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Harold D. Stolovitch
Erica J. Keeps
Editors

Foreword by Robert F. Mager

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CHAPTER TWO

The Origins and Evolution of the Field

Marc J. Rosenberg
William C. Coscarelli
Cathleen Smith Hutchison

The term *performance technology* (HPT) has slowly evolved to define an emerging field of practice in organizations. The adjective *human,* however, is often used in front of this term in an effort to make it refer more specifically to the study of people than to the study of machines. With its roots in what was then the National Society for Programmed Instruction (now known as the International Society for Performance Improvement, or ISPI), the field of HPT is now finding additional professional support and discussion in such professional societies as the American Society for Training and Development and the International Federation of Training and Development Organizations, as well as in such professional journals as *Training.*

In defining any new field, theorists and practitioners alike struggle to decide exactly what the new ideas mean and how concepts and practices from one field can aid in describing another. Moreover, in studying the framework on which any new field is built, it is essential to look at new and creative ideas, as well as at the disciplines of science.

Why is it important to review the foundations of HPT? One reason is that HPT is consistently being described as using the science and techniques of other disciplines. Thus, to apply HPT successfully, it is necessary to understand the foundation on which the practice is built. Another reason is that by understanding the origins and conceptual milestones of HPT, researchers and practitioners can better communicate HPT's role to peers in more established fields, as well as to managers and colleagues in work settings where HPT is a new resource. Because

the HPT field is still in an emerging and changing state, a grounding in its foundation and history will be crucial to any future attempts to define and set the parameters of HPT itself. Finally, as HPT is implemented globally, an understanding of its conceptual and historical origins provides common ground for practitioners as they apply HPT across borders, cultures, and economic systems.

In this chapter, the emerging field of HPT will be described from both a process and a management point of view. Specifically, this chapter will examine the significant contributions and viewpoints of the discipline's pioneering practitioners, as well as the more established scientific fields from which they came. This chapter will also note the significant contributions of learning psychology, instructional systems, analytical systems, information technology, cognitive engineering, ergonomics and human factors, feedback systems, organizational development, and change. The importance of model building (a clarifying technique used successfully by other, related fields during their evolution) and the relevance of this process for HPT will be discussed. Finally, this chapter will take a look at how the field may evolve over the next ten years as it gains acceptance in organizations around the world.

SIGNIFICANT CONTRIBUTIONS TO THE PROCESS OF HPT

According to Brethower (1995, p. 17), "HPT has enjoyed a 30-year record of achievement," but just where did it come from? A definitive answer is probably some years away, but several major influences can be clearly identified.

Systems

A *system* is a group of interrelated elements forming an entity and usually operating toward a purpose or goal. The use of systems, or the systems approach, is essential to HPT. Without a systemic framework, it would be extremely difficult to achieve improved performance. In fact, it may be impossible to engage in any form of engineering or technology outside a systemic context.

Banathy (1968) provides an excellent overview of the relationship among systems. A system can be either a subsystem or a suprasystem; which one it is depends on the perspective adopted. For example, the internal combustion engine is a subsystem to the suprasystem of the automobile, which in turn is a subsystem to the transportation suprasystem. In the HPT suprasystem, instructional technology is a subsystem, and HPT is a subsystem in the overall management suprasystem (Mager, 1988, p. 10).

According to Jacobs (1988, p. 7), "No one use of the systems approach defines the field," but the relationship among systems allow HPT to be placed in its proper perspective. This paradigm is helpful in understanding the components of HPT and how the field fits into the larger world. Because HPT is composed of

and uses the concepts and techniques of many disciplines—for example, Svenson and Wallace (1989) suggest that HPT uses an engineering-science metaphor—a systemic framework is crucial to fitting its components together, developing models of how they will work and interact, and implementing HPT in practice.

Learning Psychology

For most of recorded history, learning occurred in the mode of apprenticeship. Until about five hundred years ago, all the knowledge and skill of one person could be passed on individually to another. When, through discovery and invention, the amount of available knowledge increased substantially, and when the number of people who knew it all correspondingly decreased, a way had to be found to make learning more efficient. The newly invented medium of writing helped for a while, but soon classroom-based or group instruction was born. Thus information could be imparted to many learners at one time.

In the twentieth century, the pace of discovery and invention, coupled with the population explosion, soon made it necessary that learners spend more and more years acquiring an ever-growing body of skills and knowledge. The classroom teaching model had to be made more efficient. In response to this need, learning psychologists began to merge new techniques of instruction with audiovisual technology (media) (Rosenberg, 1982).

There appears to be general agreement that HPT ultimately stems from the work of a number of behavioral psychologists who began, in the 1950s, to experiment with innovative methods of enhancing learning. This research also led to new perspectives on how people learn. To learning psychologists concerned with prescriptive theory, instructional efficiency and effectiveness were functions of how information is structured, presented, and received by the learner.

Most of the pioneers in the field point to the work of Skinner (1954, 1958), who proposed the revolutionary idea that small-step instruction, coupled with extensive feedback, could significantly enhance learning. Skinner's ideas led directly to the development of the first teaching machines, which made use of a format known as *programmed instruction* (Crowder, 1960). Programmed instruction is one example of the early attempt to marry the principles of learning psychology to audiovisually based instruction. Research and practice in this area led to the important concepts of *instructional feedback* and *reinforcement*.

