

Instructional Development Paradigms



Charles R. Dills
Alexander J. Romiszowski
EDITORS



EDUCATIONAL TECHNOLOGY PUBLICATIONS
ENGLEWOOD CLIFFS, NEW JERSEY 07632

Library of Congress Cataloging-in-Publication Data

Instructional development paradigms / Charles R. Dills, Alexander J. Romiszowski, editors.

p. cm.

Includes bibliographical references and index.

ISBN 0-87778-294-6 (hardcover). — ISBN 0-87778-295-4 (softcover)

1. Instructional systems—Design. 2. Educational technology.

I. Dills, Charles R. II. Romiszowski, A. J.

LB1028.38.I576 1997

371.33—dc21

96-52249

CIP

Copyright © 1997 by Educational Technology Publications, Inc., Englewood Cliffs, New Jersey 07632. All rights reserved. No part of this book may be reproduced or transmitted, in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the Publisher.

Printed in the United States of America.

Library of Congress Catalog Card Number:
96-52249.

International Standard Book Numbers:
0-87778-294-6 (hardcover).
0-87778-295-4 (softcover).

First Printing: February, 1997.

- Patton, M. Q. (1980). *Qualitative evaluation methods*. Newbury Park, CA: Sage.
- Patton, M. Q. (1987). *How to use qualitative methods in evaluation*. Newbury Park, CA: Sage.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.
- Phillips, D. C. (1987). *Philosophy, science, and social inquiry*. New York: Pergamon Press.
- Preissle, J. (1991). The choreography of design: A personal view of what design means in qualitative research. In M. J. McGee-Brown (Ed.), *Fourth Annual Qualitative Research in Education Conference*, (pp. 55-66). Athens, GA: The University of Georgia.
- Reeves, T. C. (1989). The role, methods, and worth of evaluation in instructional design. In K. A. Johnson & L. J. Foa (Eds.), *Instructional design: New strategies for education and training* (pp. 157-181). New York: Macmillan.
- Reeves, T. C. (1992). Evaluating schools infused with technology. *Education and Urban Society Journal*, 24(4), 519-534.
- Rossi, P. H., & Freeman, H. E. (1989). *Evaluation: A systematic approach* (4th ed.). Newbury Park: Sage.
- Salomon, G. (1991). Transcending the qualitative-quantitative debate: The analytic and systemic approaches to educational research. *Educational Researcher*, 20(6), 10-18.
- Schauble, L. (1990). Formative evaluation in the design of educational software at the Children's Television Workshop. In B. N. Flagg (Ed.), *Formative evaluation for educational technologies* (pp. 51-66). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Schrag, F. (1992). In defense of positivist research paradigms. *Educational Researcher*, 21(5), 5-8.
- Schwab, J. J. (1970). *The practical: A language for curriculum*. Washington, DC: National Education Association.
- Schubert, W. H., & Schubert, A. L. (1990). Alternative paradigms in curriculum inquiry (pp. 157-162). In H. J. Walberg & G. D. Haertel (Eds.), *The international encyclopedia of educational evaluation*. New York: Pergamon Press.
- Sedgwick, J. (1993, March). The complexity problem. *The Atlantic*, pp. 96-104.
- Seels, B. (1993). Instructional design fundamentals: A review and reconsideration: Introduction to a special issue. *Educational Technology*, 33(2), 7-8.
- Shadish, W. R., Cook, T. D., & Leviton, L. C. (1991). *Foundations of program evaluation: Theories of practice*. Newbury Park, CA: Sage Publications.
- Smith, E. R., & Tyler, R. W. (1942). *Appraising and evaluating student progress*. New York: Harper.
- Soltis, J. F. (1992). Inquiry paradigms. In M. C. Alkin (Ed.), *Encyclopedia of educational research* (pp. 620-622). New York: Macmillan.
- Stake, R. E. (1980). Program evaluation, particularly responsive evaluation. In W. B. Dockrell & D. Hamilton (Eds.), *Rethinking educational research*. London: Hodder and Stoughton.
- Stake, R. E. (1990). Responsive evaluation. In H. J. Walberg & G. D. Haertel (Eds.), *The international encyclopedia of educational evaluation* (pp. 75-77). New York: Pergamon Press.
- Suchman, E. A. (1967). *Evaluative research*. New York: Russell Sage.
- Tate, R. (1990). Experimental design. In H. J. Walberg & G. D. Haertel (Eds.), *The international encyclopedia of educational evaluation* (pp. 553-561). New York: Pergamon Press.
- Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. Chicago, IL: University of Chicago Press.
- Walberg, H. J., & Haertel, G. D. (Eds.). (1990). *The international encyclopedia of educational evaluation*. New York: Pergamon Press.
- Yeaman, A. R. J. (1990). An anthropological view of educational communications and technology: Beliefs and behaviors in research and theory. *Canadian Journal of Educational Communications*, 19(3), 237-246.
- Yeaman, A. R. J. (1994). Deconstructing modern educational technology. *Educational Technology*, 34(2), 15-24.

11

Organizational and Performance Engineering Paradigms and Their Relationship to Instructional Systems Development

Philip L. Doughty
Alexander J. Romiszowski
Syracuse University
Syracuse, New York

The Changing HRD Paradigms in Business and Industry

From Behavioral to Performance Engineering

In this chapter, we address the business and industry context and analyze the transformations and changes occurring in this context and their impact on how instruction and therefore instructional design and development are viewed and practiced. In his chapter earlier in this book, Ivor Davies identifies five forces that are influencing current instructional development theory and practice: changing organizations; the technology explosion impacting organizations in terms of opportunities and challenges; changing employee roles, responsibilities, and expectations; changing workforce demographics; and the changing external environment due to globalization of the majority of activities undertaken by today's business organizations. An alternative way of saying much the same thing would be through the employment of systems terminology: The modern organization, as a system, is experiencing constant change in terms of expected outputs, in terms of the available inputs, in terms of the structures and the processes employed to achieve those outputs with the available inputs; and all of this occurs in an ever more rapidly changing environmental context. Change is the name of the game in business and industry today.

According to Peter Dean (1994): "Organizations that are going to survive and thrive in the 21st century must possess the attitudes, practices, and technology that will enable them

to constantly monitor and anticipate the needs of their customers and quickly change their products to meet these needs and maintain customer satisfaction. To achieve these goals, there must be change and often dramatic change in the way that organizations are run. In fact, it is widely recognized that business and industry are undergoing paradigm shifts in attitudes and practices. Attitude changes include a re-orientation towards total quality and towards customer satisfaction. Some of the practices include process redesign and re-engineering, outsourcing, utilizing product work teams, and cooperating with the competition." Changing paradigms and practices in the business environment inevitably lead to changes down the line that impact the training and development profession and, ultimately, instructional design and development. Lent, Brownfield, and Patten, in their chapter in this book, pick up on this general business trend in describing how customer orientation may be perceived as a new paradigm in the instructional design and development field. In the present chapter, we analyze the changing practices in the business and industry environment and their impact on the paradigms and practices of instructional developers who work in both contexts.

