Behavioral, Cognitive, and Technological Approaches to Performance Improvement

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CONTENTS

Introduction .....................................................................................................................................................................508
What Is Performance Improvement? ..............................................................................................................................509
   How Is Performance Measured? ...........................................................................................................................509
Three Approaches to Performance Improvement ..................................................................................................510
   The Evolution of the Behavioral Engineering Models .........................................................................................510
   The Evolution of the Cognitive–Motivational Models .........................................................................................510
   The Evolution of the Technological Models ........................................................................................................510
Behavioral Engineering Models of Performance Improvement ..................................................................................511
   Gilbert’s Human Competence Model ....................................................................................................................511
   Rummler–Brache Three-Level Model ....................................................................................................................512
   Pershing’s Performance Improvement Process Model ........................................................................................513
   Interventions in Behavioral Engineering Models .............................................................................................514
   Features of the Behavioral Engineering Models ...............................................................................................514
Cognitive–Motivational Approaches to Performance Improvement ..............................................................................515
   Goal-Setting Theory ..............................................................................................................................................515
   The High Performance Cycle Model ...................................................................................................................515
   The Effects of Feedback on Performance ............................................................................................................516
   The Effects of Incentives on Performance ............................................................................................................517
   Features of the Cognitive–Motivational Models ...............................................................................................518
Technological Approaches to Performance Improvement ..........................................................................................519
ABSTRACT

Often, training fails to improve organizational outcomes. Increasingly, practitioners are assuming a performance improvement perspective that takes a holistic and systemic perspective in analyzing causes of and solutions for gaps in organizational results. We review the models and evidence for three perspectives on performance improvement: behavioral engineering, cognitive–motivational, and technological. The behavioral engineering models prevalent among U.S. practitioner-oriented professional societies apply a pragmatic systemic approach that evaluates performance factors at the organizational, process, and individual worker or team levels. The cognitive–motivational approaches prevalent among industrial and organizational psychologists include guidelines for goal setting, feedback, and incentives. The cognitive models are based on empirical evidence and incorporate motivational and cognitive moderators of their interventions. Recent advances in computer technology offer opportunities to deliver performance support in new ways. In our discussion of technological approaches, we focus primarily on the evolution of and evidence for electronic performance support systems (EPSSs) in the workplace.

KEYWORDS

Electronic performance support system (EPSS): Enabler of work tasks that are delivered by electronic technology provided to individuals or teams at the time of need on the job. Typical support includes procedural guidance or references to factual information needed to complete tasks.

Feedback: Information on goal attainment designed to help workers, teams, or functional units monitor and evaluate their progress in achievement of desired accomplishments. Feedback may be quantitative or qualitative; it may or may not include explanations to guide performance; it may be directed to individual, team, unit, or organizational levels; and it may be provided through personal communications or through impersonal channels such as charts and graphs posted in work areas or by computer.

Goal-setting theory: Guidelines for optimizing worker or team performance by setting specific and difficult goals; goal-setting theory considers the effects of self-efficacy, goal commitment, feedback, and incentives on goal effectiveness.

Incentives: Tangible and social rewards intended to optimize performance of individuals or teams; may include money, feedback, and social recognition.

Performance improvement: An approach to optimizing organizational outcomes that uses a systemic comprehensive methodology to define and resolve gaps at the organizational, process, and individual worker levels.

INTRODUCTION

Imagine the following situations: (1) A large utility is the target of so many customer complaints of rude telephone service that the Public Utilities Commission directs the utility to remedy the problem or face fines. (2) A team of high-performing data entry clerks moves to a new facility, bringing along all of their existing furniture and computers; after a couple of weeks, management is distressed to see that online error rates have jumped. (3) A piece of equipment inexplicably shuts off, and the breakdown halts production in the factory and costs the company millions of dollars in lost productivity; the technician knows that this problem has happened before during another shift but does not know the procedure to repair the machine because it happens so infrequently. (4) Washington, D.C., gets federal funding to hire an extra 900 police officers to fight rising crime, but 3 years later 10 police officers hired during that time are arrested for abetting drug dealers. All of these real-life situations resulted in bottom-line negative consequences for the organizations involved, and in all cases the responsible managers requested a training program to solve the problem. Even after a well-designed training program was implemented, however, the problems remained. Why? The reasons for the performance gaps had nothing to do with lack of worker knowledge and skills. Frequent observations that well-designed training programs do not always translate into improved organizational outcomes have given rise to the principles and practice of performance improvement.
Unlike many other chapters in this Handbook that discuss instructional interventions and issues, our chapter focuses on factors other than knowledge or skills that influence workforce performance in organizational settings.

WHAT IS PERFORMANCE IMPROVEMENT?

In the past 20 years, scenarios like those summarized above have led to a professional practice called human performance technology. Table 39.1 lists some of the recent definitions for human performance technology. These definitions share the following two features:

- **A focus on desired organizational accomplishments**—Performance improvement initiatives are pragmatic: to improve outcomes that are linked to bottom-line goals of the organization. In the commercial sector, outcomes are typically related to metrics for sales, product quality, customer satisfaction, and work efficiency. In the government sector, outcomes are typically related to indicators of mission accomplishment, product or service quality, and efficiency.

- **Comprehensive and systemic perspectives**—Human performance analysis and interventions address the interrelated parts of an organization, including the individual worker, teams, departments, business processes, and organizational levels.