Out of this work came two important events. First, in 1961 and 1962, Thomas F. Gilbert, a former student of Skinner's, published the *Journal of Mathetics* (the term *mathetics* comes from Greek and refers to learning). In the only two volumes of this journal that were ever published, Gilbert laid the foundation for what was later to develop into the field of instructional technology. In 1962, many of the researchers who had contributed to the *Journal of Mathetics* came together to form the National Society for Programmed Instruction (NSPI). In the

development of any discipline, an important milestone is the point where ideas begin to be shared, especially through publications and meetings of professional societies. Hence the second event to come out of the early research and practice in this new field: NSPI's first meeting. As the 1960s moved into the 1970s, the new discipline began to emerge in the literature, and the use of a systematic approach to creating and delivering instruction has now come to be known as *instructional technology* or *instructional systems design* (ISD).

There were also significant contributions from cognitive psychologists in identifying the nature of skills and knowledge. It was Bloom (1956) who first organized objectives along a taxonomy related to what the learner was supposed to do. Glaser (1966), Bruner (1969) and Gagné (1970) provided seminal work to link the learning process to instructional events.

Instructional Systems Design

The concepts, theories, and practices of ISD are among the most significant underpinnings of HPT, especially when it is viewed from a historical perspective. Reiser (1987) points to the work of Skinner, and to the work of others from the orientation of behavioral psychology, as being a significant contribution to the systematic process that includes programmed instruction (already discussed), task analysis, behavioral objectives, and criterion-referenced evaluation.

Task analysis became critical as instructional technologists realized the need to identify, before instruction was designed, what they intended to teach people to do. Behavioral objectives, popularized most notably by the work of Mager (1975), infused the designers with the realization that the outcomes of instruction must be identifiable, observable, and measurable. Criterion-referenced evaluation was adopted as a way of providing practitioners with techniques for proving that learning had taken place.

ISD, the systems approach applied to learning, directly attacked the problem of inefficient and ineffective instruction. As the demands of society and the exponential growth in knowledge continued to require new approaches to teaching and learning, especially during the two world wars, the need to train large numbers of people in short periods of time had led to the advent of audiovisually based instruction, of which film was a primary example. Research consistently showed that audiovisual media could teach as well as people could, and this finding was a significant breakthrough.

Researchers and practitioners in the field of ISD have been able to use these important concepts in describing a generalized systematic model for their field. First, the instructional requirements of both the learner and the task or job are analyzed, to determine the precise instructional need. Next, an instructional program is designed, with objectives and testing that are linked to the preceding analysis. Instructional materials are then produced and delivered according to the design. In each phase, evaluation data are collected and revisions are

made so that the outcome of the process meets the identified need as closely as possible. One such systematic model has come to be known simply as ADDIE: analysis, design, development, implementation, and evaluation. Today many operational ISD models exist in practice, but most either can trace their roots to ADDIE or accept the ADDIE concept as a foundation.

The development of ADDIE-like models for ISD was crucial to the establishment of the HPT field. As instructional programs depended more and more on the analysis of a need, and as instructional evaluation became more refined, in order to reflect the degree to which the instruction had met that need, it became apparent that a variety of needs could not be met through instructional programs alone. No matter how well the programs were designed, learning did not always result in improved performance. As practitioners became better and better at identifying problems, they soon discovered that their repertoire of instructional solutions could solve only a small set of those problems. A broader paradigm was required.

As practitioners and theorists worked to describe and use this newly expanded paradigm, they relied in part on their extensive experience with the ADDIE model. Because they recognized the limitations of ISD, most notably in the phases of analysis and evaluation (Richey, 1995), important questions surfaced: Analysis of what? Design, development, and implementation of what? Evaluation of what? A new and more analytical paradigm was needed.

Analytical Systems

While working on a variety of government-sponsored training and education projects in the 1960s, many of the earliest learning psychologists and instructional technologists, such as Harless, Gilbert, and Mager, began to develop strategies that dealt with an important realization: if training and education did not accomplish what was expected, then there must be other strategies that might be more effective. They worked on describing ways to analyze problems as a means of determining appropriate solutions.

Harless (1970) coined the term *front-end analysis* when he realized that analysis of an instructional problem often comes too late in the process. When analysis is pushed forward, ahead of an instructional program's design, it becomes possible to look at a particular performance problem in isolation from any perceived solution. Harless and other researchers began to realize that instructional technology was not, after all, the superordinate concept; thus they brought the relationship between instructional and performance systems into proper perspective.

Gilbert (1996) reached several conceptual milestones in describing performance and how it is analyzed. He articulated a process of assigning value to performance by measuring its accomplishments, thus providing a framework for assessing impacts of HPT beyond changes in behavior. Gilbert's behavior-

engineering model also identified six general aspects of behavior that can be manipulated to improve performance: data, instruments, incentives, knowledge, capacity, and motives. Gilbert's model, in one form or another, plays a critical role in the analysis and evaluation of performance.

Rummler and Brache (1988b), using systematic analysis techniques to examine organizational structures, found that individual performance is influenced by organizational performance, and vice versa. They describe organizations partly as collections of integrated systems (for example, the finance, manufacturing, and marketing systems). To this list they add a performance system and suggest that all these systems (and their subsystems) are influenced by a complex and ever-changing variety of outside forces. These systems dynamics require organizational analysis, and the analysis of performance problems requires the analysis of the organization in which those problems occur; thus the "analysis tree" grows larger.

