



Web-Based, Automated Evaluation for E-Learning

Accountability from Level 1 to ROI

- Frame the evaluation effort.
- Use a computer infrastructure to analyze e-learning evaluation data
- Report and sell results of e-learning in their own organizations.

Automated Web-Based Evaluation

Levels One to Five and Beyond



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Problems with High-Level Evaluation

What types of problems have you encountered conducting high-level evaluations?

Story

Seven Blindfolded People Meet an Elephant



Agenda

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 - ✓ **Formulate an evaluation framework.**
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- **Discussion.**

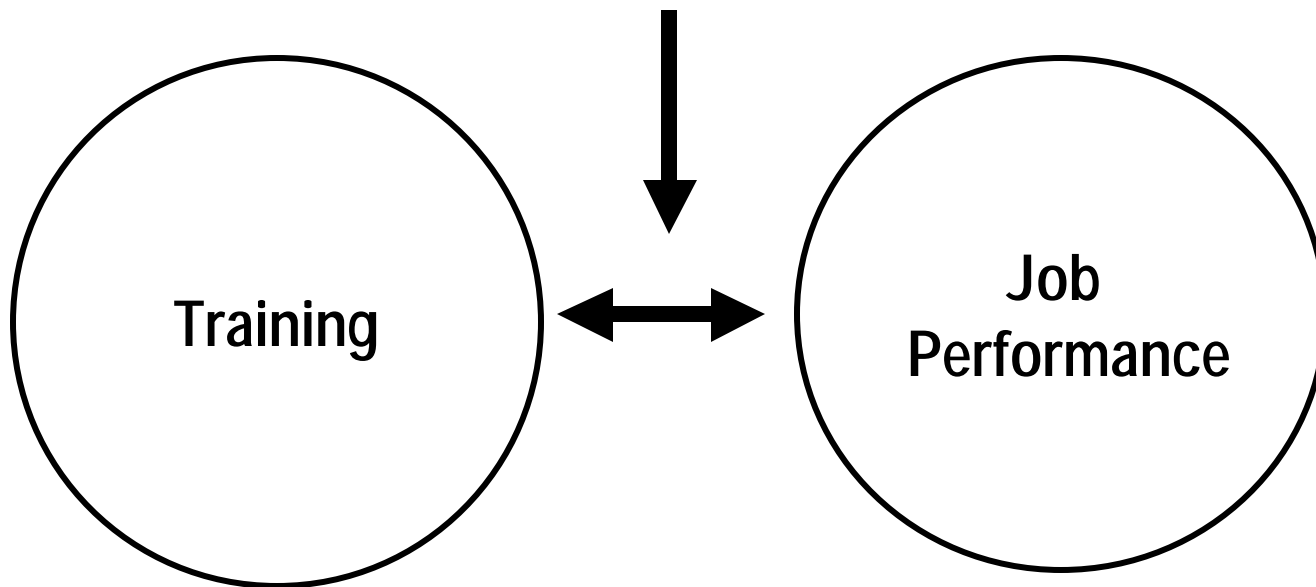
The Environment

**Businesses are getting back to basics:
profitability and execution. –HBR, 2001**



The Question

What do you want to know?



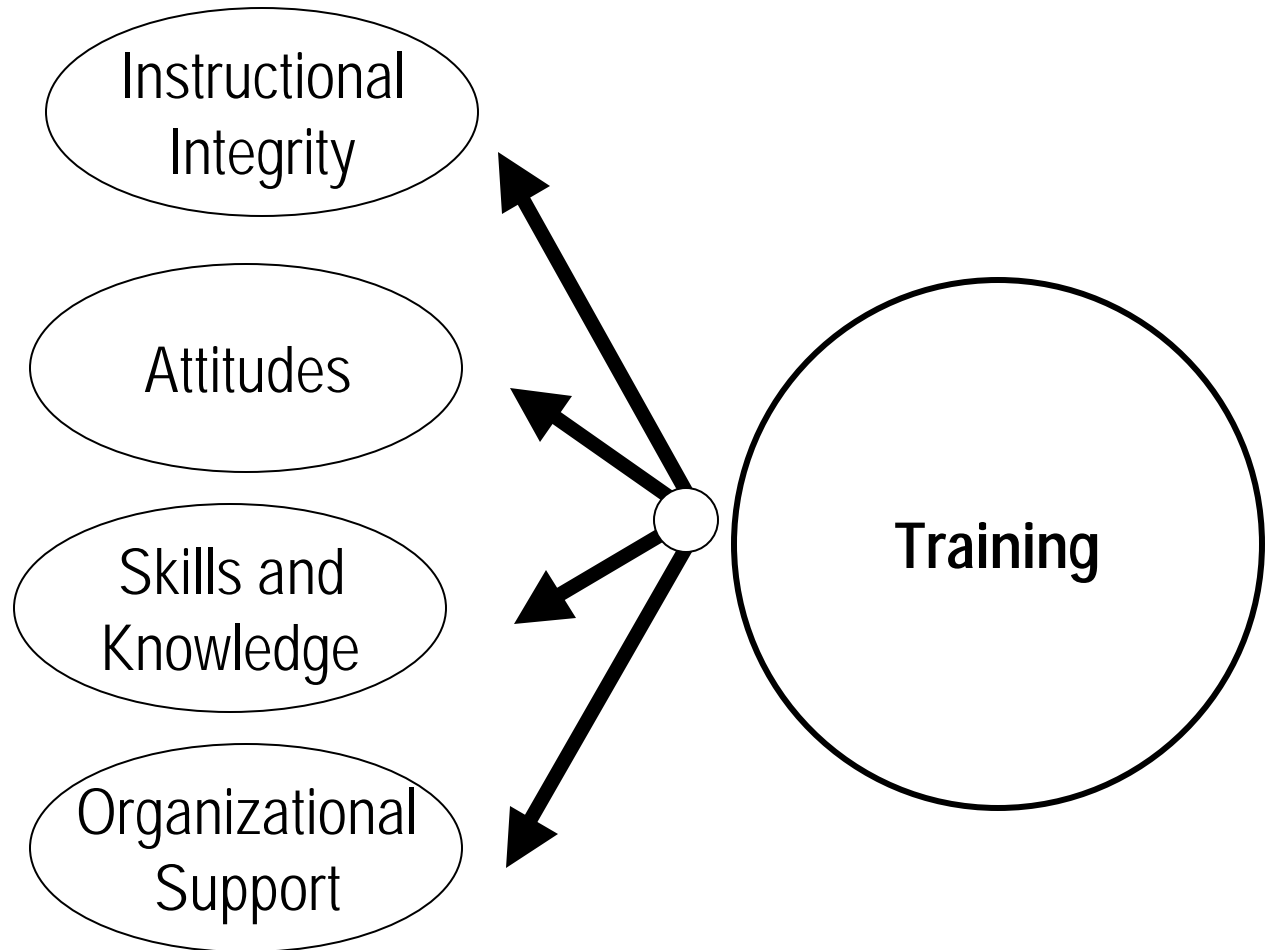
What is the relationship between training and subsequent job performance?