Marilyn Gilbert, in her chapter in this book, presents a historical review of the contribution to the instructional design and development field of her late husband, Tom Gilbert. She emphasizes the instructional design contributions of his early pioneering work in the rational application of behavioral science principles to the development of a "Technology of Education," which Gilbert named "Mathetics," and his more recent work on the systematic planning of education and training systems. She also refers to his better known work on performance engineering and technology as being partly responsible for the fact that his work on instructional design is less well known in the field. It is this work that formed the foundation for the behavior-to-performance (engineering) paradigm shift.

Both Marilyn Gilbert and Ivor Davies refer to the NSPI (now renamed ISPI) in their chapters, analyzing how this organization's name has evolved from a focus on instruction to one on performance improvement. They fail to mention that the growth in membership of this organization over the years, if taken as an indicator of the presence or absence of a new paradigm (applying Kuhn's criterion of attraction of a significant group of professionals away from other paradigmatic viewpoints) is in itself sufficient to place performance technology and the performance engineering movement within the area of interest of this book. Membership of the NSPI, which was counted in the hundreds through the 1960s and 1970s (when it was the National Society for Programmed Instruction) has in the last decade grown exponentially to include thousands of new members as it changed its name to reflect the shift from "Programmed Instruction" to "Performance Improvement." The name change from "National" (as in NSPI) to "International" (as in ISPI) also indicates that the shift in focus has led to the attraction of growing numbers of researchers and practitioners.

The main concepts, principles, and procedures of performance technology, or performance engineering, were laid out by Gilbert in his ground-breaking book entitled *Human Competence: Engineering Worthy Performance*. Originally published in 1978, the book was allowed by the publishers to go out of print at one time, but now, in the 1990s, it has been re-published due to the growing interest of the training and development profession in the ideas it presents. One of the key ideas presented is the clear distinction between behavior and performance, that is, between what it takes to do something and what the results are of that doing. Performance is seen as the accomplishments that result from the behaviors in which people engage. A focus on performance as opposed to behavior is the first underlying principle of a revolutionary change in perspective on both the role and methodologies of instruction within the business context.

The second underlying concept which Gilbert introduced into the conceptual structure of the training and development professional was the "PIP," or "Potential for Improving Per-

formance." This essentially is a novel approach to the analysis and quantification of the return on investment in the development of human resources of the organization. The revolutionary change of perspective is associated with another key concept, that of the "exemplary" or "master" performer. Gilbert suggests that instead of comparing actual performance achieved with a typical performance (or norm referencing), one would do better to compare the performance actually achieved with world class or best known performance, thus establishing the size of theoretically achievable improvement. This avoids the development of the mental set of being "satisfied with the average" as well as serving as the basis for calculation of the "PIP" and other performance improvement indicators.

The third important shift in thinking about instruction and its role was contributed by Gilbert in his emphasis on the underlying causes of performance problems, first exemplified in his treatise entitled "Praxeonomy" (Gilbert, 1967), and which is the basis for what is now commonly referred to as performance problem analysis or, more broadly, front-end analysis. This innovation, introduced by Gilbert and then popularized by a number of authors and training consultants (e.g., Harless, 1971; Mager & Pipe, 1970; Romiszowski, 1981; Rossett, 1987; Rummler, 1976), is perhaps the best known "trademark," or identifying characteristic, of the performance technology movement as it exists today. It involves the realization that training and instruction are but two of the many interventions that may be considered in order to "turn around" and improve inadequate human performance. Other major categories of intervention include the management of the incentives, the consequences, and the managerial systems that surround the performer, and also improvement of the tools used or the environmental conditions that influence the performer's chances of achieving and maintaining the desired performance criteria.

These three conceptual shifts underly the three principal phases of analysis that, together, are referred to as the performance engineering approach. These three phases are: first, determining the desired performance results or accomplishments; second, measuring and tracking the opportunities for improvement in these results or accomplishments; and, third, analyzing in a systematic and systemic manner the underlying causes of any performance deficiency and then selecting combinations of techniques for performance improvement that match the causes. This approach enables the desired accomplishments to be achieved with greater probability, and therefore positively impacts the performance indicators defined by the PIP.

A further contribution of Gilbert's philosophical approach to training and development, also initially launched on the world in his 1978 book, was the concept of vantage points and their use as an analytical tool. Gilbert suggests six systemic levels or "vantage points" within an organization, from which almost any problem or event may be observed. These represent different perspectives from which a manager can analyze what happens within the organization and how the organization operates. The six vantage points are:

1. Philosophical Level—the overall vision and ideals which govern the organization's business and operational principles.
2. Cultural Level—the overall environment within which the organization exists and operates.
3. Policy Level—which defines the missions and purposes of the organization.
4. Strategic Level—at which business plans are formulated and overall future change is designed.
5. Tactical Level—which concerns the specific tasks and duties that have to be accomplished in order to achieve the strategic objectives.
6. Logistics Level—which encompasses the various technical and support systems that must be in place to enable the tasks and duties to be performed.

This multi-level vantage points model has indeed been adopted as an organizing framework for the present book in order to be able to better perceive the systemic structure and interrelatedness that exists among the various paradigms presented by the many authors of the different chapters. However, the model is even more useful as a powerful analytical tool for understanding how an organization operates and works and why certain actions at certain levels of decision-making may be likely to succeed or fail in the achievement of their goals. As Gilbert (1978) states, "at whatever level we ultimately wish to draw conclusions about performance, we must begin by identifying the context at a higher level. And even to identify that high context appropriately we need at least to understand its context" (p. 120). In other words, in order to expect a successful resolution of a problem identified within a particular organizational level, it is important to design the solution taking into consideration all relevant factors operating within the broader environment within which the problem under investigation is embedded. And that requires further understanding of that environment's environment, and so on.

It is appropriate, therefore, to analyze the conceptual environment within which the performance engineering methodology may be applied in today's modern organizations. Change in organizational thinking has come from many sources, Gilbert's performance engineering paradigm being but one of them. The congruence in focus and impact of several such paradigmatic changes can be perceived by analysis of the higher-level contexts within which training and indeed performance technology occur. The analysis of these higher-level contexts and the design, development, implementation, and evaluation of improvements and innovations at these higher levels and contexts may be defined as organizational engineering or, as more commonly referred to in today's literature, Organizational Re-engineering. In the next section, we shall examine this trend and its principal component disciplines.

Organizational Re-engineering and Its Components

The perspective that one adopts when viewing change in an organization, change in a project, or change related to instruction influences how one thinks about strategy, processes and outcomes. Figure 1 suggests organizational re-engineering or organizational redesign as

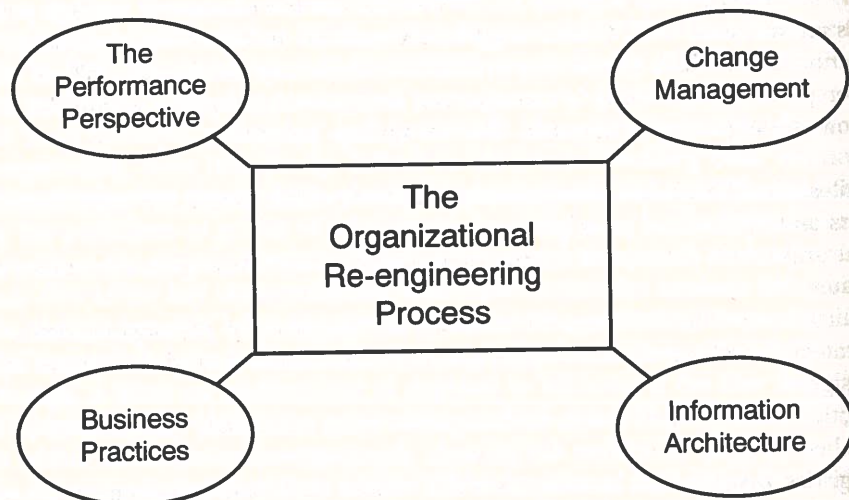


Figure 1. The organizational re-engineering perspective.