Collectively, the work of Gilbert, Mager, Harless, and Rummler forms a large part of the foundation on which performance analysis and HPT are built. Mager and Pipe (1984), Kaufman and English (1979), Rossett (1987), and many other practitioners have used this work to develop practical suggestions for analyzing performance problems (or opportunities) and their causes.

Cognitive Engineering

The field of cognitive engineering is an interesting example of how multiple fields combine to form a new discipline for dealing with new challenges. Woods and Roth (1988, p. 415) define cognitive engineering as "an applied cognitive science that draws on the knowledge and techniques of cognitive psychology and related disciplines to provide the foundation for principle-driven design of person-machine systems." This new field shows how adaptable learning psychology is when it is confronted with new vehicles (machines or computers) of knowledge delivery. When the old models no longer fit, they can be adapted, borrowed from, or redesigned to create a new approach. This is how cognitive engineering was born.

Cognitive engineering's domain is more limited than that of HPT, but its goals are quite similar. The cognitive engineer links the world of learning with that of computer technology and measures success in terms of the human-machine interface and the resulting productivity. Woods and Roth (1988) stress that their field deals with improved performance. These authors advocate analysis as the first and most important step in achieving this goal. They are emphatic in their argument that knowing how to use a new machine or technology is far less important than accomplishing something with the new tool. They also see their field as systemic. The critical system here, however, is the human-machine system (that is, the interface between humans and machines) rather than the machine and its electronic and mechanical components.

Information Technology

The concepts embraced by cognitive engineering have profoundly influenced the relatively new field of information technology. In addition, the advances made in information technology have had a significant impact on HPT. Gilbert (1996) notes that the effects of a good information system can be staggering. The overwhelming amount of complex information required to perform work at a competent level has placed considerable strain on traditional education and training systems. This situation has led to the development of job aids, computer databases, and electronic training systems as well as of structured text design (Horn, 1982). It has also had a significant impact on work design and organizational structures.

Electronic performance-support systems (EPSS)—linking training, information systems, computer applications, and so on (Gery, 1989)—will have a significant impact on the design and operation of an organization, and on human performance. According to Rosenberg (1995), HPT and EPSS will have essentially the same future; he predicts that "they will be integrated directly into the key processes of an organization" (p. 98). This prediction has been borne out in the growing use of these tools to support increased productivity and quality in a variety of jobs, such as customer care, sales, manufacturing, project management, and even in the HPT field itself.

Eucker (1989) notes that "our assumptions regarding information systems in traditional organizations are out of date" (p. 87) and that "the potential influence of information technology on human performance is likewise limited by inadequate organizational strategies and structures" (p. 89). In his analysis of the influence of information technology on human performance, Foshay (1989) also sees such systems as potentially having a profound impact on organizations. New work routines, changed career orientations, redesigned job environments, and, perhaps, new missions for training and education require a new approach to managing and evaluating such changes. Foshay suggests that HPT may be that new approach, and these developments are already affecting the field. Foshay notes that the traditional view of HPT, in which particular jobs are a given and interventions for improving performance in the jobs are developed, may give way to the design of "organizational structures and information architectures" (p. 125). In other words, it may be necessary to redesign the jobs themselves.

The explosion of information available through the World Wide Web has drastically changed the role and impact of information technology. New fields of knowledge management and information design radically expand the HPT practitioner's toolkit. Having access to just-in-time information and knowledge databases is a capability essential to the modern organization. Access to information clearly has an impact on performance, and the power of the Internet and of company intranets has profoundly increased capabilities in this area (Hinrichs, 1997).

Ergonomics and Human Factors

Ergonomics and human factors are disciplines that developed in response to the world's increasingly complex technology. They can be seen as companion disciplines to information technology and cognitive engineering. According to Phillips (1989, pp. 44–45), "ergonomics and human factors link our quantitative skills to the integrated systems of people, machines, and materials." The fields of ergonomics and human factors help in ensuring that the design of systems complies with the requirements of users. From desk chairs to computer systems to automobiles, the most successful products—those used to their fullest potential—are those that are easily operated, maintained, and understood.

There is an important implication for HPT here. Ergonomics and human factors are concerned with the design of machines, but their primary goal is to improve human performance. According to Shephard (1974, pp. 8–9), "Systems are examined to see (1) how their purpose can be achieved with minimum damage to either operator or machine, and (2) how their design may be improved to facilitate transfer of energy, materials, or information across the man-machine interface." It is clear that in a complex, technological world, human performance is enhanced through the proper application of ergonomics and human factors. For the HP technologist, then, the field encompasses more than the role of human beings; it includes their interactions with their tools.

Psychometrics

Psychometrics is the measurement of human achievement and capabilities. In the past, it was used primarily to measure learning and general ability. Many standardized tests are administered each year to millions of public school and college-bound students. These normative tests were designed to predict performance in learning environments. More recently, valid and reliable tests have been developed to predict performance in task accomplishment or in the demonstration of sets of behaviors. It was only natural that these techniques would be found useful in the development of methods for selecting people to fill jobs or for certifying competence in a job.