In 2006, in the United States about $56 billion was invested in workforce learning (Training Magazine, 2006). The actual investment was much greater because this figure does not take into account the most expensive element of any training program—the salary time of the training participants as well as the lost opportunity costs. While sales professionals are in training, they are earning a salary and they are not selling. Because training is an expensive intervention, a performance improvement perspective first defines the factors needed to attain desired outcomes and only recommends training when there is a gap in worker knowledge and skills. Managers often assume that training is the appropriate (and only) route to achieve performance goals. The challenge of the performance improvement professional is to partner with line clients to jointly assess the performance environment, define barriers to and enablers of those behaviors that lead to desired organizational accomplishments, and recommend interventions (solutions) that reduce or eliminate those barriers.

How Is Performance Measured?

In this chapter, we examine three perspectives on performance improvement: behavioral, cognitive—motivational, and technological. All three perspectives have a similar goal—namely, the improvement of desired organizational end results. Unlike instructional-dependent variables, which usually rely on learning measures in the form of tests, the measures of performance improvement vary widely. In the commercial sector, bottom-line metrics are linked to profitability (e.g., sales, expenses, errors or rework, profit). In many

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**TABLE 39.1**
Definitions of Human Performance Technology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human performance enhancement</td>
<td>The field focused on systematically and holistically improving present and future work results achieved by people in organizational settings</td>
<td>Rothwell (1996)</td>
</tr>
<tr>
<td>Human performance technology</td>
<td>The systematic and systemic identification and removal of barriers to individual and organizational performance</td>
<td>International Society of Performance Improvement (<a href="http://www.ispi.org">www.ispi.org</a>)</td>
</tr>
<tr>
<td>Human performance technology</td>
<td>The process of selection, analysis, design, development, implementation, and evaluation of programs to most cost-effectively influence human behavior and accomplishment</td>
<td>Harless, cited in Geis (1986)</td>
</tr>
<tr>
<td>Performance improvement</td>
<td>The study and ethical practice of improving productivity in organizations by designing and developing effective interventions that are results oriented, comprehensive, and systemic</td>
<td>Pershing (2006)</td>
</tr>
<tr>
<td></td>
<td>The process of identifying and analyzing important organizational and individual performance gaps, planning for future performance improvement, designing and developing cost-effective and ethically justifiable interventions to close performance gaps, implementing the interventions, and evaluating the financial and non-financial results</td>
<td>American Society for Training and Development (<a href="http://www.astd.org">http://www.astd.org</a>)</td>
</tr>
</tbody>
</table>
cases, measures that are already in place in organizations, such as customer satisfaction, error rates, productivity measures, employee turnover, and sales volume, are used as dependent measures; for example, in a study on the effects of different incentives on performance in fast-food stores, the dependent measures included store profit, drive-through times, and employee turnover (Peterson and Luthans, 2006). In other organizations, such as nonprofits or government, the measures link to the organizational mission statement or goals. When organizations do not have clearly defined measurable goals, the first performance improvement intervention must engage responsible management to establish relevant goals and metrics.

THREE APPROACHES TO PERFORMANCE IMPROVEMENT

There is nothing new about a focus on workplace performance. At the end of the 19th century, the Industrial Revolution spawned some of the first attempts to make workplace performance more efficient and effective. Frederick Taylor (1911) promoted scientific management based on time and motion studies to maximize work efficiency. His recommendation that rewards be linked to the level of performance is in line with contemporary evidence on the effect of compensation on performance. In the mid-1900s, Maslow’s theory of needs and Vroom’s expectancy theory both focused on motivational explanations of performance. At around the same time, behaviorism based on Thorndike’s law of effect and extended by B.F. Skinner gave rise to a human engineering approach to performance. From these paradigms, two branches of performance improvement have evolved: one reflecting behaviorist roots tempered by systems theory and a second evolving from industrial/organizational (I/O) research and theory on motivation in the workplace. We refer to these two branches as behavioral engineering and cognitive–motivational. Recently, the evolution of computer-based technologies has prompted a third approach that we call technological. Our discussion of technological models focuses primarily on the use of computer technology to offer electronic performance support. Electronic performance support encompasses an eclectic array of digitally delivered interventions that may embody either behavioral or cognitive–motivational assumptions.

The Evolution of the Behavioral Engineering Models

Around the mid-20th century, behaviorists applied the concept of contingencies to training through programmed instruction. A number of these behavioral scientists in the United States founded the National Society for Programmed Instruction in 1962. In the process of implementing and evaluating programmed instruction and instructional design models, several of these professionals discovered that even well-designed training did not result in the accomplishment of organizational goals. Thomas Gilbert, for example, stated: “I found that businesses had all kinds of performance problems and most had nothing to do with training. That really struck me. I realized that the world of work was really screwed up and that before I could make the world safe for instructional design I had to get all the other problems cleaned up. That’s where the first ideas for performance technology came from” (Dean, 1994, p. 37).

The frequent failure of training to produce organizational results led to a focus on factors in addition to knowledge and skills that influence work place performance. Gilbert’s book, Human Competency: Engineering Worthy Performance, published in 1978, and Joe Harless’ An Ounce of Analysis (Is Worth a Pound of Objectives), published in 1970, represent two milestones in the behavioral engineering approach to performance improvement. Over the past 40 years, as the behavioral engineering approach evolved, the National Society for Programmed Instruction refocused its mission and scope and today is called the International Society for Performance Improvement (www.ispi.org).

The Evolution of the Cognitive–Motivational Models

At the same time, the cognitive–motivational branch of performance improvement scientists focused on managing work behaviors through motivational means, most notably through goal theory, recently integrated with social cognitive and self-efficacy theory. Based on 35 years of empirical research, Locke and Latham (2002) summarized their goal-setting model, which specifies the mechanisms and processes that link goal setting to performance improvement.