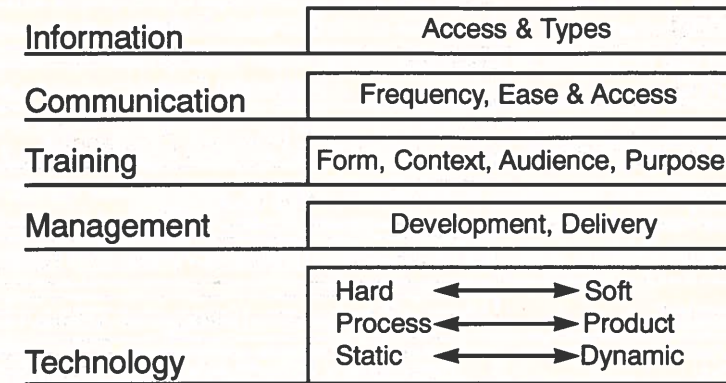


Figure 2. Integration of fields, functions, and technologies.

a perspective to adopt. One subcomponent of this particular organizational re-engineering perspective is performance, both large-scale organizational performance and work-group or individual performance. This is the primary target area for performance engineering or technology.

A second component is change management. Is the organization like a leaf, tossed about by the winds of changing technology, or is technology change and transfer a planned, mission-oriented, and well-managed process? Other people's views of technology transfer also are relevant in this situation. For example, a recent study comparing multiple high-tech company approaches to the design and implementation of a technology transfer process studied the integration of human resource development, human resources, and human performance technology within a technology transfer process (Jassawalla, 1996).

A third component relates to all aspects of information: information architecture, information technology, and networking, perhaps combining communications within information or information as a part of communication. Many view this as the starting point for a large-scale organizational change in which the import of new technology, particularly information and communication technologies, drive that change.

A fourth component of organizational re-engineering relates to the notion of business practices, or organizational practices. How does or should an organization do its work? The answer to this question could include strategic plans for integrating training and development, strategic plans for integrating human performance technology within a larger scale organizational structure, and practices that reflect a concern for return on investment, for example, Kirkpatrick's (1976) "Level 3 and Level 4 evaluation" notion of training as an investment.

Figure 2 portrays this integration of fields, functions and technologies in a somewhat different way. Here the primary thrusts related to information, communication, training, management, and technology (both as a process and as a product) are viewed as forces influencing organizational performance. The types of available information and access to information have direct impact on how an organization functions in both process and product terms. The notions of access (ready, quick, just in time) and types of information (customizable, generic, job-specific) are factors of great relevance here. The concept of communication is difficult in many ways to separate from information in that information, when well-designed and well-formatted, can lead to appropriate kinds of communication between work groups and teams. Thus the opportunities for communication, in terms of frequency, ease, and access for all concerned, are important factors to consider as part of the organizational re-engineering process.

Teaching	Process Focus
Learning	Outcome Focus
Training-Education	Purpose & Function Differences
Delivery	Via Technology
Methods	Interactive • Distance • Instructor Based
Strategies	Video • Computers • Interactive Video • Print
Tactics	Feedback • Individualized • Independent

Figure 3. The meaning of instruction in an HPT context.

Development and training, whether it involves formal training, group or individual training, “just-in-time,” “embedded,” or “integrated” (all relatively new concepts related to training) fit well in the overall concept of an integrated performance support system that should be present within any organization. Of course, the management of all this (the organization itself and the change process it is experiencing) includes information, communication, staff development and training, management development, and the like. Thus, management may be viewed as the “glue” or integrating force that directs and controls the interaction of the other forces influencing the change process.

Finally, technology in some contexts is viewed merely as the delivery mechanism for change: the systems, software, and equipment to implement an innovation. In other contexts, technology may be perceived as the causal factor that is driving the requirement for change. It is seen as both hardware and software. It is understood in both process and product terms. Consequently, the impact of technology on an organization varies widely from something that is quite dynamic, open, and flexible to something that is not at all flexible, quite rigid and restrictive. Of course, the goal is that technology will support the process of organizational re-engineering and be a prime driver for the integration of the other four forces of information, communication, instruction and overall change process management.

Figure 3 addresses the next more detailed level of concern related to the human performance technology (HPT) component of the re-engineering process and the role of instruction within that component. The figure suggests a variety of ways of looking at instruction and thinking about instruction. Within today’s HPT contexts, all of these have relevance. Figure 3 suggests how these issues should be addressed once one figures out whether the overall intended organizational change requires interventions designed to change human performance through instruction. Given these seven (not so randomly selected) issues, one should examine how their treatment is different when viewed within a human performance technology context than when viewing the same issues in any other approach to planned change. The key difference is that many of these teaching, learning, training, and delivery issues now are viewed as parts of a larger scale organizational intervention and are selected and employed when the front-end analysis data suggest that it makes sense to train or teach, rather than as an initial almost reflex-like selection of training as the solution to any organizational problem.

The ultimate purpose of the exercise from the organization’s standpoint is not performance and is not technology but productivity. In this context the concept of productivity includes quality, efficiency, cost, and some kind of balance between them: a kind of three-

legged stool. The colloquially expressed notion of “good, fast, and cheap” sometimes used to emphasize these three criteria sounds simplistic but in some ways makes excellent sense. The concept of “good” includes quality, “fast” includes notions of efficiency, just-in-time, and just-in-case, and the “cheap” notion really means affordability or working within realistic budgets. Thus, how to improve productivity translates into how to improve the quality and efficiency of work and how to manage resource requirements for that work. The tools used to achieve this include: change management strategy, improved or expanded technology transfer plans, human performance technology interventions (that may include human resource development, training or staff development) changes in information architecture and in business practices.

Most ISD models or approaches employ the general notions of analysis, design, development (perhaps with production separated from development), and evaluation as major components. In the broader HPT context the same overall scheme can guide the ISD process. However, the new models have stronger “front-end analysis,” “needs assessment,” or “curriculum analysis” components. No longer do we jump immediately into instructional design and development with little attention paid to the initial, broader-context, analysis phases. In almost any human performance technology or organizational performance technology context, the “front-end analysis” phase is a pre-eminent component such that only when that’s finished or well along, does the consideration of training or instruction as an intervention or ISD to define the details of that intervention come into play.