Leibler and Parkman (1986) and Ross (1986) provide a good overview of the use of assessment techniques in personnel selection and staffing. Techniques for accurately predicting performance have become important HPT tools. Ross notes that the preliminary purpose of selection is cost-effectiveness, and the implication for HPT is that it may be more cost-effective to select people who are already classified as high performers than to train or motivate mediocre performers. The development of more accurate assessment devices (such as

paper-and-pencil tests, expert or peer evaluation, assessment centers, and so on) relies in part on the advances made by psychometricians.

Feedback Systems

In an extensive review of the literature on feedback systems, Ilgren, Fisher, and Taylor (1979, p. 349) note that "feedback about the effectiveness of an individual's behavior has long been recognized as essential for learning and for motivation in performance-oriented organizations." These researchers see feedback as an essential feature of interpersonal relations and as an appropriate tool for improving performance.

Feedback is a unique type of information. It is reflected in praise, criticism, corrective instruction, nonverbal communication (smiling, anger), and so on. It can be informal, as in a supervisor's daily behavior with subordinates, or formalized, as in a system for performance appraisal. Feedback is directly related to motivation, incentives, and rewards. According to Donald Tosti and Stephanie F. Jackson (see Chapter Twenty of this volume), the critical characteristics of feedback are tied to who gives it, what the content the feedback is, and when and where the feedback is given (see also Tosti, 1986). The literature on supervision devotes considerable space to feedback as a management tool, and HPT embraces performance feedback as an effective and efficient strategy for improving performance.

Recognition of the substantial impact that feedback systems have on overall performance improvement has had a tremendous effect on HPT. Feedback is an essential ingredient of the new performance management systems, which incorporate many other HPT interventions. These include interventions concerned with training, participative decision making, teamwork, quality, incentives, and rewards, among other elements.

Organizational Development and Change

Much of this chapter has considered new approaches to instruction, information, and management as having a significant impact on the organization. Organizational development (OD) is a large field that seeks to deal with this impact. It encompasses many interventions, including organizational design, team building, culture change, leadership, strategy development, management systems, and a variety of techniques designed to transform an organization's beliefs, values, operations, or interrelationships. OD practitioners are extremely people-oriented. They consistently look for opportunities to make the human part of a system work better and thus focus on humanistic rather than behavioristic strategies. The field draws its theory from psychology and organizational behavior.

In an extensive review of the literature, Beer and Walton (1987) look at organizational development from several perspectives. Each perspective has its own implications for HPT. From the first perspective, where the view is of *OD as general management*, attention centers on the operation and general management of an organization. Of specific concern is the culture of the organization, especially the issues of how to manage it and change it. Sometimes an organization's culture can enhance performance by espousing the ideal of a supportive environment. At other times the culture may inhibit performance by inhibiting risk, change, or growth. The performance technologist must understand the culture of the organization in order to implement the interventions most likely to succeed. Another concern is leadership. Research shows that true leadership can be an effective vehicle for change, including change in performance. The HP technologist can use leaders to set a vision, model behaviors, and challenge others.

From the second perspective, OD is seen as *creation of an adaptive organization.* Here we find the component of organizational redesign. Innovative, responsive, and flexible organizational structures can enhance workers' performance; in turn, workers' enhanced performance can help create adaptive organizations. Organizations that are more flexible and more adaptive are more likely to respond to HPT-related changes. Inflexible or rigid organizations, by contrast, make it difficult for new performance improvement strategies to succeed, especially if they involve changes in work patterns, the introduction of new tools or methods, or realignment of jobs.

The third perspective, from which OD is viewed as *human resource management,* gives insight into the effort to "develop high commitment work systems that will attract, motivate and retain superior employees" (Beer and Walton, 1987, p. 353). Such issues as compensation, benefits, and labor relations are important here. For HPT, the challenge is to use these human resource functions appropriately in an integrated approach to improving performance.

OD as implementation of change, as it is viewed from the fourth perspective, embodies much of the research on change and how to make it happen. Change theory and processes are at the very heart of HPT. Lasting, positive change in the workforce's productivity and competence is the goal of any performance improvement system. Change-oriented strategies have been instrumental in enabling the HPT field to expand its goals from individual to organizational results.

Nevertheless, the influence of organizational development and change on HPT has been hampered by the conflict between the imprecise, solution-oriented focus of the OD field and the more rigid, systematic, and measurement-oriented focus of many of the other disciplines. Beer and Walton (1987, p. 363) note that "tension has always existed in the [OD] field between a concern for effectiveness and a concern for the well-being of employees." In the conclusion to their review of the literature (such as it was more than a decade ago), they suggest that the OD field look at a broader array of interventions, moving away from structured, preprogrammed, consultant-centered interventions; and, similarly,

that HP technologists with roots in training obtain more exposure to the OD field. In the future, perhaps, integration between HPT and OD will help achieve these ends.

Intervention Systems

From the intervention side, "human performance technology represents the use of the systems approach in a number of different forms, depending upon the problem of interest and professional activity required" (Jacobs, 1988, pp. 6–7). Interventions are responses to identified causes of human performance problems or to opportunities for improving performance. They are often referred to as *solutions*, although it is difficult to determine whether the problem is "solved" before the intervention is developed. Some practitioners refer to interventions as *strategies*, *tactics*, or *human resource functions*.