The Evolution of the Technological Models

In her milestone book, Electronic Performance Support Systems, Gery (1991, p. 34) stated that:

The goal of an EPSS is to provide whatever is necessary to generate performance and learning at the moment of need. We now have the means to model, represent, structure, and implement that support electronically—and to make it universally and consistently available on demand any time, any place and regardless of situation.
Performance support systems have evolved alongside advances in technology. Knowledge management systems allow employees to tap into the knowledge of experts. Learning content management systems now make it possible to link to learning objects originally developed for training as on-the-job support. Search engines and visual mapping systems make it increasingly easy for employees to locate support content. Mobile devices will allow employees to access content anytime, anywhere from their cell phones and iPods. Electronic performance support system (EPSS) approaches to performance improvement focus on the use of technology in various ways to help workers, teams, and functional units achieve organizational outcomes. EPSS interventions are varied and may reflect behavioral or cognitive–motivational perspectives.

In the next sections, we summarize the behavioral, cognitive, and technological approaches to performance improvement. Although we could have summarized many behaviorist performance models, we briefly describe three here that have played a significant role in the evolution of the International Society for Performance Improvement. These are the models of Gilbert, Rummler and Brache, and Pershing. We summarize the Gilbert model to describe one of the acknowledged foundational approaches to human performance technology. The Rummler–Brache model is included as one of the most influential recent performance improvement models that builds upon and extends Gilbert’s pioneering work. Finally, we summarize the Pershing model as a very recent synthesis of behavioral approaches summarized in the 2006 Handbook of Human Performance Technology. Regarding cognitive–motivational approaches, we summarize goal setting and the high performance cycle from Locke and Latham (2002) as well as other recent research on goals, feedback, and incentives reflecting a cognitive perspective. To address the role of technology in performance support, we will also look at research and practice in the use of electronic performance support systems (EPSSs) to improve workplace performance.

**BEHAVIORAL ENGINEERING MODELS OF PERFORMANCE IMPROVEMENT**

Thomas Gilbert, who worked with B.F. Skinner, is considered one of the founding fathers of the behavioral performance improvement approach. Much of Gilbert’s performance model, originally published in 1978, has been incorporated into more recent human performance models.

**Gilbert’s Human Competence Model**

As shown in Figure 39.1, Gilbert articulated a behavioral/systems model in which individual workers act on inputs (stimuli) in ways that produce results (responses) which in turn have consequences. Based on feedback, workers modify their performance to increase positive consequences. This systems perspective is a major feature of all behavioral engineering approaches to performance improvement. Gilbert defined specific performance factors in terms of information (inputs), instrumentation (inputs), and motivation (consequences) in a two-tier model with tier 1 focusing on the environmental factors and tier 2 focusing on the individual performer (Figure 39.2). Summarizing environmental performance factors, cell 1 includes the informational resources required to perform the job, including work standards, work documentation, and performance feedback. Cell 2 specifies environmental resources, including money, time, equipment, ergonomics, leadership support, and work processes. Cell 3 focuses on incentives including compensation, recognition, and developmental opportunities. The lower
tier includes similar categories as they apply to the individual worker: Cell 4 includes knowledge and skills based on adequate training. Capability to do the job is the theme of cell 5, which includes the physical, mental, and emotional job prerequisites. Cell 6 addresses motives of the individual worker to invest effort and persist in response to the available incentives.

Many of the basic elements of human performance improvement are reflected in the Gilbert model, which has a focus on accomplishment—outcomes rather than events. He distinguished between environmental influences, such as tools and standards, and factors related to individual performers, such as working aids and selection. The Gilbert model is a behavioral systems approach that depicts workers as respondents to inputs adjusting outputs based on feedback and consequences of their actions. Aspects of the Gilbert model have been carried forward in all of the behavioral models that followed it.

![Gilbert's six-cell performance factors](image1.png)


### Rummler–Brache Three-Level Model

The Rummler–Brache (1995) model incorporates Gilbert’s behavioral engineering concepts, adding a systems view of organizations and the opportunity for improvement through process alignment. In their 1995 book *Improving Performance: How to Manage the White Space on the Organization Chart*, they stated that: “In our experience, the greatest opportunities for performance improvement often lie in the functional interfaces—those points at which the baton is being passed from one department to another” (p. 9). As shown in Figure 39.3, the Rummler–Brache model focuses on planning and management at three levels of performance—the organizational level, the process level, and the individual job performer level. The job level performance factors are similar to those specified in the Gilbert model; however, the Rummler-Brache model emphasizes a holistic view of organizations and the need for alignment among the three main interfaces.

![Rummler-Brache three performance levels model](image2.png)

Behavioral, Cognitive, and Technological Approaches to Performance Improvement

of organization, process, and individual performer. A Rummler–Brache analysis evaluates performance factors at all three levels: the strategies, goals, measures, structures, and resources at the organizational level; the flow of inputs and outputs through functional units at the process level; and the various individual worker factors described in the Gilbert model. One major underlying premise is that the three levels are interdependent and that planning and management must occur at all three levels. To address individual worker factors outside of the larger context will often be counterproductive. The Rummler–Brache model is widely used today as a guide for a comprehensive behavioral engineering approach to performance improvement.

Pershing’s Performance Improvement Process Model

We include the Pershing model (2006), summarized in Figure 39.4, because it focuses on the performance improvement process and thus adds a different quite recent perspective on human performance improvement. Typical initiators of a performance improvement project might be performance problems such as the ones we summarized in our opening paragraph, quality improvement initiatives or business opportunities such as acquisitions and mergers. The Pershing performance assessment process recommends initiating a performance improvement effort by identifying perceptions or perceived needs. This process includes identifying the sponsors, champions and stakeholders of a performance improvement initiative, determining how the need originated and the importance of the initiative. An early step at this stage is to assess the alignment of any performance initiative with the operational objectives of the organization. If the problem is resolved or the goal is achieved, will the outcomes align with the values, culture, structure, and goals of the larger organizational environment? As Pershing (2006, p. 18) stated: “Organizations are often caught up in expending resources and time in solving problems or seizing opportunities with little or no payback or contribution to organizational goals.”