The HPT-Based Paradigm for Instructional Development

Changing Views of Analysis and Its Role in ISD

Within a human performance technology (HPT) context, a “macro” or “total systems” orientation often drives how one then conducts analysis. Figure 4 suggests at least four different ways to think about analysis in this way. The approach called discrepancy or gap analysis concentrates on the performer’s job context and suggests some kind of needs assessment. The identified needs may include many other component factors in addition to instruction, and occasionally may not include instruction at all. A second approach is that of marketing, in which the goal is not to analyze the performance problem but to identify sales, productivity, and other kinds of problems and opportunities. Marketing is both the point of view and the justification for a planned-change intervention. Yet another analytical approach is based on the decision-informing and decision-making paradigm in which problem-identification, problem-clarification, and problem-solving is the purpose of the exercise. A fourth approach identifies the training requirements aspect of large scale strategic planning exercises or at least the systematic definition of tactical planning requirements. The planning and eval-

Activity	Rationale
Discrepancy Analysis	Needs Assessment
Marketing	Justification
Decision Informing and Making	Problem Solving
Planning and Evaluation	Consistency of Intent and Action

Figure 4. Analysis perspectives.

Context Activity	Rationale
Strategic Planning	Decision Informing & Making
Restructuring	Applied Planning
Planned Change	Advocacy
Human Resource Development	Cost vs. Investment
Evaluation	Judgment
Problem Analysis	Discrepancy or Deficiency Analysis
Organizational Audit	Documentation

Figure 5. Contexts for front-end analysis.

uation paradigm underlying such approaches requires a kind of consistency of purpose and intent, or "ends and means" linkage.

Figure 5 suggests a variety of contexts within which the front-end analysis process may occur. This includes at the macro level strategic planning, organizational restructuring, and a variety of planned change models that are applied in a variety of settings. This also includes the more traditional contexts of: human resource development (and perhaps human resource management), evaluation, assessment and performance appraisal, the problem analysis approach addressed earlier, and the notion of an organizational audit or comprehensive assessment of an organization. The justification or rationale for these, as shown in Figure 5, suggests that frequently there are different explanations and different reasons for engaging in these kinds of front-end analysis and planning ventures.

The concept of gap or deficiency analysis flows through many of these front-end analysis schemes. Whether one follows the general models of Harless (1971), Gilbert (1967), Mager & Pipe (1970), or the more specific suggestions of Romiszowski (1981), Rossett (1987), Kaufman, Rojas, and Mayer (1993), the notion of a "need," that is, the identification of some kind of gap or deficiency, is seen as the underlying goal of the initial analysis phase of almost any HPT-based ISD approach. Figure 6 suggests that needs can be defined in a variety of ways. The first and foremost one is as a discrepancy, deficiency or gap between a desired and an actual state of the system under analysis. This makes the most sense most of the time. At times, however, opportunities, possible solutions, or various innovations made possible by new technologies suggest or imply a future need which may well trigger performance technology interventions. Yet another source of need is existing requirements and mandates, whether they be state or federal (i.e., external) or managerial (i.e., internal). The notion of need as a want or a desire (more like a solution rather than a gap) arises from a client-oriented approach to needs analysis. The bottom line is that the concept of need and the process of gap analysis are components in most systemic approaches to problem solving and therefore appear within most HPT models as well as in recent ISD models.

Why one would engage in any kind of front-end analysis or needs analysis may vary depending on the environment. Figure 7 suggests there are several possible reasons for conducting these kinds of analyses, including problem solving (in general), strategic and tactical

- | |
|---|
| <ul style="list-style-type: none"> • As Discrepancies, Deficiencies, and Gaps • As Opportunities and Solutions • As Requirements and Mandates • As Wants and Desires • As a Component in Problem Solving |
|---|

Figure 6. Needs in context.

planning, description and documentation, evaluation, and resource allocation, where the primary focus is on planning and budgeting. However, when the solution of choice, or the implementation of a particular innovation is the focus, the process becomes a marketing analysis to support, advocate, or justify the planned change. Finally, the last item is that of planned change, which analyzes how to build involvement and develop a sense of ownership and cooperation in all concerned with the innovation.

Figure 8 reflects the fundamental model of front-end analysis in which the notion of human performance deficiencies or discrepancies is the focus. Embedded within this model is a three-part schema of skill and knowledge/deficiency, lack of incentives or motivation, and environmental barriers. This figure is based on the suggestions of Gilbert (1967, 1978) and Harless (1971). An expansion of this model is presented by Allison Rossett (1987) in her *Training Needs Assessment* text, in which she breaks out the incentive and motivation components into separate elements, thereby suggesting a more refined analysis and a more refined identification of potential solutions and combinations of solutions to address a given performance deficiency.

Romiszowski's (1981) concentric circles model presented in his *Designing Instructional Systems* text further breaks out the kinds of primary and secondary questions to ask when analyzing a performance deficiency and explicitly suggests a broader range of potential solutions to the problems being analyzed. The concentric-circles presentation of this model is de-

- | | |
|-----------------------|---------------------------|
| • Problem Solving | (Clarification) |
| • Planning | (Strategic and Tactical) |
| • Description | (Documentation) |
| • Evaluation | (Valuing) |
| • Resource Allocation | (Budgeting/Costing) |
| • Advocacy | (Justification/Marketing) |
| • Planned Change | (Involvement/Ownership) |

Figure 7. Needs analysis purposes.

- **Skill Knowledge Deficiencies**
 - Don't Know How To (Training)
 - Don't Know What Is Expected (Standards)
 - Don't Know Present Performance (Feedback)
- **Motivation/Incentive Barriers**
 - Not Rewarded for Appropriate Behavior
 - Punished for Appropriate Behavior
 - Rewarded for Inappropriate Behavior
- **Environmental Barriers**
 - Insufficient Resources
 - Deficient Equipment
 - Conflicting Demands/Standards

Figure 8. Causes of deficient performance.

signed to represent the integration and “one-ness” of a complex system of ideas, communicating the non-linear and “systemic” aspects of the front-end analysis process. Another “systemic” aspect is the notion of the various organizational levels at which one performs front-end analysis, as illustrated by Kaufman, Rojas, and Mayer (1993) in their “mega/macro/micro” model of needs assessment. Without consideration for community, societal, and/or larger organizational concerns, small-scale interventions based on localized problem or gap analysis, though well intended, may lead one down a garden path which does not lead to a full solution of the problem.

Of course, viewing front-end analysis as needs assessment alone also severely limits the notion of front-end analysis. Jonassen & Hannum (1991), in their book chapter on analysis of task analysis procedures, describe a large variety of front-end analysis methods and tools in addition to needs assessment, including content analysis, conceptual analysis, job and task analysis, and the like. This begins to present the wide array of potential tactics, tools, and methods that can be employed in the process of front-end analysis, all of them geared towards first identifying “the right thing to do” before proceeding to the question of “doing it right.”