The conventional wisdom holds that if some form of individual or organizational change can be designed, implemented, and evaluated with respect to a performance analysis, then it can be considered an intervention. Examples (taken from the preceding discussion) of areas in which interventions can be used are training and education, job design, feedback systems, incentives and rewards, selection and staffing, and environmental engineering. Many practitioners use some type of derivative of Gilbert's behavior-engineering model as an organizational framework.

How many interventions are there? No boundary or categorization scheme has yet been established for determining what is and what is not an intervention. Rosenberg (1990) elaborates on the ISPI model as a strategic overview of HPT. Rothwell and Kazanas (1997), Hutchison and Stein (1997), and Rothwell (1996) provide the most recent attempts to identify and categorize interventions at both the strategic and the tactical level.

HPT is emerging as a two-sided coin. On one side, analysis is concerned with identifying specific problems and opportunities. On the other side, interventions seek to fulfill the recommendations of the analysis. Many contributions from established disciplines have been expansions of intervention options. By looking at the field of HPT, it is possible to identify the initial set of skills necessary for conducting a performance analysis. Determining appropriate interventions is not so simple, however. For example, expertise in instructional systems design is adequate knowledge if training or education is the only intervention used. If, however, performance analysis indicates the possible applicability of dozens or hundreds of different interventions, it quickly becomes apparent that no one person will possess the expertise needed to design, implement, and evaluate them all.

This is a dilemma in HPT: although it is now possible to identify myriad performance problems (or opportunities) and their causes, it is also true that the number of options at a practitioner's disposal has significantly increased. What

can be done? Is the practitioner limited to analyzing a performance problem or an opportunity but not recommending an intervention? If an intervention is recommended, can the HP technologist design, implement, and evaluate it? Is the practitioner essentially a manager or a designer of interventions? Does the practitioner belong to a larger team of experts beyond the still undefined boundaries of the profession? Is HPT not also a superordinate concept? These questions and others are causing the management of HPT to emerge as an important area for study.

MANAGEMENT OF HPT

Where the process of HPT is concerned, much has been contributed by more established fields, but there has been little discussion of the management of that process. It is generally agreed that managing a performance improvement system that is based on HPT is more complex than managing a single intervention, but the information is sparse on how to do this more complex kind of management.

Bullock (1973, p. 3) suggests that HP technologists may not offer a "unique total capability for solving human performance problems" but that the field "brings together a variety of individuals whose combined skills offer a total capability." Hutchison (1990) recognizes this concern by distinguishing between the practice of HPT and the design of specific interventions. She identifies two types of HPT practitioners: the *HP technologist*, concerned primarily with analysis, management, and evaluation, and the *intervention specialist*, concerned primarily with the design and implementation of specific interventions. These roles may be performed by one or more individuals, according to the expertise of the individual and the parameters of the performance gap.

Hutchison stresses the importance of the interrelationships between HPT and other specialist strategies, and she points to the significance of process management in the role of the HP technologist, especially as process management involves the phased and integrated implementation and evaluation of combined interventions. According to Hutchison, it is crucial to distinguish between the practices of HP technologists and those of intervention specialists.

What makes HPT unique is that it is emerging as a field characterized by the integration of the disciplines on which it is built. The usefulness of this integration lies in the assumption that combinations of interventions, taken from a variety of fields, provide greater value when applied to a performance problem or opportunity than does any specific intervention when used alone. This necessary integration will be a cornerstone of how human resources, training, and other such departments are restructured in the future (Robinson and Robinson, 1998).

Gilley (1989) notes that career development in an organization is enhanced when strategies are linked to training and organizational development processes.

With respect to staffing issues, as a result of integrated selection, training, and performance evaluation processes, test subjects have been able to attain higher levels of measurable performance than was previously possible (Pucel, Cerrito, and Noe, 1989). These researchers conclude (p. 28) that "the linkage between selection, training and performance appraisal can result in a legally defensible human resource system that can contribute to management's ability to improve productivity." These two studies are examples of how HPT applications can demonstrate the strategic results of integrated responses, and this emerging orientation of HPT allows the field to be more strategic than the individual fields that compose it. HPT's strategic ability to achieve not just enhanced individual performance but also organizational results is another important foundation of the field.

CONCEPTUAL MODELS OF HPT

While the ISD field was emerging from the established disciplines of learning psychology (behavioral and cognitive), education, and communications, practitioners relied on modeling to help define it. Modeling is a useful technique for describing a new concept, idea, or process. Models like ADDIE helped researchers and practitioners communicate and apply the concepts of the new field. As more people were able to talk about and use ISD, it became more accepted as a legitimate discipline in its own right.

HPT continues the struggle to define itself and understand its roots and boundaries. Meanwhile, new models of the field are emerging. This is to be expected. Any science or technology moves through the following four phases as it attempts to define itself:

1. Observation of phenomena: the realization that there is something new "out there"
2. Classification of phenomena: the description of the new field's components
3. Generalization of phenomena: the identification of consistencies across the components
4. Manipulation and control of phenomena: the application of the new field to some purpose

The pioneers of HPT were reporting observed phenomena, especially in behavioral psychology. They knew that improved performance was a result of a combination of interventions that corresponded to the findings of a valid and reliable analysis of a problem or an opportunity. Furthermore, they realized that

no single discipline, whether it involved training, organizational development, or feedback systems, was now adequate to address situations effectively and efficiently. Models were then built to classify and generalize this new reality and help communicate these conclusions. Once general agreement on models has been reached, it will be possible to move with assurance toward the manipulation and control of phenomena, and applications of HPT will be more likely to succeed. It might be expected that, over time (as was the case with ISD), HPT practitioners will move beyond models, internalizing the systematic process in the ways they think and act. In the meantime, two general types of models have been developed: *diagnostic* and *prescriptive* models. Each type has an important role to play in describing the field of HPT.