Once an alignment is realized, the performance assessment examines factors in organizational, management, physical, and human systems. At the organizational level evaluating the structure, communication lines, divisions of labor, and methods of operation and decision making may offer avenues for improving organizational viability and effectiveness. Management system analysis assesses the quality of the key management functions to delegate, develop others, conduct performance appraisals, and set priorities. An assessment of physical and technical systems considers the adequacy of the technical processes as well as the equipment and tools that workers are using to accomplish their goals. This includes ergonomic issues, functionality of technical systems, process engineering, and

job aids both traditional and electronic. Last, a review of the human systems focuses on selection processes, knowledge, and skills, along with rewards and incentives. As a result of the performance scan, gaps are identified related to one or more of these systems to be resolved by an appropriate intervention.

**Interventions in Behavioral Engineering Models**

Interventions in the behavioral engineering approaches involve either a removal of barriers or the addition of enablers of performance within the organizational, management, physical, or human systems. Typical interventions can include process reengineering, management standards and training, ergonomic modifications, job aids (traditional and electronic), job standards, performance feedback, and incentives, as well as training, to name a few. Recall the performance problems we mentioned in our introduction. In all of these situations, management called for a training solution; for example, the utility management called for a telephone courtesy course to reduce customer complaints of rude service, the data entry clerks were given a refresher training course to reduce input errors, and so on. The performance problems did not wane after training, though. A closer look at the organizational, management, technical, and human systems found that the gaps were unrelated to knowledge and skills.

Structured observations of customer call simulations, for example, showed that most of the utility customer service representatives were capable of making courteous responses; however, their job standards, feedback, and incentives were set at 120 calls per day. There was a misalignment of job standards, feedback, and incentives with desired work accomplishments (e.g., courteous responses). As long as management demanded and rewarded quantitative outcomes only, quality would suffer.

With regard to the data entry clerks, analysis of error patterns showed that most were made in the later afternoon after 2:00 p.m. Interviews and observations of work conditions showed that sunlight coming through the large windows in the new facility created a glare on the computer screens that reduced the level of visibility on the screens in the afternoon hours. An inexpensive ergonomic solution was in order—good window shades (Addison and Haig, 2006).

In Washington, D.C., the $500 million in federal funds available to hire new police officers had to be spent within a 2-year period. As a result, there was no time for the usual psychological screening and background checks (Flaherty and Harrison, 1993). This performance problem had its roots in a failure to apply an effective selection system.

As shown in Figure 39.5, only a small proportion of performance gaps stem from lack of knowledge and skills and warrant a training solution. The vast majority require solutions that address the organizational, management, physical, or human systems. Rothwell and Kazanas (2004) identified five of the most frequent alternatives to instructional solutions: feedback, job performance aids, reward systems, employee selection practices, and organizational redesign.

**Features of the Behavioral Engineering Models**

The strength of the behavioral perspective is its holistic and pragmatic approach that, when effectively applied, improves organizational results by aligning organizational efforts vertically, horizontally, and at the individual worker level. The knowledge base of the behavioral engineering community rests primarily on extensive case-study work and the articulation of models such as those summarized above. The behavioral engineering perspective lacks experimental evidence; for example, a review of articles published in the main ISPI research journal, *Performance Improvement Quarterly*, found that 36% of the articles in the period from 1997 to 2000 were based on data (Klein, 2002), a number that increased to 54% for the time period 2001 to 2005 (Marker et al., 2006). Of the reports based on data in the Marker et al. analysis, only 5% reflected experimental or quasi-experimental research studies.
As reflected in the models reviewed here, a diverse set of practitioner perspectives and skills is often needed to define and to implement a comprehensive performance solution. A second potential limitation of the behavioral models is the one-size-fits-all perspective. A basic assumption of the behavioral engineering orientation is that performance can be engineered by modifications to the environment with little consideration for how individual worker or task differences might interact with the modifications. This assumption may lead to recommendations that do not factor in critical differences in the nature of the work tasks or differences among individual worker motivations and skills.

Cognitive–Motivational Approaches to Performance Improvement

In the previous section, we reviewed the main tenets and assumptions of the behavioral engineering perspective on performance improvement. In contrast, industrial and organizational psychologists have relied to a large degree on experimental evidence as well as a cognitive perspective on workplace performance. In this section, we summarize the main findings from goal-setting theory as well as the effects of feedback and incentives on performance outcomes.

Similar to the behavioral engineering models summarized in the previous paragraphs, the cognitive–motivational performance models are designed to predict, explain, and positively influence organizational results. In addition, cognitive approaches address some of the same performance factors as the behavioral models—most notably, performance standards (goals), feedback, and incentives. Unlike the behavioral engineering models, however, cognitive–motivational guidelines are based on numerous experiments—both controlled laboratory experiments as well as field studies. In addition, these models incorporate interactions between the workplace environment and internal psychological processes. Theories based on interactions between internal mental processes and external environmental factors are one of the features of cognitive models that distinguish them from behavioral approaches; for example, a behavioral perspective assumes that worker feedback will generally exert a positive effect on work outputs. In contrast, cognitive approaches show that sometimes feedback has a detrimental effect on performance because it directs attention to the self rather than the task (Kluger and DeNisi, 1996). For success, feedback must be designed and delivered in ways that direct attention to the task—not the self. When addressing performance factors such as goals, feedback, and incentives, cognitive models ask about how they exert their effects and how they should be implemented adaptively based on their mechanisms of action.