Interventions with HPT Implications

Although the “flavor of the month” or “flavor of the year” training and development intervention often is embedded within an HPT argument, there are also others that are presented almost as if they are independent of human performance technology and indeed independent of any kind of instructional system design/development paradigm. For example, the currently popular notion of the “Learning Organization” (Senge, 1990) has implications for organizational redesign and for systems planning and also has considerable implication for training, instruction, career pathing, and job performance aids. Most of the quality movements, whether it be Total Quality, Quality Improvement, Process Improvement, the ISO 9000 strategies, or the like, also have considerable implications for information, communication, and instructional intervention. Svenson and Rinderer's (1992) *Training and Development*

Strategic Plan Workbook suggests a comprehensive approach to strategic planning within a large scale company or corporation which has broad implications for training and development. Their approach includes organizing, staffing, managing, positioning, and planning functions. Although not strong in the ISD components, this workbook has major implications for the front-end analysis and planning for training and development that then leads to planning for ISD. All these approaches to organizational re-engineering share many concerns and some strategies with the HPT-based approaches. Yet none of them were born within the HPT movement and few of their “early adopter” practitioners have seen themselves as members of this fraternity. Nevertheless, as these various separate planned-change movements become accepted and institutionalized, one may see them as complementary components of an integrated approach to organizational re-engineering.

Examples of the integration of strategic planning, or at least strategic thinking, organizational change (development), and training are becoming more frequent in the literature. The Spuches and Evensky (1991) study reported recently in the *Journal of Staff, Program, and Organizational Development* suggests just such an integrated venture. It includes a blending of strategic planning, ISD and organizational development in a higher education context. Such multi-faceted and integrated model ventures now drive many contract R&D firms and in-house organizational change agencies for whom strategic planning, training, information technology and organizational communication are all integrated or partially integrated to address a comprehensive problem. Several of the chapters presented in this book (for example, Davies, Kessels & Plomp, Lent *et al.*) illustrate or advocate this trend. There is evidence of ever-greater integration of the underlying paradigms of the various disciplines that study and attempt to influence the productivity of organizations.

Problem Solving as a Foundation for Action

One way to think about instructional systems development and human performance technology approaches to planning is to address the range of models that can be and have been employed in this context. Figure 9 suggests that there are at least six ways to think about such an integrated instructional systems and human performance technology. They include problem solving, strategic planning, goals and objectives or requirements models,

- Problem Solving Models
- Strategic Planning Models
- Goals and Objectives Models
- Theory-Based Models
- Philosophical Approaches
- Vocational-Technical Perspectives

Figure 9. Where to start ISD/HPT planning?

learning theory based models (addressed elsewhere in this book), as well as philosophical approaches (also addressed in other chapters) and the basic "push vs. pull" model for curriculum design in which the vocational/technical requirements of the field drive goals, which drive objectives, which drive strategies, which drive assessment, which drive practice, and the like.

A variety of creative problem-solving strategies are of relevance here. They include various problem-solving strategies that are almost independent of the ISD approach: using analogies and metaphors as ways of thinking; changing representation or presentation or point of view and perspective; spending considerable time defining and clarifying the questions prior to design and development; in essence, being quite clear on the ends before addressing the means. Techniques such as constraint analysis and risk analysis also apply in this kind of environment, where one is looking for either stable or not so stable structures that would guide both analysis and development. Kaufman's notions of inductive and deductive planning also merit consideration. Sometimes, when in the development stage, one could work from the requirements or the competencies backwards to strategies and techniques and goals and objectives, ultimately inferring gaps.

A fundamental and basic approach to addressing this means-and-ends planning scheme for both ISD and human performance technology development is presented in Figure 10a, b, c, and d. This simple "Why, What, How, and How Well" diagram portrays basic elements inherent in human performance technology as well as on ISD planning. The initial notion of "why" can be driven by either organizational or personal philosophy, perspectives of the organization, the agency or individuals within the agency, as well as the kind of ethical issues related to political, social, and/or economic concerns (see Figure 10a). Related to this, of course, is the notion of values, whether they are societal, organizational, group, or individual. The explanation or rationale may be driven by one of these previous notions or may be driven by the important concepts of gap, performance deficiency, productivity, and the like. In theory, all of these lead to priorities, either priorities in terms of sequence or criticality, which then lead to further conversations about purpose.

The second component of this scheme (Figure 10b), addresses "what to do" when engaging in the design and development component. The "front end analysis" list addresses many of the issues identified in previous sections in this chapter. But there are some additional elements. The notion of constraint analysis hasn't been addressed in depth before, but merits inclusion here. The notions of standards, benchmarks, or benchmarking and all the requirements issues, including competencies and organizational or professional standards, fit in here as well. The notion of content analysis as well as job and task analysis also fits within our broadly-based concept of front-end analysis. Finally, we include the futures invention issue, since the goal of the front-end analysis may be to in some way engage in planned change or technology transfer for building a better future for the organization, the society, or for specific work groups.

In the "how to do it" phase of our model, the four items listed in Figure 10c represent at least some of the levels of action and some of the procedures to be employed at these levels, once one figures out why some intervention is necessary and what form of intervention that should be. This multi-level notion of course, curriculum, lesson and materials development also applies within the instructional analysis phase of our ISD scheme.

Finally, Figure 10d presents the evaluation, or "how well was it done" phase. This component of our basic model suggests evaluation and validation both of a formative and a summative nature, as well as both process and product evaluation. Careful consideration should be given to all kinds of criteria here, to ensure that the structure, processes and outcomes reflect the initial analysis of the problem, its causes and its organizational or human "costs". One could add to this list of criteria some considerations of "Level 3" and "Level 4" evaluation (Kirkpatrick, 1976) or some aspects of return on investment. Investment in training often

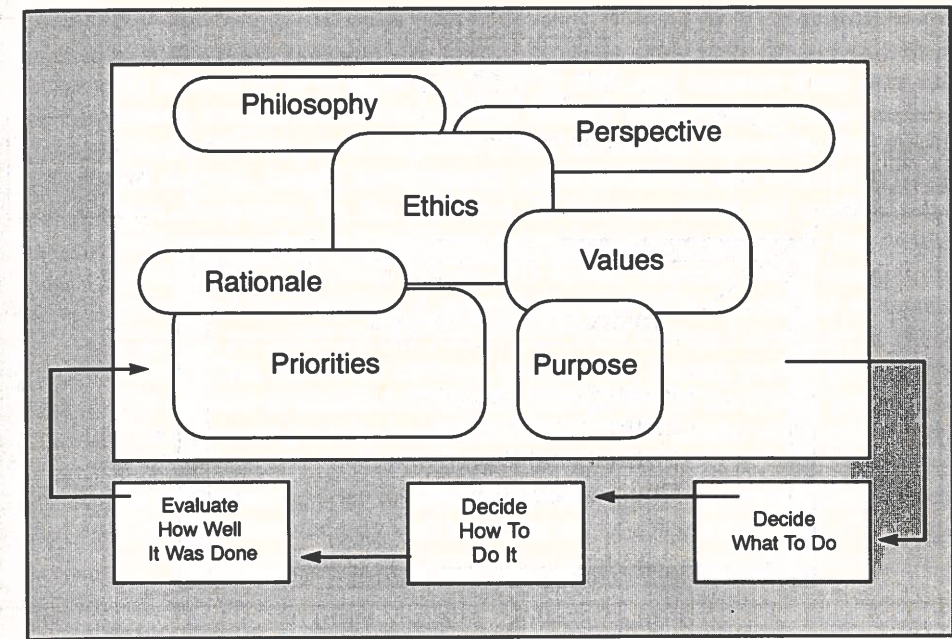


Figure 10a. ISD/HPT development: Determine why to do it.