The Answer

It's all about TRANSFER.



Training Components



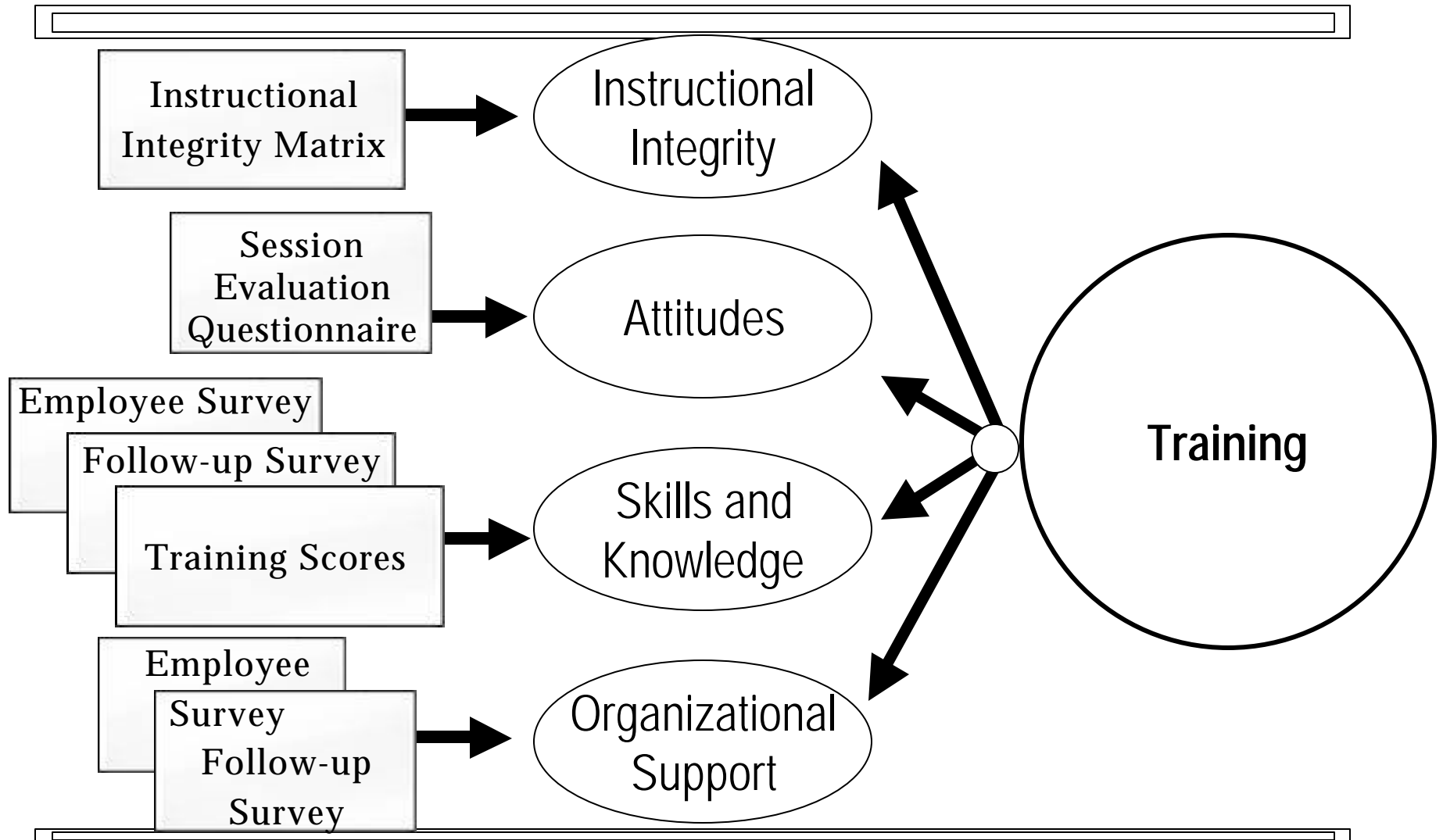
Why “Organizational Support?”

- **Information technology that aims to empower individuals by obliterating social organization ignores ways in which social context adds meaning to information.**