Diagnostic Models

Diagnostic models classify the areas where HPT can be applied and can have an impact on performance. Different theorists and practitioners divide the HPT world in different ways. Some focus on types of performance, whereas others focus on aspects of an organization in which various types of performance occur. The four diagnostic models discussed here present the HPT field from three perspectives: the individual, the individual as a member of an organization, and the organization as a whole.

Gilbert (1996) has proposed a diagnostic model that classifies six major elements on two levels: those elements at the level of an individual's repertoire, and those at the level of the environment that supports the individual's performance. Using a behavioral model of stimulus-response-consequences, Gilbert identifies the six elements as data, instrumentation, incentives, knowledge, response capacity, and motives. These six elements can be altered in some way to affect the performance of the individual or a group. A major feature of this model is its movement beyond the narrower focus of instructional interventions and its having begun to broaden the perspective of ISD practitioners. Gilbert's model has been recognized for several important strengths. It identifies and classifies specific areas for performance impact, and each area can be altered to influence behavior. Thus there is a framework for identifying appropriate interventions into each area. It also builds on the contributions of behavioral psychology by tying HPT directly to one of its strongest roots.

Harless (1979) has another perspective on the HPT universe. He places the focus of HPT within the context of the organization and directs it toward human performance on the job. Rather than carving performance into six areas, as Gilbert does, Harless identifies three categories that influence human performance on the job: skill or knowledge, the environment, and motivation. Harless's diagnostic model, by placing human performance in an organizational context, indicates that performance should be in alignment with the organization's goals. His model also implies that it is important for us, in addition to

analyzing influences on performance, to consider who the performers are, what the specific performance is, and how well it is being carried out. Harless's model presents generic areas of intervention that are relevant to the three categories that influence performance, and it depicts interrelationships among the three categories.

Mager and Pipe (1984), adding more structure to a similar assumption, expand yet again the notion of an integrated performance perspective.

Whereas the focus of the Gilbert, Harless, and Mager and Pipe diagnostic models is individual performance, Rummler and Brache (1988a) turn to organizational analysis to provide a framework for enhancing human performance. The realization that organizational performance is as important as individual performance has proved to be a significant contribution to the development of HPT. The belief of Rummler and Brache, in part, is that organizational and individual performance are so different that unique strategies must be developed for each.

Process Models

Diagnostic models help classify areas where HPT *can* be applied; prescriptive models attempt to describe how HPT *could* be applied. Because HPT is partly an outgrowth of ISD, it is natural for practitioners to attempt to use linear systems models (like ADDIE) to describe HPT processes. After all, such models represent a systematic approach and are familiar to the wide range of people engaged in HPT. Although sophisticated practitioners have never assumed that the linear systematic process is adequate for describing multifaceted projects, they have often found it useful in highlighting common stages of problem solving. (This fact is apparent in Bullock's description of an early model for HPT, a model in which the major emphasis is on performance diagnosis; see Bullock, 1973.) Nevertheless, as practitioners attempted to integrate the myriad potential interventions that could be applied to solving performance problems or realizing opportunities for performance improvement, the linear systematic process began to break down.

Mager and Pipe (1984) relate specific interventions to the outcomes of performance analysis. Their model uses a decision-tree format whereby specific interventions are tied to corresponding yes-or-no questions. Mager and Pipe's model is primarily a tool for determining the best intervention to use in removing a discrepancy between actual and desired performance.

Rosenberg (1990), building on the work of Rossett (1987), provides a more detailed view of a performance analysis process. He categorizes a list of potential interventions into four major human resource functions: human resource development, organizational development, human resource management, and environmental engineering. The model shows interrelationships among interventions, and, through the application of the HPT process, the interventions are brought to bear on the performance problems or opportunities identified in the performance analysis.

As previously noted, Hutchison's HPT model (1990) adds a layer of management to the process. In a sense, Hutchison sees HPT practice as two distinct processes: managing HPT and designing interventions.

The HPT field has not developed its own widely accepted model, but the building of models, both diagnostic and prescriptive, still stands as one of the best methods available for continuing to define the field. New models will enable researchers and practitioners to integrate new disciplines, concepts, and interventions more successfully into the expanding practice of HPT.

HPT AT THE MILLENNIUM

Historically, HPT has been in the domain of scientific inquiry and research into specific areas (learning psychology, systems, instruction, and the like). Currently and in the future, however, HPT seems much more likely to evolve from its practical application in organizations. Of particular interest for the field will be the continuing study of how HPT will be used in differing organizations, as well as how HPT will be applied in different cultures and in global corporations.