Goal-Setting Theory

The core finding of goal theory is that there is a direct and positive relationship between goal difficulty and subsequent performance with effect sizes ranging from .52 to .82—in the moderate to high range. Locke and Latham (2002) have found that specific difficult goals consistently lead to higher performance than more general goals such as “do your best.” When goal levels are held constant, higher levels of performance are realized from individuals with high self-efficacy who believe that with effort they can attain the goals.

The High Performance Cycle Model

Goal-setting theory has studied both the mechanisms and modifiers of goals summarized in the high performance cycle model shown in Figure 39.6. Regarding mechanisms, goals are effective because they direct attention followed by effort toward goal-relevant activities and
away from activities that do not achieve goals. In addition, goals energize performance, prolong effort and stimulate more effective approaches to job tasks.

Challenging specific goals may not always result in better performance, however, because there are some proven moderators of goal setting on performance. First, workers must make a personal commitment to achieving the goal. To ensure goal commitment, goal attainment should be positioned as important, and workers should be assured that they can attain the goal. Although there has been a popular belief that participative setting of goals results in greater goal commitment, research has not born this out; rather, an assigned goal is as effective as one set collaboratively provided the purpose or rationale for the goal is given. Meta-analysis of the effects of participation in decision making on performance has yielded a low effect size of .11 (Locke and Latham, 2002). Apparently, the greatest benefits derived from participative goal setting are cognitive in nature as a result of information exchange among the participants.

Goal commitment can be enhanced by monetary incentives, with more money leading to greater commitment; however, if the goal is very difficult and incentives are contingent on reaching the goal, workers will tend to abandon the goal once they sense they will not reach it. Instead, goals should be moderately difficult, or employers should pay for performance levels rather than goal attainment. To boost self-efficacy (e.g., to promote self-confidence in attaining the goal), adequate training must be provided to increase mastery, combined with role modeling or persuasive communications that express confidence in the workers’ abilities.

A second moderator of goal-setting effects is feedback. For goals to be effective, workers benefit from feedback that shows their progress in relationship to the goals. Combining goals with feedback is more effective than goal setting alone; however, a recent meta-analysis on the effects of feedback on performance (Kluger and DeNisi, 1996), summarized in the next section, offers additional insights about how to use feedback most effectively to maximize performance.

Task complexity is a third moderator of goal-setting effectiveness. Most of the research has been conducted on tasks of relatively low complexity. As the complexity of the task increases, goal effects will increasingly depend on the ability of the worker to discover appropriate task strategies. Because some workers will be more successful than others, the effect of goals on complex tasks is smaller than on simple tasks. Meta-analysis shows an effect size of .48 for complex tasks compared to .67 for more simple tasks. On complex tasks, a learning goal might lead to better performance than a performance goal.

In summary, Locke and Latham (2002, p. 714) concluded that:

…the effects of goal setting are very reliable. …With goal-setting theory, specific difficult goals have been shown to increase performance on well over 100 different tasks involving more than 40,000 participants in at least eight countries working in laboratory, simulation, and field settings.

### The Effects of Feedback on Performance

Providing feedback on goal attainment results in better performance than goal setting alone. Kluger and DeNisi (1996) summarize guidelines and a theory of feedback based on a meta-analysis of 607 effect sizes contained in 131 papers spanning 23,663 observations. A histogram of these effect sizes is shown in Figure 39.7. Although the average effect size was moderate.

![Figure 39.7](image-url)
and positive (.4), over one third of the feedback interventions either had no effects or sometimes even depressed performance. Kluger and DeNisi (1996, p. 254) emphasized that “a considerable body of evidence suggesting that feedback intervention effects on performance are quite variable has been historically disregarded by most researchers. This disregard has led to a widely shared assumption that feedback interventions consistently improve performance.”

To explain the variable effects of feedback on performance, Kluger and DeNisi proposed that feedback primarily refocuses the workers’ attention to one of three levels: self, task, or task detail. A shift of attention to the task level or the task detail level usually will result in a positive effect; however, if attention is refocused to the self, performance suffers. The reason is that, for many, feedback that draws attention to the self is threatening and diverts limited cognitive resources from the productive task and task details level.

When Kluger and DeNisi evaluated the moderators of feedback, they found that cues that direct the workers’ attention to self such as normative feedback (how you do compare to others?), feedback that is either discouraging or includes praise, and feedback from a person compared to feedback from a computer all attenuate the positive effects of feedback. That is because all of these cues direct mental resources to self goals rather than to task goals. In contrast, feedback that shows progress from previous attainments, emphasizes correct solutions, and comes from a less personal source such as a computer augments feedback effects by focusing attention on the task. These effects are moderated by self-esteem. Individuals low in self-esteem will direct negative feedback to the self more than individuals high in self-esteem; therefore, negative feedback will have a more negative effect on the performance of those with low self-esteem. In addition, as summarized by Locke and Latham (2002), Kluger and DeNisi (1996) also reported that feedback improves performance more in the presence of goals.

The Effects of Incentives on Performance

The role of consequences (rewards) is a key element of all performance improvement paradigms, but what do we know from research about the types of incentives that improve performance? Two meta-analyses published in 2003 offer some insights on the effects of incentives on performance. Stajkovic and Luthans (2003) reviewed the average individual and combined effects of three common incentives—money, feedback, and social recognition—on work performance. They hypothesized that the three reinforcers together would have a synergistic effect that was greater than the sum of the three used individually as a result of different and complimentary mechanisms. Money has high instrumental value and will likely lead to extra effort to increase performance; however, monetary rewards do not provide much information about the performance. Workers may not be sure what must be accomplished, where to get resources, or how to correct unproductive behaviors; therefore, a second reinforcer—feedback—derives its power from the information it provides. Finally, social recognition has positive effects on performance as a predictor of future positive consequences such as promotions and raises.