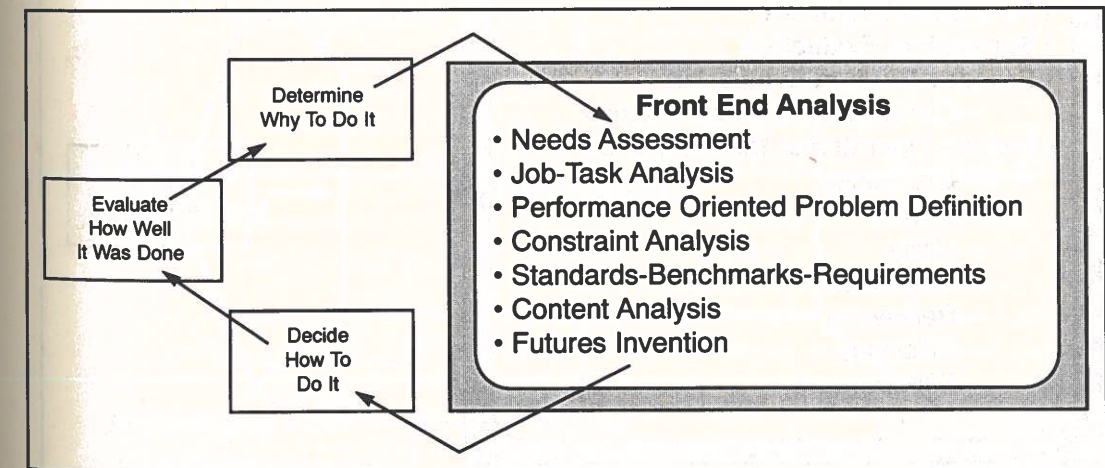


Figure 10b. ISD/HPT development: Determine what to do.

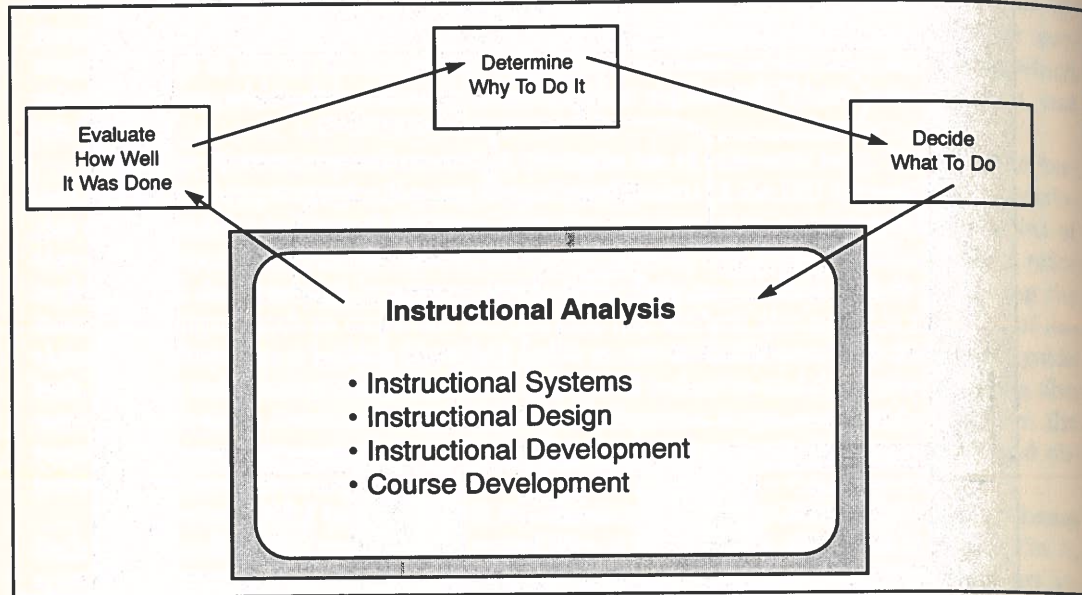


Figure 10c. Decide how to do it.

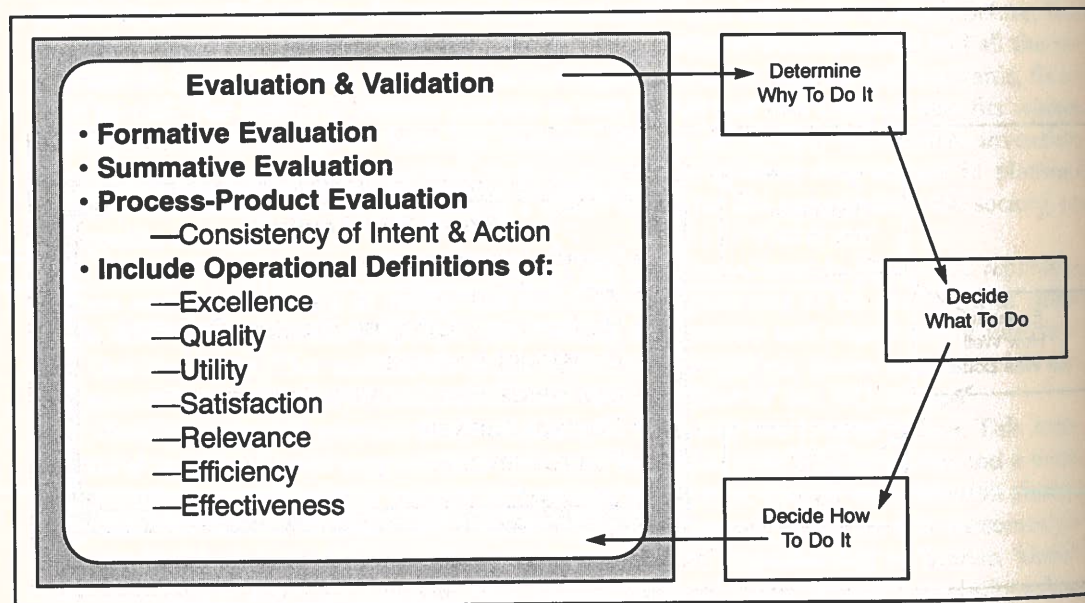


Figure 10d. Evaluate how well it was done.

cannot be easily assessed, but in cases where it can be, and especially when there are organizational-level reasons for assessing the return on investment, such further criteria should be operationally defined so as to make it possible to track and measure them over time.

An interesting example of an instructional systems design/development model is that created by Molenda, Pershing, and Reigeluth (1996) at Indiana University. Their model follows the typical analysis, design, development, implementation, and evaluation stages, but adds a significant component for the front end. In this case, front-end analysis serves not only instructional systems design, but also human performance technology intervention design. Their model, called a Business Impact ISD Model, considers both non-training and training or instructional interventions. A general overview of this model, or at least its underlying philosophy, is presented by Ivor Davies (also from Indiana University) in his chapter of the present book. This model for systems analysis and human performance technology planning, though not new in theoretical terms, is perhaps one of the first to present practical procedures for implementing a fully integrated ISD and HPT model. Although it is the case that a number of performance technology contract R&D firms have been employing these paradigms in an integrated manner for some time, little has been presented in the literature reflecting why they do what they do and how they do what they do.