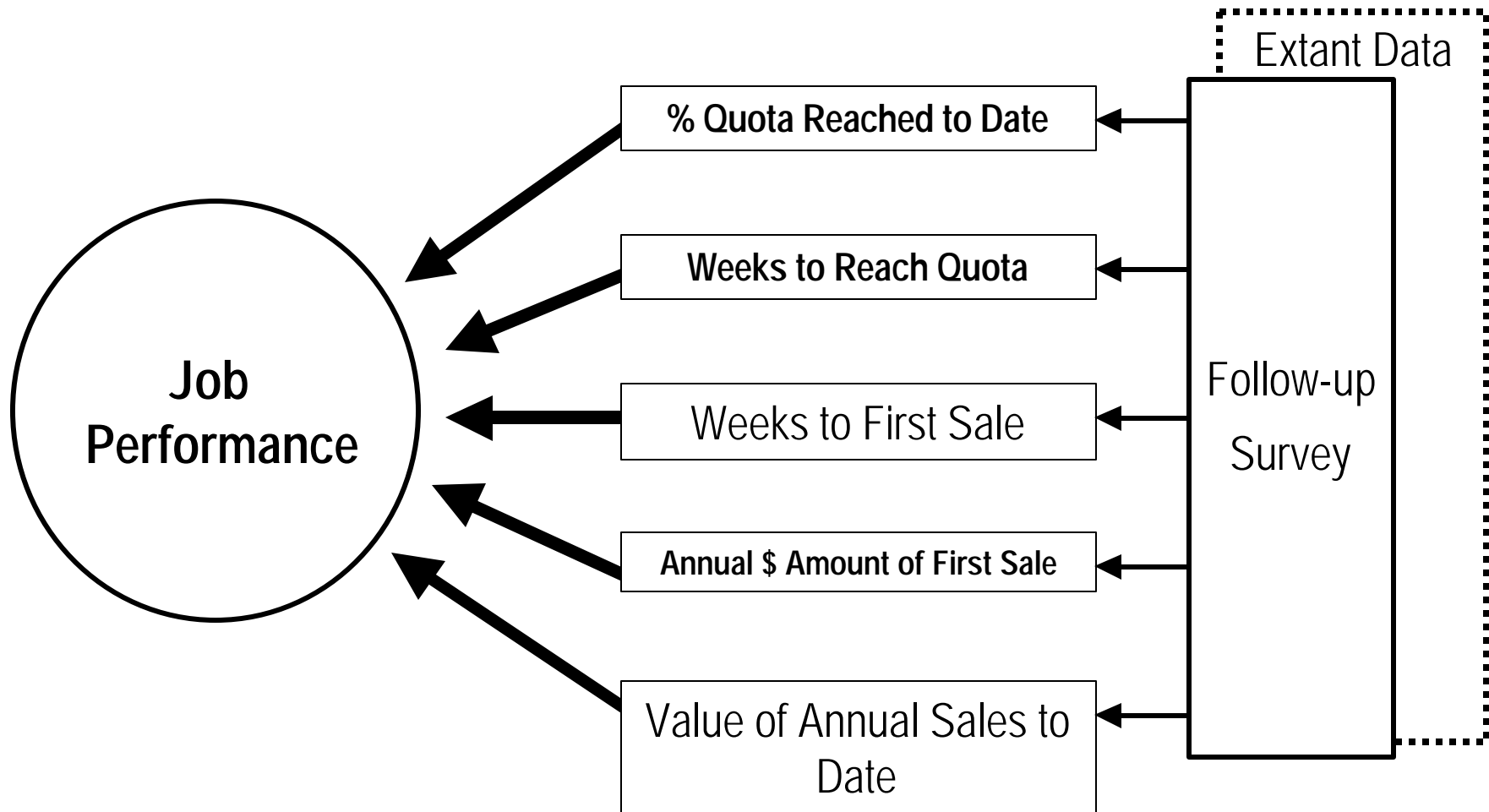
–Brown & Duguid, 2000

- **There is a tendency to largely ignore social networks, as well as the reciprocity and trustworthiness they require. –Putnam, 2000**

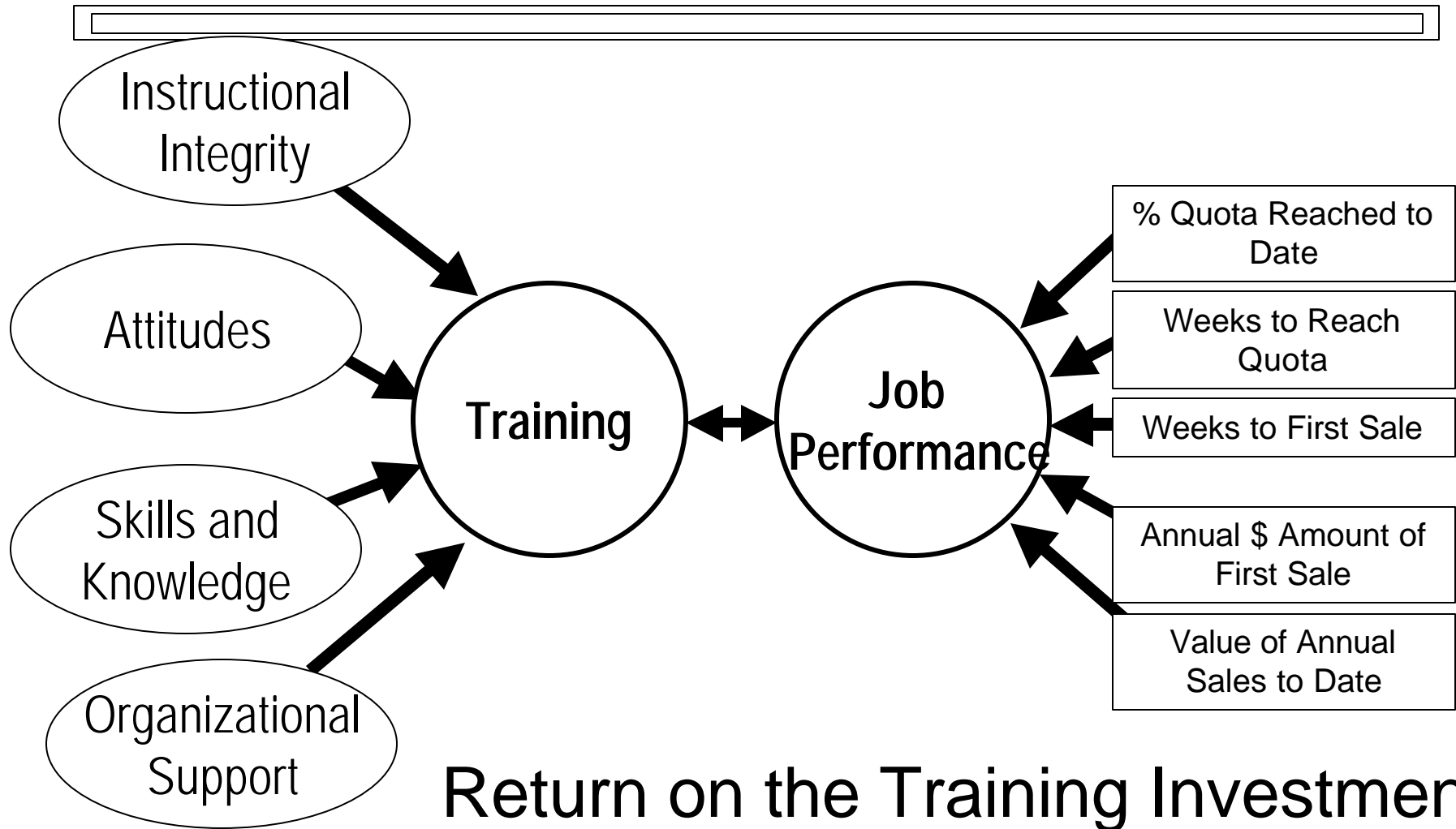
Training Measures



Job Performance Measures



A Systemic Evaluation Framework



Return on the Training Investment

Benefits of the Framework

Rigor

+ Flexibility

+ Extensibility

+ Improved data

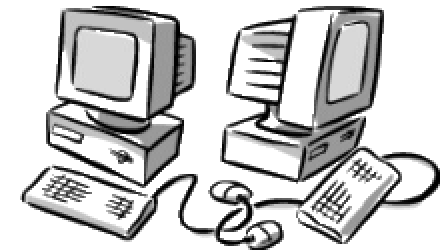
BETTER DECISIONS

Cost Efficiencies within the Framework

- **Web-based surveys.**



- **Automated computer-2-computer data collection scripts.**



- **Automated “grunt-level” data analysis and reporting.**



What We Learned about Frameworks

- **Make the framework modular.**
- **Build the framework incrementally and iteratively.**
- **Modify the framework based upon the data you collect.**
- **The framework should accommodate a broad range potential evaluation questions.**
- **Revisit the framework frequently.**

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Evaluation Matrix

Description

- **Equivalent of an evaluation design containing a detailed scope of work.**
- **Relates evaluation levels, questions, measures, data sources, and data analyses.**
- **Obtains stakeholder and client-side project management buy-in early in the process.**

Evaluation Matrix

The Tool

- Evaluation Question.
- Evaluation Level.
- What the Question Means.
- Measures Used to Answer the Question.
- Data Types.
- Data Collection Instrument(s).
- Unit of Analysis.
- Population Size.
- Sample Size.
- Data Source(s).
- Data Format(s).
- Statistical Test(s).