The data from the meta-analysis are summarized in Figure 39.8, which shows the percentage effects of various reinforcement interventions on performance both individually and in combination. The

![Figure 39.8 Percentage effects of reinforcement interventions on employee performance. (From Stajkovic, A.D. and Luthans, F., Pers. Psychol., 56(1), 155–194, 2003. With permission.)](image-url)
three incentives combined (C4) clearly have a greater positive effect than any single incentive or the mathematical sum of the three effects measured individually. Of the individual incentives, money has the largest effect followed by social recognition. The studies that evaluated the effects of all three reinforcers showed a 45% impact on performance. The sum of the individual effect sizes equaled 1.48; however, the actual effect size from studies that combined all three equaled 1.88. This difference in actual and combined effect sizes suggests a synergistic effect of all three in concert. The authors reported an average effect size of 16% improvement in performance. Money improved performance 23%, social recognition 17%, and feedback 10%. Stajkovic and Luthans (2003) suggest that the impact of feedback will be even greater in more complex tasks where the information value of feedback will exert greater leverage than with less complex tasks.

A second meta-analysis on incentives by Condly et al. (2003) reported that all incentive programs in all work settings and on all work tasks resulted in a 22% gain in performance, a figure quite close to the 16% reported by Stajkovic and Luthans (2003). Condly et al. (2003) found that team-directed incentives had a markedly superior effect compared to individual-directed incentives and that monetary incentives resulted in higher performance gains than tangible incentives such as gifts and travel. They also found that long-term incentive programs led to greater performance gains than short-term programs.

A recent quasi-experimental control group study reported by Peterson and Luthans (2006) compared the effects of financial and nonfinancial incentives applied to fast-food franchise store teams on three outcome measures of performance over a 9-month time period. In their research, 21 fast-food stores were randomly assigned to two treatments or a control group. One treatment offered a monetary incentive to the entire team, the amount of which was contingent on the number of points earned by structured management observations of desired behaviors. The nonfinancial treatments involved feedback provided on charts and social recognition offered to the entire team by the managers. Peterson and Luthans (2006) compared the performance outcomes of store profit, drive-through times, and employee turnover at 3, 6, and 9 months.

With regard to profits, they found significant main effects for both interventions. At 3 months, both the financial and feedback-recognition groups outperformed the control stores, with the financial interventions outperforming the nonfinancial. By 6 and 9 months, however, both the financial and nonfinancial interventions had a similar positive impact on profits. With regard to drive-through times, at all three time periods both the financial and nonfinancial groups improved performance equally compared to the control stores. Although both treatment groups experienced less turnover than the control groups, the financial incentive had significantly greater impact on turnover than the feedback-recognition incentives. Specifically, the study showed that average profits rose from 30% from pre-intervention to post-intervention over the 9 months for the financial condition and 36% for the nonfinancials; drive-through times decreased 19% for the financials and 25% for the nonfinancials; and turnover was reduced by 13% for the financials and by 10% for the nonfinancials. An interesting outcome of this study is the differential effects of the incentives on different performance outcomes; for example, turnover responded differently than profitability to monetary and feedback-recognition incentives. Consequently, we recommend that research studies use more than one performance metric as a dependent measure and evaluate results over a period of time.

In summary, the recent meta-analyses and experiments on incentives suggest that: (1) incentive programs in general will lead to about a 20% improvement in performance outcomes; (2) a coordinated program that uses a combination of incentives such as monetary rewards, feedback, and social recognition contingent on desired behaviors will exert the largest effects on performance; (3) team-administered incentives may yield greater performance outcomes than individual incentives; (4) the effects of the incentives on different performance metrics; and (5) feedback on performance of complex tasks should incorporate explanatory or task-specific advice for maximum value.

**Features of the Cognitive–Motivational Models**

In contrast to the behavioral engineering models reviewed previously, the cognitive motivational models rely to a greater extent on experimental evidence. These models are also more cognitive in that they incorporate internal personality factors, such as self-confidence, and cognitive factors, such as attention, to explain the diverse effects of various motivators on different performance outcomes. The cognitive–motivational approach considers interactions among diverse factors more than the behavioral perspectives, which assume a consistent effect of a given intervention. The behavioral engineering approach, for example, views feedback linked to desired behaviors as a consistently effective performance improvement.
mechanism. In contrast, the motivational perspective proposes that feedback may be more or less effective depending on how effectively feedback cues direct attention to tasks.

TECHNOLOGICAL APPROACHES TO PERFORMANCE IMPROVEMENT

In the behavioral engineering models of performance improvement, we identified memory support in the form of job aids as one common intervention recommended in situations where it is not efficient or possible to train knowledge and skills required for job performance. Technical support personnel often encounter new issues and must quickly find or devise solutions. Sales representatives are often challenged to keep up with ever-evolving product lines and features. Finance controllers may be asked to conduct financial analyses that they learned months ago in training. Although training could be developed and delivered to address these situations, instructional interventions may not be timely or cost effective.

To address these issues, electronic performance support systems provide users with “individualized on-line access to the full range of … systems to permit job performance” (Gery, 1995, p. 21). Unlike training, which requires participants to spend time away from their jobs, EPSS provides the information and tools that they need to do their job, on the job. Although much of the EPSS research summarized below assumed desktop-computer-delivered support, the evolution of mobile computing devices opens greater opportunities for EPSS in settings where computers have not been readily available; aircraft mechanics, factory workers, and sales agents will be able to access performance support content any time they have access to their cell phones, iPods, or other small form factor computing devices.