**Focus on the Bottom Line:
A Change-Based Rationale for Instructional Development**

Figure 11 suggests that there are many influences on workers, on work groups, and on organizations. Although the standard approach to interpreting this diagram would be to suggest that ISD should address training and job aids and perhaps management and supervision, leaving the others for some other kinds of intervention, the new integrated ISD/HPT approaches suggest otherwise. If one looks at methods, whether they are work methods, communication methods, information transfer methods, or the like, then potential human performance technology interventions, which may perhaps include training and instructional interventions, usually also come into play. Once one completes a policy analysis, as an example, what does one do to promote, practice, implement and evaluate new policy? This implies training, staff development, and management development.

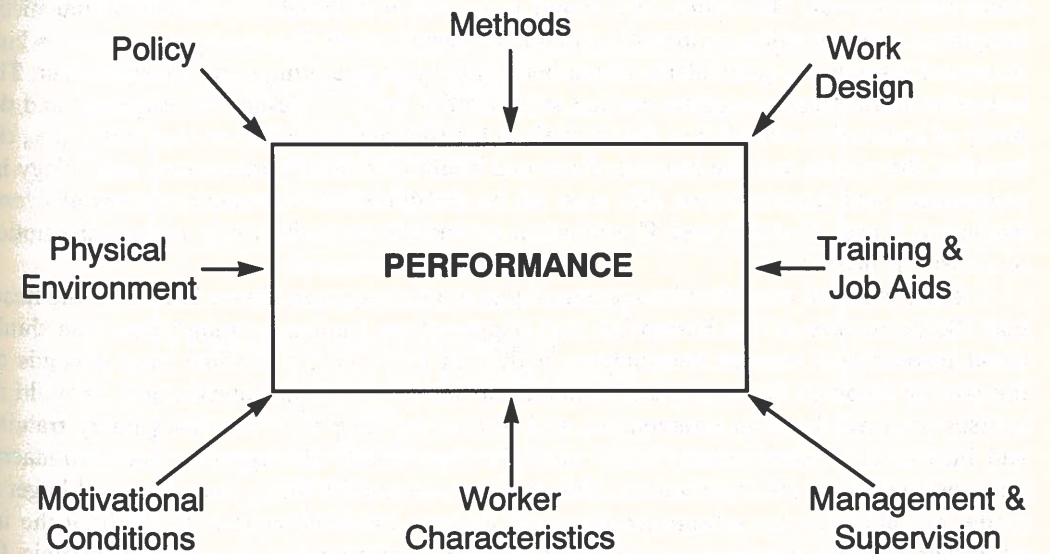


Figure 11. Influences on worker performance.

- Process vs. Product
- Practical vs. Conceptual
- Depreciation vs. Obsolescence
- Investment vs. Operation
- Sizzle vs. Steak

Figure 12. Implications of change for ISD/HPT decisions.

It is also likely that training, instruction, perhaps job aids and job performance tools could also be considered as components of work design and improving and maintaining an appropriate physical environment. John Keller's (1983) ARCS model speaks eloquently to the motivational conditions, at least as far as instruction and training is concerned. Improving the quality of the workers who are selected and promoted can be at least partially impacted by training and instruction. Although not exhaustive, this view of comprehensive analysis with implications for instructional interventions hopefully serves to illustrate the range of influences.

Figure 12 suggests that there are a number of components embedded within the concept of planned change that have implications for instructional systems developers. Whether one focuses on improving the process, such as total quality, ISO 9000 and the like, or on the product with emphasis on competence, or "Level 3" and "Level 4" evaluation, the ISD models within HPT in some way ought to reflect these kinds of concerns. Larger scale strategic and conceptual planning as well as practical and tactical planning make sense here as well. The notion of instruction or training or job aids as an investment that can be depreciated much like other kinds of capital investments rather than considered a cost or overhead has implications for how training proposals are presented and how to conduct the analysis that precedes the proposal. The notion of a sound front-end, well-designed instruction, and nicely integrated delivery using multimedia should be viewed much like one views any other kind of capital investment, particularly where both initial and operating costs are significant. The last point in this figure suggests moving away from a focus on design, development and delivery of instruction overall (i.e., the "sizzle") to focusing more heavily on the "steak" (i.e., the benefits, the results and the impact). Front-end analysis, human performance technology interventions, and impact-driven ISD must all be integrated in a systemic process of events leading to "Level 3" and "Level 4" evaluation procedures that effectively address the notion of return on investment.

More practical considerations about all this are portrayed in Figure 13a under the headings "Scope or Size of the Enterprise" and "Approach to Implementation." How one thinks about instructional systems development within an HTP context in some ways depends on the size or scope of the enterprise. Thinking of one course as an intervention, or multiple courses or curricula as an intervention, and ultimately, large scale interdisciplinary training and instructional interventions across multiple departments all suggest a "micro-to-macro" focus on improving the organization. This does not necessarily imply that more and larger is better, but often once a substantive front-end analysis has been conducted, limiting the intervention to a few people or a small subset of an organization can be viewed as myopic. Of course, the detailed implementation of any kind of instruction or training venture may vary quite widely, depending on a number of theoretical and practical considerations. Subsequent

- **Scope or Size of the Enterprise**
 - One Course
 - Multiple Courses
 - Interdisciplinary Across Multiple Departments
- **Approach to Implementation**
 - Individualized
 - Modularized
 - Mediated
 - Self Instructional
 - Mastery Based
 - Non-Time Based
 - Criterion Referenced

Figure 13a. Practical considerations in ISD/HPT planning—Part I.

chapters in this book address many approaches to the design, development, and delivery of instruction, illustrating the wide variety of possible approaches. The list presented in Figure 13b identifies just some of the elements that ought to be considered whenever the practical considerations of ISD come into play after the large scale front-end analysis has been conducted. Although not exhaustive, these approaches to implementation, along with integration provided by multimedia delivery systems, all fit within the proposed ISD/HPT planning schema.

The newly evolving software to support group development suggests many of the components listed under the "Development Process" heading in Figure 13b. A team focused on a specific project, but not necessarily all working in the same context or using the same approach to development may integrate and cross over many disciplines, may be content based or process based, or some combination of content and process. A non-linear, non-sequential kind of approach to design and development also is possible, through the use of "rapid prototyping" models (see the chapter by Dorsey, Goodrum, & Schwen in this book), facilitated by information and communication technology software and tools (see the chapter by Zhang, Gibbons, & Merrill in this book).

- **Development Process**
 - Team Focused
 - Multi-disciplinary
 - Content Based
 - Process Based
 - Systems Approach
 - Incremental Decision Making
- **Planning and Evaluation**
 - Internal and External Support
 - Purposes
 - Audiences
 - Issues
 - Methods
 - Reporting

Figure 13b. Practical considerations in ISD/HPT planning—Part II.