Corporations, as well as some academic and governmental institutions, can be categorized by several means, and the characteristics of any particular organization's category will affect the nature of HPT development, practices, and emphases within that organization. For example, in what industry does the organization exist? Is it a high-tech organization, a durable-goods manufacturer, or a nonprofit? Is it young or mature? Some start-up organizations are locked in fierce competitive battles over market share; others, more well established in mature industries, are looking for ways to move into other markets as business opportunities become limited in current ones. The nature of the organization's products or services will also affect the nature of its HPT needs; thus, in various categories, successful interventions in recruitment, training, motivation, feedback, the work environment, and so forth may be significantly different, and interventions that work well in one organization may be totally inappropriate to another, even if the performance problems are similar. In fact, HPT itself, born of the merger of many fields, is likely to be practiced quite differently in disparate organizational environments (Coscarelli, 1996). How is the practice of HPT, as well as the fundamental understanding of the field, influenced by the environment in which it is applied? A few examples may shed some light.

A premier consumer products organization in a competitive market knows that, once it introduces a new product, it has about nine months to establish its new product before competitors can respond with a similar product. Thus, for some start-up products, the organization will invest millions of dollars in an assembly line that may fold in less than a year. Given the prospect of such a short life for some products, the organization's heavy investment in training and other technologies seems risky, at least initially. Its first goal is to keep the new-product assembly line running at the lowest possible cost until it can be determined whether the marketplace will support continued investment in and refinement of the new product. Therefore, the organization is relying on EPSS to provide instant advice, at relatively low cost, about repairing or maintaining of the assembly line.

A large international consulting firm is in a competitive service industry that is heavily driven by the need to understand people in organizations and the systems they use to achieve goals. There is a strong emphasis on the ability to think clearly, creatively, and systematically about organizations' problems and the solutions for them. The firm is very selective in its hiring, and it places a premium on both technical and consulting skills; the firm believes that hiring smart, motivated people is the most important step in ensuring high performance from the workforce. The firm also relies on apprenticeships (conducted in person or via electronic media) to develop people's skills, in the belief that people will learn by making mistakes and having experts share their knowledge and experiences with them. Multimedia systems founded on a constructivist philosophy now form the basis of the firm's entry-level course in business practices.

A major manufacturer of large appliances finds itself in a mature industry. Very few refrigerators wear out these days, and washers and dryers last a long time, too. The market has settled down to a few suppliers competing for a relatively small market. The pace of change is not brutal, and heavy emphasis on the more traditional manufacturing processes creates a need for performance solutions that work on the shop floor. The company uses a great deal of on-the-job training and little formal or systematically designed instruction; given the relatively stable workforce, HPT selection strategies are unlikely to pay off significantly for this organization.

A computer company is in a fast-paced, fiercely competitive market, but certain aspects of its manufacturing process cannot be left to informal training. Job performance in the company's "clean room," for example, relies on exceedingly high standards to be successful. Therefore, performance in the clean room begins with formal training that has been systematically designed, developed, and evaluated.

A start-up company that makes electronically based training-and-information systems for physicians has the feel of a high-tech "garage" business and only recently moved to a state-subsidized small-business incubator. Performance at the company depends on the talent pool that can be recruited and on the need to get the next demo done. No formal training or performance-support systems exist, and they are unlikely to be created until a critical mass of staff and income is reached.

A large telecommunications firm has characteristics of both a mature and a fledgling organization, of both a high-tech and a consumer-oriented company, and of both a product and a service orientation. The practice of HPT in this firm is quite complex. In the somewhat mature and highly competitive consumer long-distance market, the company uses EPSS and highly structured on-line training to keep its customer care representatives up to speed on new products and new service offerings. The company's data networking and Internet businesses are closer to high-tech services in this industry that is constantly redefining itself, but the technical and account specialists in this area tend to be more experienced. For them, the use of knowledge and information systems (that is, knowledge management) is appropriate as a performance improvement strategy.

A global industrial corporation is moving its manufacturing operations to countries outside its home base. Its emphasis on quality is posing challenges as it recruits and trains workers from new countries and cultures. In one country, where the workforce is highly skilled, the firm is not putting an initial focus on extensive training but is concentrating instead on the stiff competition in attracting and retaining talent. If employees jump from job to job, the firm may have to give its workers incentives not only to perform to expectations but also to stay with the company. Given the prospect of high turnover, the company, through EPSS, embeds some of its knowledge in processes and systems rather than in people. In another country, this one less developed, recruitment and retention are less of an issue; here, unskilled workers do require extensive training before they can be productive. In a third, highly unionized country with a culture of lifetime employment, the firm must motivate and maintain high performance in a stable and perhaps aging workforce.

Thus, in a global environment, the diversity of cultures, governmental regulations, and economic systems clearly influences how HPT will be used. Many global firms are finding that a mix of HPT interventions (for example, involving training, compensation, motivation, and performance support) must be applied differently, and often delicately, from one country to another.

At any rate, these cases illustrate a quickly emerging, fundamental characteristic of HPT practice: its diversity. "One size fits all" is less likely to be the catchphrase when organizations differ on such fundamental factors as markets, products (and products' life cycles), maturity of the industry, and region of the world where operations are conducted. Although HPT's roots in science and engineering still define its components, especially in the areas of performance analysis and evaluation, these roots will increasingly be intertwined with new ones that are growing from HPT's awareness of business realities, the nature of

today's organizations, and the increasingly global nature of work. Therefore, practice rather than research is likely to have the greater impact on continued evolution of the field.