Types of Performance Support

Among the models proposed to differentiate the types of performance support systems, Raybould (2000) argued that performance technologies should first employ embedded EPSS and then move to less powerful linked or external systems if embedded systems are not possible for a particular performance problem. Rossett and Schafer (2006, p. 67) pointed out that planner systems are used when a performer “gets ready to act and afterward, when [they] reflect on [their] efforts,” while sidekick systems support performers while they are “in the work.”

The most widely cited and discussed categorization of performance support was developed by Gery (1995), who proposed three categories of performance support systems: external, extrinsic, and intrinsic. External systems store content used to support task performance in an external database. This content is not integrated within a user’s work interface; as a result, users are forced to manually locate relevant information in the external EPSS. Figure 39.9 illustrates a common form of external EPSS: a search engine. Other examples include frequently asked question pages and help indexes. External performance support also “may or
may not be computer mediated” (Gery, 1995, p. 53). Job aids or documentation are examples of non-computer-based performance support interventions.

Extrinsic “[p]erformance support … is integrated with the system but is not in the primary workspace” (Gery, 1995, p. 51). In other words, extrinsic systems integrate with the user’s work interface in such a way that the EPSS can identify the user’s location in a system or even the exact task they may be working on. With this contextual information, the extrinsic system can intelligently locate content that may be relevant to the task at hand. Figure 39.10 shows an extrinsic system that embeds help links in a software interface. These links enable the EPSS to intelligently locate the appropriate support content for a particular work context. Like external performance support systems, the content used to support the task is external to the work interface.

Intrinsic systems provide users with task support that is incorporated directly within their work interface. Due to this direct integration with the interface, Gery asserted that intrinsic EPSS provides “[p]erformance support that is inherent to the system itself. It’s so well integrated that, to workers, it’s part of the system” (Gery, 1995, p. 51). Under this rather broad definition, examples of intrinsic performance support systems can include tools that automate tasks and processes, user-centered design of work interfaces to reduce complexity and improve usability, or embedded knowledge that is displayed directly in the work interface, as illustrated in Figure 39.11.

Applications of Performance Support

Case studies report the application of performance support systems to a wide range of settings and performance problems; for example, performance support systems have been used in educational settings. Brush et al. (1993) developed a performance support system to improve collaboration among teachers in rural communities. McCabe and Leighton (2002) created an EPSS to help master’s students with analysis and instructional design. Darabi (2004) explained how a similar system was used to help graduate students with performance analysis.

Performance support systems have also been widely used in industry. Dorsey et al. (1993) and Cole et al. (1997) applied performance support systems to support local and remote sales employees. Huber et al. (1999) provided three examples of how intrinsic, extrinsic, and external EPSS were applied to automobile manufacturing, insurance, and civil engineering. Kasvi and Vartiainen (2000) demonstrated four different ways in which EPSS has been applied in factories. Gery (2003) cited examples of how performance support systems have been used in investment and financial planning, real estate, travel, and government applications. A survey conducted by McManus and Rossett (2006) showed that performance technologists had applied EPSS to problems ranging from vessel tracking by the U.S. Coast Guard to coaching restaurant managers.
The broad proliferation of performance support can be partially attributed to cost savings. Several authors have proposed methods to calculate returns on investment for performance support systems (Altalib, 2002; Chase, 1998; Desmarais et al., 1997; Hawkins et al., 1998). Desmarais et al. (1997) implemented an EPSS for support customer service representatives at a utility company and estimated a modest monetary savings realized through benefits such as reduced call time, improved productivity, and reduced training. Hawkins et al. (1998) reported that an EPSS developed for a government agency saved over $17.6 million over the lifetime of the system.

The benefits of performance support extend beyond dollars and cents. Hunt et al. (1998) conducted a meta-analysis on performance support systems in the medical field. The authors reviewed a total of 68 studies with systems that supported drug dosing, patient diagnoses, and preventive care. User performance improved in 42 of the studies reviewed, was not significantly changed in 19 cases, and decreased in only 7 instances. Although studies on EPSSs designed for diagnoses and certain types of drug dosing were inconsistent, the researchers noted that systems for other areas such as preventive care demonstrate positive results for these systems in ambulances, clinics, and hospitals. Villachica et al. (2006) reported the benefits of performer-centered design (PCD) winners from 1997 to 2004. The impact of these projects ranged from reductions in training time, increased user satisfaction, and improved productivity, among other factors.

**Research on Performance Support Systems**

Research has also examined the most effective types of performance support systems. Bailey’s (2003) meta-analysis found that linking, as one would do in an intrinsic or extrinsic performance support system, “tends to be more effective than searching to find content” as in an external system (Bailey, 2003, p. 1). Similarly, Spool (2001, p. 1) found that: “The more times users searched, the less likely they were to find what they wanted”; in fact, Spool observed that users were successful in finding the correct support information 55% of the time on the first try. On the second search attempt, only 38% were successful, and none was successful on the third attempt. Nielsen (2001) found similar results in another study where 51% were successful on the first search attempt, 32% on the second, and 18% on the third attempt.

A study by Nguyen et al. (2005) validated some of these results. The researchers tested three different types of performance support systems that aligned with Gery’s intrinsic, extrinsic, and external EPSS categories. Results from the study indicated that users provided with intrinsic and extrinsic performance support systems performed significantly better on a software procedure compared to a control group with no EPSS. Also, all users provided with an EPSS had significantly more positive attitudes than the control group.