While still not supported wholeheartedly by many clients, evaluation, testing, measurement, and assessment all play a role in any substantive ISD planning venture (see the chapter in this book by Reeves). The question of how the market for ISD views the notion of evaluation as related to planning could merit extensive conversation. It is often the case that clients suggest that if planning is well done, evaluation is unnecessary. This suggests that planning, if well-conceived, well-executed, and well-validated, may in fact make evaluation easier or less costly. However, theoretical considerations, such as the laws of cybernetics and general systems theory, teach us that when dealing with complex and probabilistic systems (which is the case of any human activity system such as a training program), it is almost impossible to predict all aspects of system operation with accuracy. Therefore, superior quality planning may indeed reduce the cost and complexity of the evaluation process, but it never totally eliminates the requirement to perform one or several cycles of formative evaluation. The currently popular push for more systematic "Level 3" and "Level 4" evaluation within organizations sits well with the human performance technology model, in which the focus is less on training satisfaction and immediate post-training performance and more on the impact on the bottom line. All these theoretical and practical considerations combine to make the evaluation-to-planning link all that much more important. This is where the human performance technology and ISD models support one another in very powerful ways.

The Bottom Line: Converging Paradigms

This chapter started by outlining how the instructional design/development paradigms held by a large proportion of the business training and development community have been subsumed into a broader performance engineering paradigm, which itself is now part of an even broader organizational re-engineering paradigm. It also indicated that this organizational re-engineering paradigm really has a number of sources, each of which could be considered as a paradigm for human resource management or even for the general management of organizations. Today, in the fast changing society that we are entering, the different areas of study and practice referred to as total quality management, organizational development, organization and methods, human resource management, and many others are converging to work as integrated components in a broader approach to the systemic planning of change in organization.

At this broader level of the organization, a multi-paradigmatic approach seems to be developing, similar to the one that is suggested by the editors of this book in the introductory chapter when discussing the field of instructional systems design and development. Furthermore, we have argued in the later sections of the present chapter that instructional systems development can best be seen as a component within a broader organizational re-engineering or organizational development approach. In reflection over this chapter and its place and role within the book as a whole, we may state that not only is the field of instructional systems design and development (ISD) multi-paradigmatic but that ISD fits into a multi-paradigmatic context of organizational design and development. In effect, the multiple vantage points model which Gilbert proposed for organizational analysis and problem solving may well be a model which has value beyond the structuring of the present book to the structuring of one's views regarding how alternative paradigms in our field may not necessarily be alternatives at all, but may best be viewed as contributing components which often are relevant at different levels of systemic analysis of the problems we try to solve.

A second final observation is to question why, given that the bulk of fundamental theory building and research which led to the performance technology or performance engineering movement was completed through the 1960s and 1970s, is it only in the 1980s and 1990s that we see a significant adherence to this new paradigm. Why has it taken 20 or more years for the paradigm shift to occur? One possible answer is that paradigm shifts often do

occur over a considerable period of time and that 20 years is fairly typical. It reflects the typical period of time between a given generation of students completing their graduate and post-graduate studies in a field, and reaching the level of organizational authority to be able to influence the adoption of what they learned as a model for action. The human resource department directors and human resource development managers of today are those who had the opportunity to study the principles of the performance technology movement in the 1960s and 1970s, but only now have the power to implement them in a systematic and organized manner.

However, an alternative line of argument is that the basic research and theory building which led to the performance technology movement originated a little before its time in a period when, at the higher levels of organization, the pressures for productivity, competitiveness, and customer orientation were not felt as strongly as they are today. We may compare the time it took for the performance technology paradigm to take root with the much shorter time that the total quality movement, the organizational re-engineering movements, and other movements such as "right-sizing," etc., have taken to become almost household words within the business sphere. This can be ascribed to a very much more rapidly changing environmental context within which modern businesses operate, the globalization of markets, and strong international competition, and thus to the general need to improve productivity as an essential requirement for organizational survival.

Given this change in its macro environment, the organization (as does any system) rapidly moves towards internal change in order to adapt itself to its new environmental conditions. In so doing, the macro organizational policy and strategic planning levels (in Gilbert's model) create the environmental conditions for the subsystem of human resource development to be required to rapidly adapt itself to its new environmental conditions. Thus, in turn, by the laws of general systems theory, the ISD fraternity now finds itself within a working environment in which human performance technology principles are the ruling environmental pressures for change.

If there is one major "bottom line" lesson to be drawn from the analysis of the growth of the human performance technology paradigm, its absorption of ISD as a sub-component, and its own absorption into broader total quality and organizational re-engineering paradigms, it is that the paradigms of today are the results of the environmental requirements, pressures, and conditions of today. This being an observation based on general systems theory, it may be considered equally relevant for the analysis of what is happening, or probably will happen, in formal education. Maybe what has been happening over the last decade or so at a very rapid rate within the business training context could be considered a model for what is likely to happen, perhaps a little more slowly and a little later, within the general educational field.

References

- Dean, P. J. (Ed.). (1994). *Performance engineering at work*. Batavia, IL: International Board of Standards for Training, Performance, and Instruction.
- Gilbert, T. F. (1967). Praxeonomy: A systematic approach to identifying training needs. *Management of Personnel Quarterly*, 6(3).
- Gilbert T. F. (1978). *Human competence: Engineering worthy performance*. New York: McGraw-Hill.
- Harless, J. (1971, 1975). *An ounce of analysis (is worth a pound of programming)*. Washington, DC: Harless Performance Guild, Inc.
- Jassawalla, A. (1996). Unpublished doctoral dissertation, Syracuse University School of Education.
- Jonassen, D. H., & Hannum, W. H. (1991). Analysis of task analysis procedures. In G. J. Anglin (Ed.), *Instructional technology: Past, present, and future*. Englewood, CO: Libraries Unlimited.

- Kaufman, R., Rojas, A. M., & Mayer, H. (1993). *Needs assessment: A user's guide*. Englewood Cliffs, NJ: Educational Technology Publications.
- Keller, J. M. (1983). Motivational design of instruction. In C. M. Reigeluth (Ed.), *Instructional design theories and models: An overview of their current status*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Kirkpatrick, D. L. (Ed.). (1976). *Evaluating training programs*. New York: McGraw-Hill.
- Mager, R. F., & Pipe, P. (1970). *Analyzing performance problems*. Belmont, CA: Fearon Publishers.
- Molenda, M., Pershing, J., & Reigeluth, C. (1996). Designing instructional systems. In *Training and development handbook* (4th ed.). Alexandria, VA: American Society for Training and Development.
- Romiszowski, A. J. (1981). *Designing instructional systems*. London: Kogan Page.
- Rossett, A. (1987). *Training needs assessment*. Englewood Cliffs, NJ: Educational Technology Publications.
- Rummler, G. A. (1976). The performance audit. In R. L. Craig (Ed.), *Training and development handbook* (2nd ed.). Alexandria, VA: American Society for Training and Development.
- Rummler, G. A., & Brache, A. P. (1990). *Improving performance: How to manage the white space on the organization chart*. San Francisco: Jossey-Bass.
- Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.
- Spuches, C. M., & Evensky, J. (1991, Winter). Instructional improvement revisited: Lessons in strategic design. *The Journal of Staff, Program, & Organization Development*, 9(4).
- Svenson, R. A., & Rinderer, M. J. (1992). *The training and development strategic plan workbook*. Englewood Cliffs, NJ: Prentice-Hall.

PART 3

The Theory/Policy Vantage Point: Theoretical Underpinnings of Instructional Development