Types of Analyses

- **Exploratory factor analysis.**
- **Chi-square test of independence.**
- **Multiple linear regression.**
- **Univariate analysis of variance (ANOVA).**
- **Multivariate analysis of variance (MANOVA).**
- **Discriminant analysis.**
- **Structural equation modeling.**
- **Qualitative analysis of comments.**

Evaluation Matrix

Lessons Learned

- **Be specific.**
- **Try to use the appropriate data sources.**
 - **Use self-report data for attitudes.**
 - **Use extant data about performance.**
- **Work with others.**
 - **Line managers.**
 - **Statisticians/research designers.**
 - **Information technology.**
- **Obtain stakeholder signoff.**

Evaluation Matrix

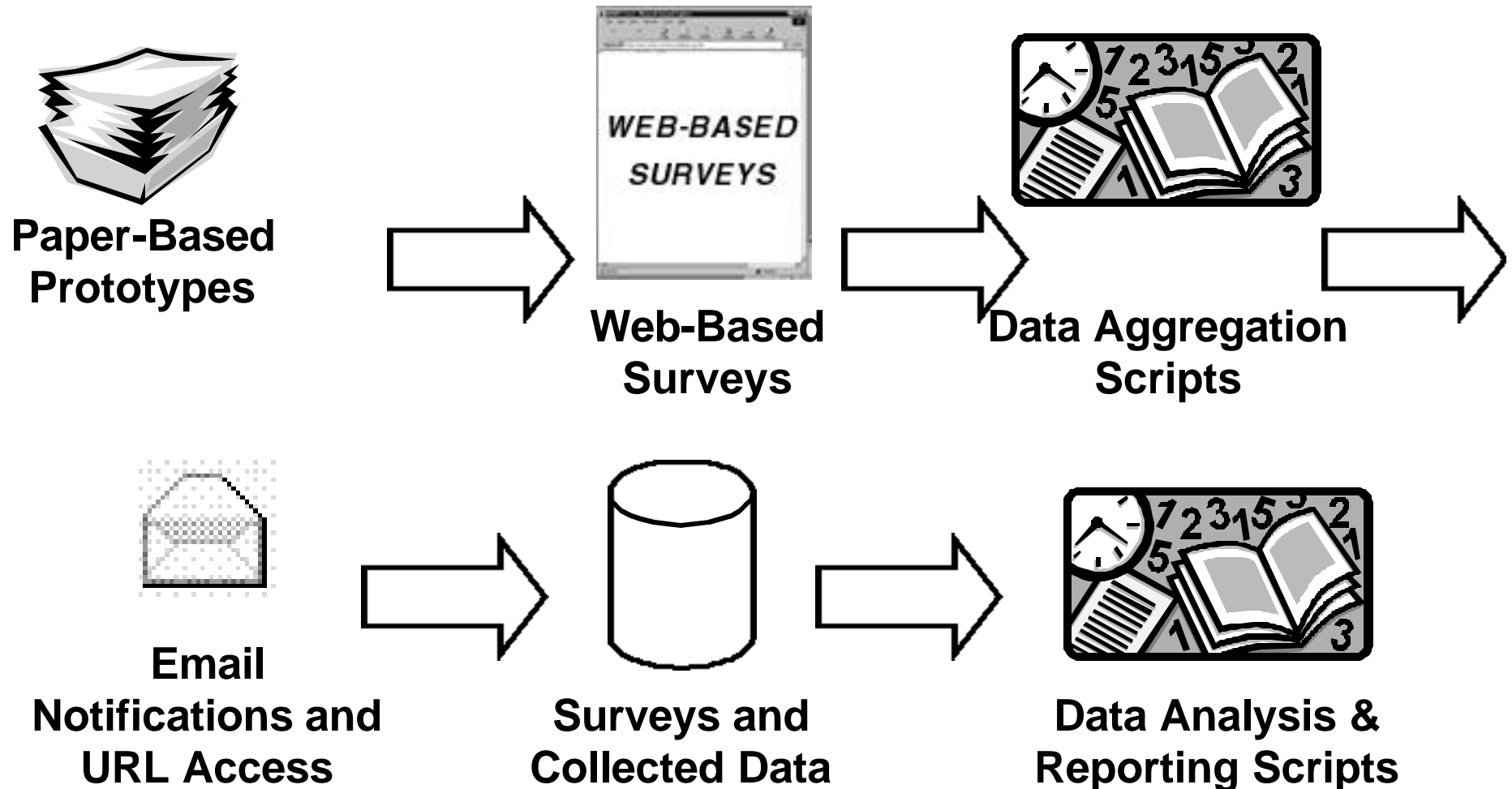
Lessons Learned (*continued*)

- **Matrices aren't fun, but they are necessary.**
- **Matrices are live, iterative documents.**

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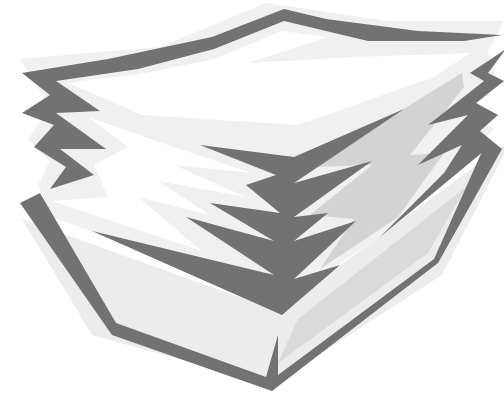
Automated, Web-Based Training Evaluation



Create Paper-Based Survey Prototypes

- **Prototype 1 (Client Deliverable)**
 - **Instructions, anonymity message**
 - **Topics**
 - **Items**
 - **Rating scales**

- **Prototype 2 (Internal Deliverable)**
 - **Survey topics**
 - **Items**
 - **Rating scales**
 - **Variable name**
 - **Variable type (nominal, scaled, text)**
 - **Variable labels**



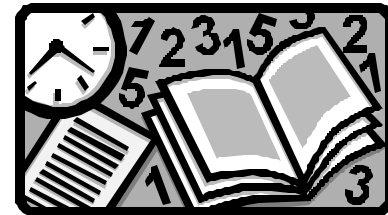
Create Web-Based Surveys

- Create HTML style sheet.
- Copy and paste items into DreamWeaver.
- Copy and paste variable names and values.
- Specify branching logic.
- Test HTML displays in Netscape and IE.



