are Kirkpartick's recommendations for level four evaluation:

1. Use a control group if practical. In other words, use the strongest experimental design that is feasible.
2. Allow time for results to be achieved. In other words, many level four outcomes will take some time to occur.
3. Measure both before and after the program if practical. Again, use the strongest experimental design that is feasible.
4. Repeat the measurement at appropriate times. Repeated measurement (e.g., using the time-series design) can provide data on the long term pattern of results.
5. Consider costs versus benefits. You may not want to perform a level four evaluation if the costs of that evaluation are high in comparison to the potential benefits or impacts of the training program.

Level four evaluation is difficult in the sense that it is quite difficult to establish firm evidence that a training program was the key or only source that produced the level four outcomes. For example, time has to elapse after the training program in order for these outcomes to occur. Other factors may also occur during that time period. Second, it is hard to isolate the effect of the training program because there are usually many additional causal variables operating on the level four outcome variables (i.e., the training event is just one of many potential causes). Level four outcomes are often more distal outcomes, rather than proximal outcomes of a training program. For these reasons, the evidence obtained from level four evaluation is usually weaker than the evidence obtained from lower level evaluations, especially levels one and two which are relatively easy to document.

For an example of distal, level four outcomes (increased productivity and profits) here is a potential outcome line that ends with the level four results:

Program →Reactions→ Learning →Behavior →Productivity →Increased profits.

Level four outcomes tend to fall far down outcome lines, which means that many intervening factors must take place in order for the level four outcomes to take place. This means that we should not be overly optimistic in expecting large level four outcomes from single training programs.

In general, we should try to develop an impact theory to help us to understand the operation of level four outcomes. If you really want a training program to have a positive level four outcome, it is probably wise to make the training program a component of a larger organizational performance program package that is designed to produce level four changes.

A common design for documenting level four outcomes is the interrupted time-series design, although the other experimental designs with control groups are also frequently called for, depending on the kinds of outcomes you want to measure. For example, some data are frequently recorded at regular intervals (sales, turnover, accidents) making these variables easy to measure over time forming time-series data (you just have to get these secondary data). Other level four results will be more difficult to obtain because pre-training data may not be available (e.g., data on worker morale, quality of work life, improved communication). If pre-training data are not routinely recorded, you will have to make sure the data are recorded at least once before the training event is implemented. If the data are recorded multiple times before the training event, the interrupted time-series design may be used. If data are recorded only once before the training event, the one group pretest-posttest design is possible, or, even better, the pretest-posttest nonequivalent control group design may be feasible.

Summary of the Kirkpatrick Model

Donald Kirkpatrick first proposed this four-pronged approach to evaluating training programs in his 1959 doctoral dissertation.

Since then, it has become so widely used, that trainers can typically talk about it in shorthand and understand the reference. For example, when one trainer says to another, "What are you doing about level IV?" the other knows that the first trainer wants to understand how the second evaluates the impact of training.

Level Name Issues Assessed at this Level

I. Reaction

Assesses participants' initial reactions to a course. This, in turn, offers insights into participants' satisfaction with a course, a perception of value. Trainers usually assess this through a survey, often called a "smiley sheet." Occasionally, trainers use focus groups and similar methods to receive more specific comments (called qualitative feedback) on the courses. According to the TRAINING magazine annual industry survey, almost 100 percent of all trainers perform "Level I" evaluation.

II. Learning

Assesses the amount of information that participants learned. Trainers usually assess this with a criterion-referenced test. The criteria are objectives for the course: statements developed before a course is developed that explicitly state the skills that participants should be able to perform after taking a course. Because the objectives are the requirements for the course, a Level II evaluation assesses conformance to requirements, or quality.

III. Transfer

Assesses the amount of material that participants actually use in everyday work 6 weeks to 6 months (perhaps longer) after taking the course. This assessment is based on the objectives of the course and assessed through tests, observations, surveys, and interviews with co-workers and supervisors. Like the Level II evaluation, Level III assesses the requirements of the course and can be viewed as a follow-on assessment of quality.

IV. Impact

Assesses the financial impact of the training course on the bottom line of the organization 6 months to 2 years after the course (the actual time varies depending on the context of the course).

For many reasons, Level IV is the most difficult level to measure. First, most training courses do not have explicitly

written business objectives, such as “this course should reduce support expenses by 20 percent.” Second, the methodology for assessing business impact is not yet refined. Some assess this measurement by tracking business measurements, others assess by observations, some by surveys, and still others assess by qualitative measures. Last, after six months or more, evaluators have difficulty solely attributing changed business results to training when changes in personnel, systems, and other factors might also have contributed to business performance.

Notes -