Research addressing other assumptions about performance support is currently lacking or inconclusive. One of the most widely held notions about EPSS, for
example, is that implementing on-the-job support interventions can reduce or even eliminate the amount of training necessary to address a performance problem (Chase, 1998; Desmerais et al., 1997; Foster, 1997; Sleight, 1993). This notion of reducing training through EPSS and enabling “day-one performance” has been a major attraction for performance technologists. Bastiaens et al. (1997) examined this assumption by comparing the effectiveness of different combinations of computer-based and paper-based performance support with computer-based and instructor-led training. They found that users preferred paper-based forms over the electronic software tool as well as instructor-led training over computer-based training. They found no significant difference on test achievement scores, performance, or sales results for the other treatments over a 1-year period. Mao and Brown (2005) examined the effect of using an EPSS to support pre-task exercises and on-the-job performance as compared to an instructor-led training course. Users provided with the EPSS performed significantly better on an achievement test than those provided with training. They found no significant difference between the two groups on a procedural task. It should be noted that both of these studies suffered from potential validity problems, ranging from small sample sizes to procedural issues (such as using the EPSS for practice exercises—not an authentic use of on-the-job support).

RESEARCH RECOMMENDATIONS FOR PERFORMANCE IMPROVEMENT MODELS

The advent of meta-analyses and effect sizes has in a short time period harvested useful performance improvement guidelines gleaned from many research studies. In this chapter, we have summarized findings from meta-analyses of research on goal setting, feedback, incentives, and EPSS. After gathering relevant studies, the research team reviews and selects only those studies that meet criteria to be included in the meta-analysis. Most meta-analyses are able to use only a small fraction of the available studies because many do not meet criteria for validity. We forward their call for research of higher quality that is either experimental or quasi-experimental with control groups to augment the many survey, case study, and anecdotal reports on performance improvement initiatives.

We cited the study by Peterson and Luthans (2006) of incentives in fast-food stores as an example of research that is useful because: (1) it was quasi-experimental in that it included a control group; (2) it compared two types of incentives—monetary vs. feedback with recognition; (3) it examined the effects of the incentives on three outcomes—profit, drive-through times, and turnover; (4) it evaluated the effects of incentives awarded to a team rather than to individuals; and (5) it evaluated outcomes over a 9-month period of time.

We recommend that the following issues or questions be addressed in future research:

- **How do task complexity and worker expertise affect performance interventions?** Many of the studies on goal setting, feedback, and incentives have focused on low-complexity tasks; however, the core strategic advantage for many organizations relies more on high-complexity work such as design, analysis, communication, and human interactions. The outputs of these tasks are more challenging to quantify, which may explain their scarcity in the literature to date. Task complexity is relative to the experience of the worker or team. We know from cognitive load theory (Clark et al., 2006) that instructional interventions that work well for novice learners not only do not help those with more experience but in many cases depress their performance. It is likely that the types of goals, feedback, incentives, and EPSSs that are appropriate for higher complexity work and less experienced workers will be different than those that best serve low-complexity tasks and new workers; for example, the research reports on the effects of feedback suggest that information cues in the feedback may have greater positive results on high than on low task complexity (Kluger and DeNisi, 1996).

- **How should performance support be deployed through new technology?** The research described previously on electronic performance improvement initiatives assumed delivery using a desktop computer. With the convergence of computing and telecommunications, small hand-held mobile devices offer the potential to deliver performance support to a new generation of technology. Research on feedback showed better results from computer-delivered feedback than from feedback provided by a person (Kluger and DeNisi, 1996). We need research to define what kinds of feedback, training, and EPSSs are best provided on devices such as cell phones, PDAs, and iPods.
• **Build explanatory models and taxonomies.** Performance improvement models that incorporate moderators of interventions offer opportunities for building performance theories and for adapting interventions to unique situations. The Kluger and DeNisi (1996) feedback model, for example, suggests that feedback will have its effects based on the types of cues embedded in the feedback with cues that direct attention to the task being most useful. This model can be tested and, if valid, offers practitioners guidelines for delivering feedback in ways that obtain the most benefit. Regarding EPSS, more robust taxonomies of the type of performance support needed would help practitioners define the best types of support systems to use for given tasks, workers, and devices.

• **Define the effects of combined interventions.** The majority of research reports focused primarily on a single intervention or perhaps on a combination of two such as goals and feedback. We could benefit from more studies that look at combinations of incentives, such as the Stajkovic and Luthans (2003) meta-analysis suggesting a synergistic effect among goals, feedback, and incentives. We need more data to understand the interactions among interventions such as EPSSs and training or incentives and goal setting.

• **Support and disseminate research.** In this chapter, we have briefly summarized a behavioral engineering, a cognitive–motivational, and a technological perspective on performance improvement. We suspect that these communities of practice often work independently and fail to leverage their potential combined strengths. In addition, practitioners rarely read the same publications and websites or attend the same conferences as the research community. We recommend a greater exchange of information among these communities initiated by professional associations involved in performance improvement.

**THE FUTURE OF PERFORMANCE IMPROVEMENT**

We began our chapter by providing four vignettes of organizational failures that were not caused by a lack of knowledge and skills. We believe that a performance improvement perspective is an essential tool set to develop solution systems that do not rely on training alone to reach organizational objectives. The recent adoption of performance improvement certification programs by practitioner professional associations that formerly emphasized training only, such as the American Society for Training and Development and the International Society for Performance Improvement, along with increased mobility of electronic technologies, is advancing the opportunities for performance improvement initiatives. At the same time, the lack of experimental studies combined with failure to communicate the research results outside of the academic communities limit the full potential of performance improvement interventions. This is an opportune time to focus, improve, and disseminate research efforts to build a more evidence-based foundation for performance improvement initiatives. We hope this chapter and the Handbook contribute to that effort.

**REFERENCES**


Ruth Colvin Clark and Frank Nguyen


* Indicates a core reference.