Aggregate the Data

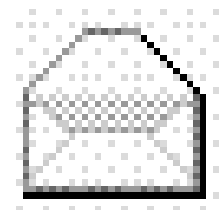
- **Model the data.**
- **Build the relational database.**
- **Code the ASP scripts that post data to the SQL server.**
- **Test the web pages, scripts, logic, and database.**
 - **Specify inputs.**
 - **Printout before submitting survey.**
 - **Compare responses.**



Provide URL and Email Access

- **Provide URL access to people in classrooms.**
 - **Collect Level 1 data.**
 - **Collect email addresses.**

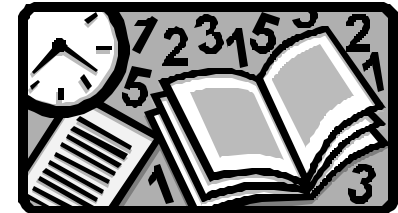
- **Provide email access to participants who have returned to their jobs.**
 - **VB scripts.**
 - **Initial survey invitations.**
 - **Collect level 3 and 4 data.**
 - **Reminders.**
 - **Sent from sponsor.**



Analyze and Report Data

ASP scripts:

- **Generate descriptive data.**
- **Write data to to MS-Word report templates.**
 - **Final drafts of frequent, descriptive reports.**
 - **Rough drafts of infrequent reports.**



Evaluation Infrastructure

Lessons Learned

- **Prototype what you want. Then investigate off-the-shelf survey solutions.**
- **Automate tasks that are manually intensive and repetitive.**
- **Make sure the manual process is solid before you automate it.**
- **Make sure you can justify the cost of any automation.**

Evaluation Infrastructure

What We Learned (*continued*)

- **Focus on priorities, not niceties.**
- **Work iteratively.**
- **Match report formats to what stakeholders (and their managers) want to see.**

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Level 1 Results

Session Evaluation Questionnaires (SEQs)

- Instrument based on sound theory (self-efficacy, cognitive load, quality).
- Responses are related in expected ways.
- Participants like their training.
 - Median = “5” for 11 of 14 scaled items.
- Beginning work to aggregate quarterly and annually.
 - Quantitative analysis.
 - Qualitative analysis.

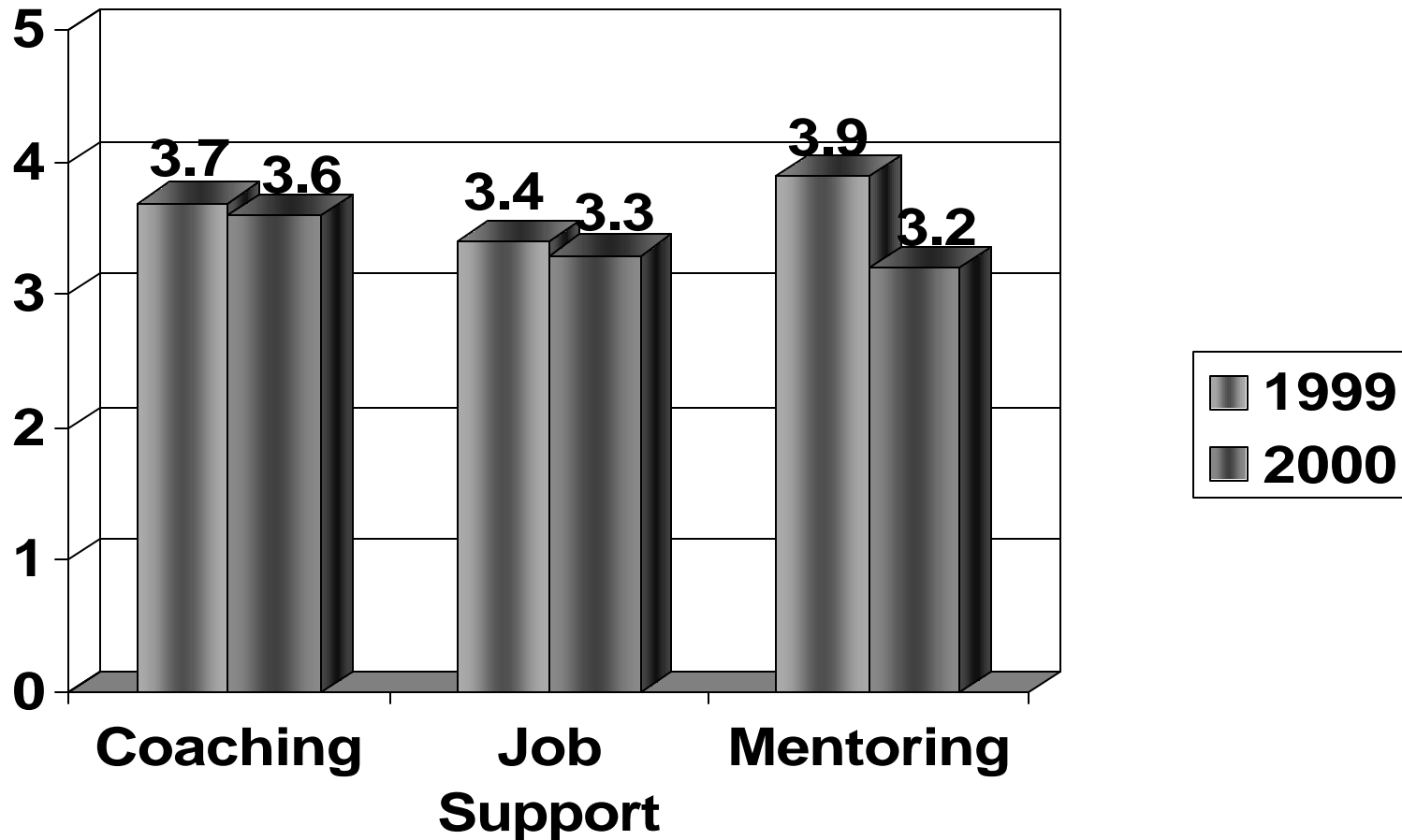
Level 2 Results

Test Scores

- **Courses have been revamped, based on results of instructional integrity matrices.**
 - **IDL and classroom components.**
 - **Online and role play tests.**
- **All online tests are now situated.**
- **Moving to integrate level 1 and 2 data in quarterly and annual reports.**