HPT UNTIL 2010

HPT is directly descended from systems theory and behavioral psychology. Most of its practitioners and theorists have their roots in the training profession, but these people have borrowed extensively from related disciplines (for example, information and feedback systems, ergonomics and human factors, organizational development and change theory, and human resource management). As more work is done to define the multidimensional nature of HPT and performance interventions, practitioners and theorists will have to address more fully the issue of who designs, implements, and manages the performance improvement process. Tosti alludes to the resolution of these issues:

> HPT practitioners have emphasized prescription; the goal is to clearly specify results and to define the performance factors required to produce those results. OD practitioners have emphasized description, with the goal of creating understanding so that people can take action to produce the needed outcomes. For example, if we are measuring individual performance, then task analysis, performance analysis, and skill/knowledge development are key tools. If we are measuring team performance, then interpersonal working relationships are likely to become important factors. If we are measuring departmental performance, then process mapping, information systems, and a host of other factors enter the equation as well. If we are measuring organizational performance, then the importance of organizational culture, strategy, and cross-functional working relationships increases. As we move out from the level of the individual performer to the level of the organization two things happen: (1) the variety of influences on performance increases, and (2) our ability to precisely define and control those influences decreases [Tosti, 1998, pp. 2–3].

Simultaneously, as HPT is applied in more diverse and global settings, not only HPT practitioners but also general managers, employees, and business leaders will begin to shape it in the ways that will be of most benefit to individual organizations. Future HPT concepts, systems, and models will no doubt reflect this complexity and diversity. Moreover, as organizations implement new management techniques, these techniques will increasingly incorporate an HPT perspective. Indeed, as Rosenberg (1996) points out, the processes used by the quality movement are in many respects the same as those used in HPT. In fact, integrating HPT into already established and accepted processes (performance management, reengineering, and the like) may ease the transition to a performance-centered environment and lower resistance to what some may perceive as uncomfortable or even unnecessary change.

We expect that by the year 2010 the competition among several structures currently framing HPT practice will have resolved itself in particular organizations, if not in the field as a whole. From a macro perspective, "ownership" of HPT will reflect an organization's philosophy of empowerment. Some philosophies argue for the placement of HPT processes within the purview of an HRD department (McLagan, 1989); others seek holographic skill development and empowerment in learning organizations (Senge, 1990). In the first situation, the training and interdisciplinary teams offered by existing ID or OD programs may suffice; in the second, context may be so important to success (as in a high-tech organization) that HPT skills will begin to be integrated into the in-house training of subject matter experts.

And this brings us back to the beginning—to systems theory and systems management. Referring to industrial engineering, Phillips (1989, p. 45) notes, "Without this integrated perspective, we will relegate ourselves to the position of overpaid, useless technicians looking for individual problems to shoehorn into individual methodologies." The same challenge may confront HPT.

No one model or conceptual approach addresses all a practitioner's needs or totally defines the field of HPT. There are, however, five cornerstones that form a basis for describing the discipline:

1. HPT operates within a systemic framework.
2. HPT depends on a comprehensive analytical process.
3. The application of interventions to solve performance problems, or to realize opportunities for performance improvement, requires a nonlinear perspective.
4. HPT will most probably involve expertise that resides not in individuals but in diverse teams.
5. Future HPT practice will depend in many ways on organizational settings and on the requirements of practitioners and sponsors.

Given these five cornerstones, HPT will involve a substantial amount of sophisticated project management and contextually sensitive solutions.

Taken together, the conceptual underpinnings and models of the field can provide a framework to help define both where HPT is relevant and how it can be used. Over time, the field of HPT will develop a more solid base on which researchers and practitioners will be able to build while developing a more diverse set of applications. From these developments will emerge others. They will include a curriculum for teaching the HPT profession, a body of replicable research that builds on previous work, sets of standards and competencies that

define HPT practice, and a more definitive set of boundaries and parameters for the field.

While HPT is becoming more mature as a unique field of study and practice, it is also becoming more accepted in the workplace—and acceptance in the business arena, especially in global companies, means that HPT is generating worldwide interest. Indeed, the language of HPT, its processes, and its fundamental pillars are universal, transcending geography and culture and truly beginning to have an impact on the world economy. As this development proceeds, HPT practitioners will become more valued and respected for the specific and organizationally beneficial contributions they can make, and the field will develop even more. It is essential that study and discussion of the foundations, origins, and conceptual milestones of HPT, as well as our envisioning of the next stages of HPT's evolution, continue in a robust way. As this chapter has shown, an understanding of HPT's roots can be an essential instrument in the evolution of its future.

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CHAPTER THREE

Transforming Organizations Through Human Performance Technology

Geary A. Rummler

The term *transforming* means a lot of different things these days. In the context of this chapter, we will be talking about transforming an organization from one that performs at a particular level of output to one that performs at a higher level. Such a transformation may include a change in what is called the organization's *culture,* but the organization will certainly undergo a change in its performance infrastructure, or *performance system.* To complete such a transformation, two things are required:

1. A method for designing the necessary performance system to achieve the new levels of performance
2. Organizational leadership that can recognize the need for the higher levels of performance and make the changes and sacrifices necessary to achieve them

This chapter will focus on the first requirement, the method; the critical issue of leadership is addressed elsewhere in this handbook.

Underlying the method is Human Performance Technology (HPT), which is distinctly different from other approaches to change and performance improvement. Unfortunately, this distinction is not obvious to the casual observer. This chapter deals with the two ways in which the HPT approach differs from other approaches to improving performance and solving problems. The first way concerns the unique worldview or vantage point held by the HP technologist;