Level 3 Results

Organizational Support for Training Transfer



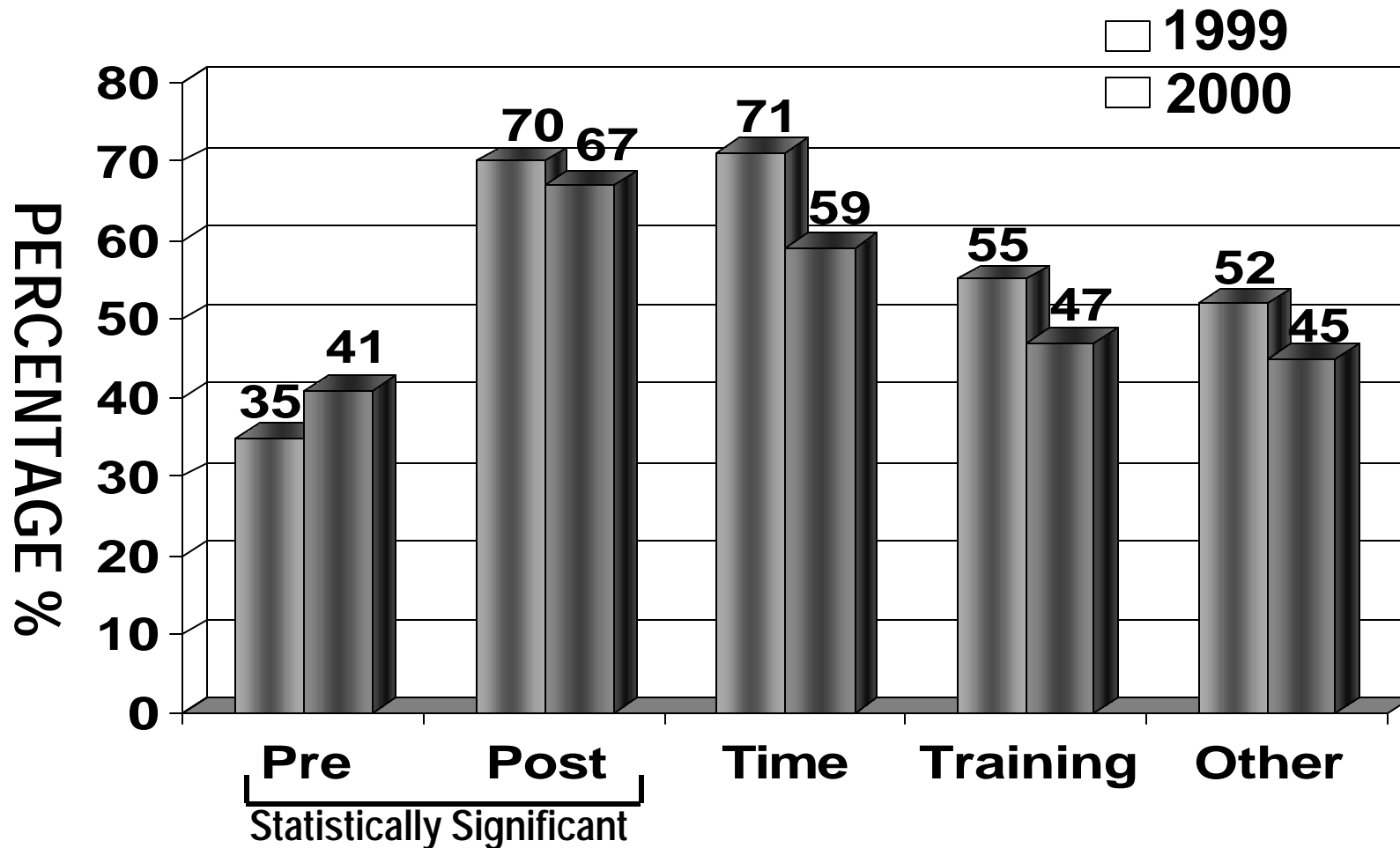
Level 4 Results

Impact

- **Estimate performance before training.**
- **Estimate performance after training.**
- **Estimate percent of work time spent on tasks.**
- **Estimate percent of improvement due to training.**
- **Estimate percent of improvement due to other factors.**

Level 4 Results

Comparative Impact Data



Level 5 Results

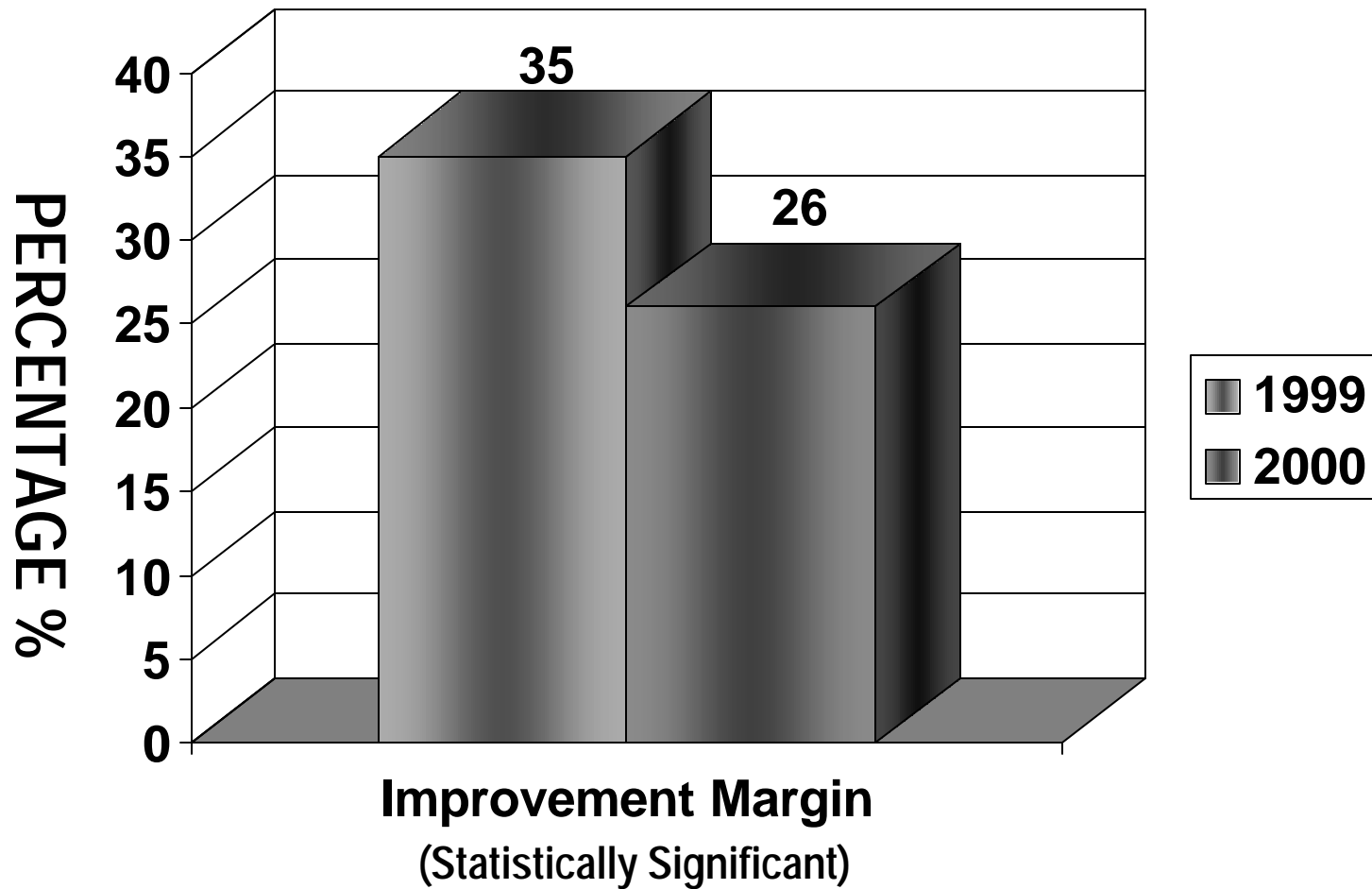
Return on Investment

$$\text{ROI} = \frac{\text{Training Benefits}}{\text{Training Costs}}$$

Measuring Benefits

- **Estimate performance before training.**
- **Estimate performance after training.**
- **Estimate percent of work time spent on tasks.**
- **Estimate percent of improvement due to training.**

Measuring Benefits

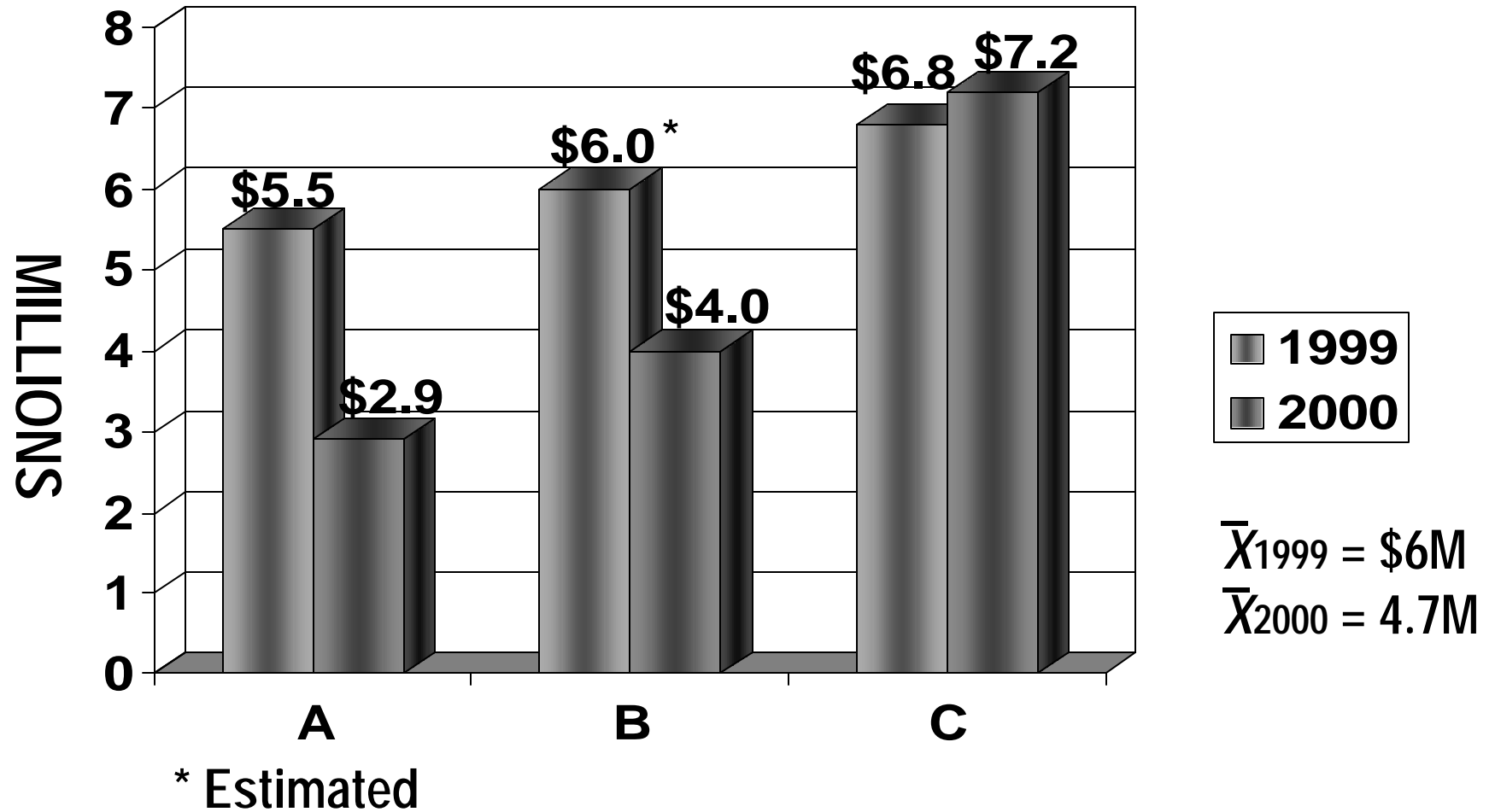


Measuring Benefits

\$ Value of Benefits

	1999	2000	
			Unit of performance (salary, sales to date, or exemplary revenue)
X	.35	.26	Gain in performance
X	.55	.47	Percentage of performance attributable to initial training
X	.71	.59	Percentage of AE's time spent on tasks requiring training
X	500	500	Number of participants
=			Value of training benefits

AT&T Benefits



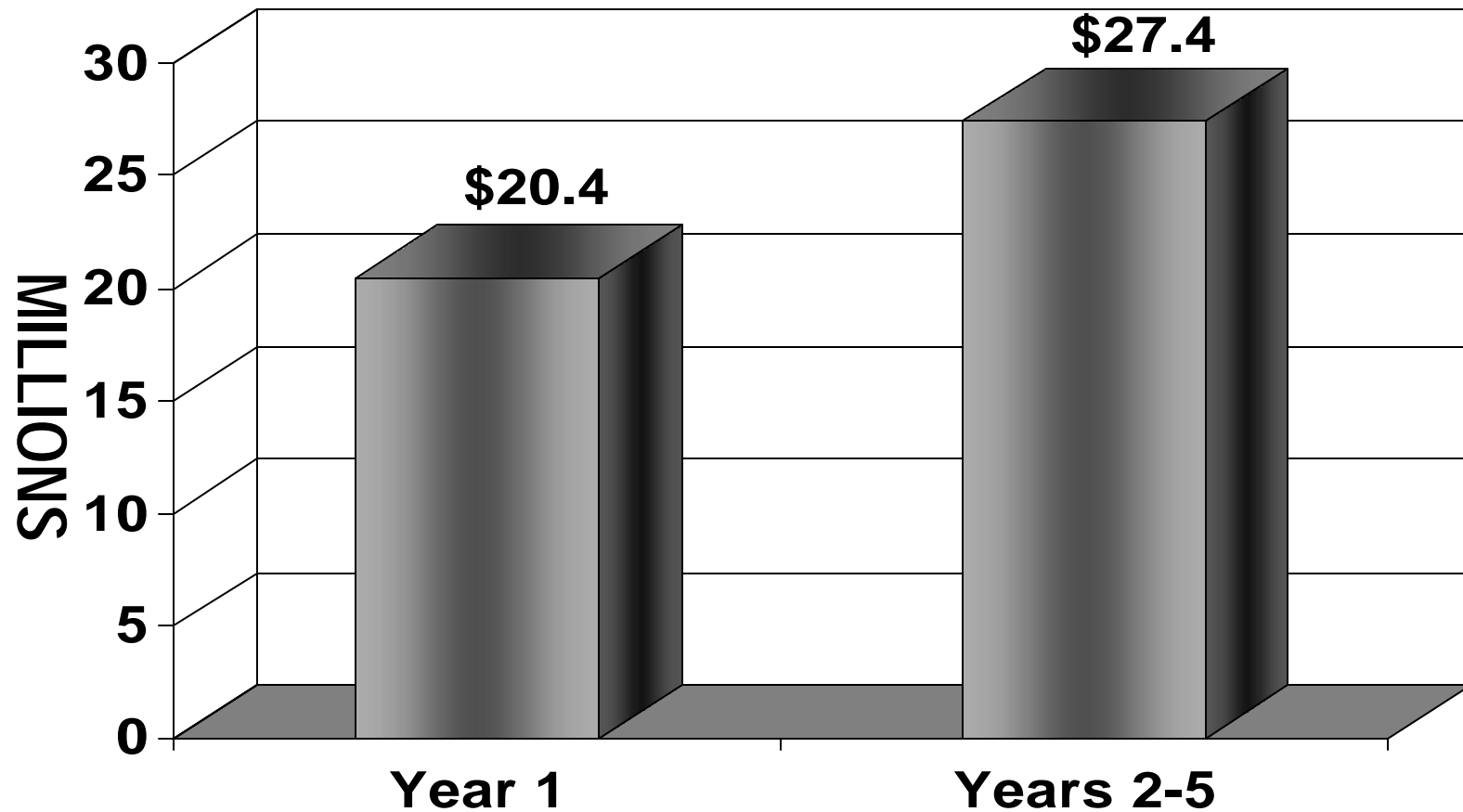
Calculating ROI

Measuring Training Costs

- **Number of Students**
- **Courses per Year**
- **Course Length**
- **Number of Participants**
- **Employee Pay (Burdened)**
- **Instructor Bill Rate**
- **Travel Costs**
- **Classroom Rental**
- **Course Development Costs**
- **Course Maintenance Costs**

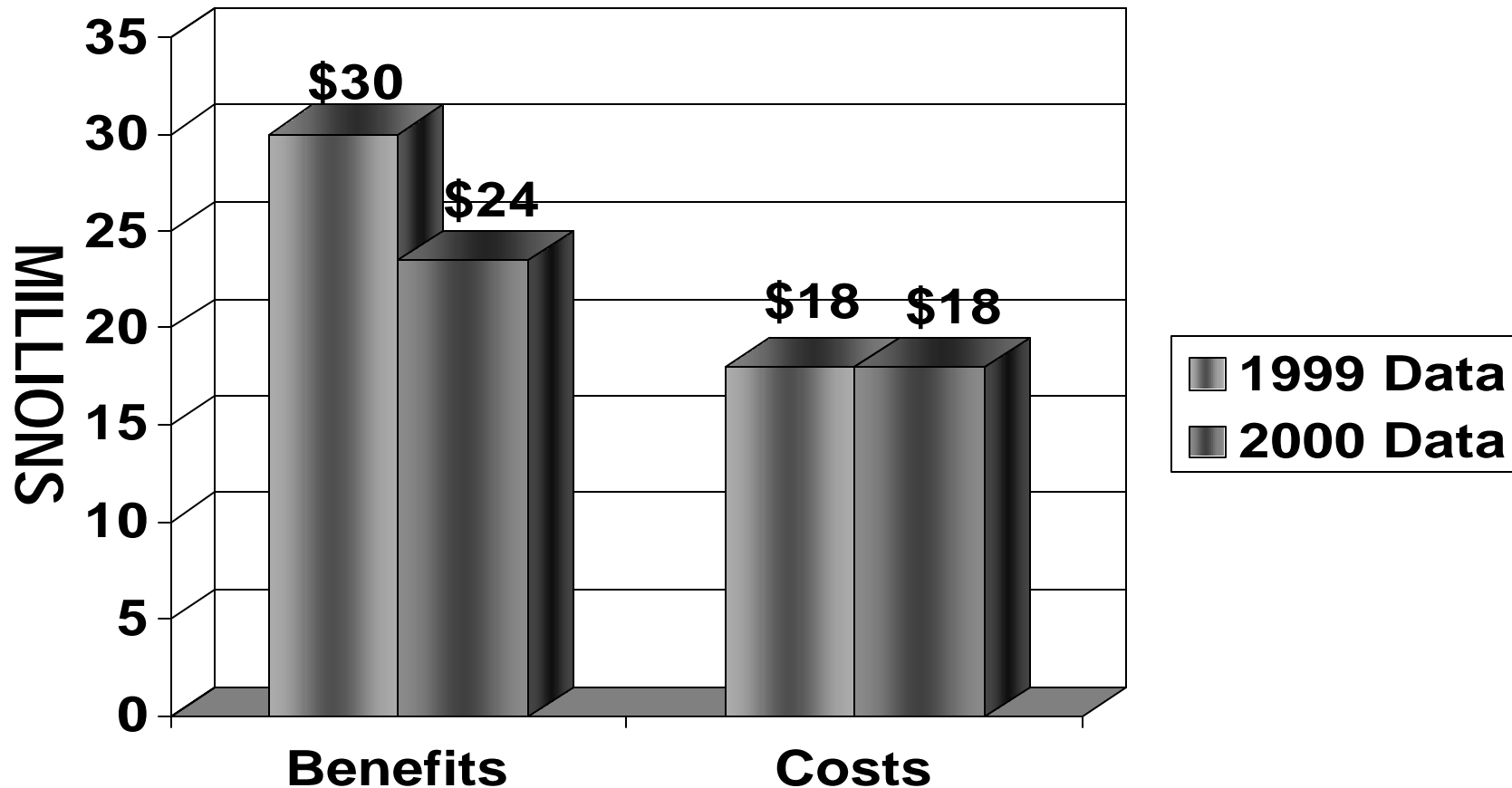
Calculating ROI

Training Costs



Calculating ROI

5-Year Benefits and Costs



ROI Calculations

1999	2000	
\$30M	\$24M	Average Training Benefit over 5 Years
\$18M	\$18M	Average Training Costs over 5 Years
\$12M	\$6m	Average Return on Investment (ROI) over 5 Years
Within 1 Year	Within 1 Year	Payback Period
165%	133%	Average Percentage ROI over 5 Years

Beyond Level 5

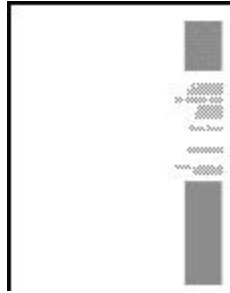
Monitoring Performance

- **Populations are changing.**
- **Attitudes towards training are:**
 - **Uniformly high.**
 - **Not affected by instructor, course, or region.**
- **Some attitudes are very weakly correlated with performance measures.**
- **Future correlations are expected as the framework solidifies.**

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Selling Results Different Formats



**Annual
Evaluation
Report**



Weekly SEQs



Quarterly Reports



**Quarterly Executive
Briefings**

Selling Results

Rules of Thumb

- **Evaluation is not always an objective activity.**
- **Choose stakeholder-approved methods to:**
 - **Value performance.**
 - **Handle opportunity costs.**
 - **Address salary costs.**
- **Make sure the evaluation is done by stakeholders, not “the evaluation group.”**

Selling Results

Rules of Thumb (continued)

- **Match the level of detail to the incentives, informational needs, and attention span of the evaluation user.**
- **Remember that evaluation results can indicate opportunities for improvement and provide rationales for action.**

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A GLIMPSE OF THE FUTURE

- **“An immense and ever-increasing wealth of knowledge is scattered about the world today; knowledge that would probably suffice to solve all the mighty difficulties of our age, but is dispersed and unorganized. We need a sort of mental clearinghouse: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified, and compared.”**

–H.G. Wells (1940)

Open Discussion

Your questions and comments.