

SECTION I

INDUSTRIAL ENGINEERING FUNCTION AND SKILLS

CHAPTER 1

Full Potential Utilization of Industrial and Systems Engineering in Organizations

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1. OVERVIEW

The theme of this chapter is “achieving full potential.” We explore how industrial and systems engineering and engineers (ISEs) can achieve full potential and how the ISE function and individual ISEs can assist their organizations in the achievement of full potential. Our fundamental premise is that organizations that desire to achieve full potential can enhance their success by more fully utilizing the potential of their ISEs. This will require holding a different definition for ISE, organizing the function differently, and having a different expectation regarding the ISE value proposition. The practicing ISE will also need to envision the role(s) he or she can play in large-scale transformation. This possibility has implications for the way ISE is organized and positioned in organizations, for higher education, and for the individual ISE.

1.1. Full Potential Introduced

Have you ever experienced being a “10”? Perhaps you struck a perfect golf shot, had a great day when everything went perfectly, or flawlessly executed a project. We’re thinking of something that turned out even better than you expected—when you were in “flow,” creating the optimal experience and optimal results (Csikszentmihalyi 1990). Full potential is about realizing personal and organizational possibilities. It’s about getting into flow and staying there. It’s about creating optimal results from the organizational system.

1.2. Structure of the Chapter

In its simplest form, an organization might be modeled as a complex collection of actions that drive particular results. These actions take place in a context or environment that mediates or moderates the results. Figure 1 illustrates such a model.

This model will be our organizing frame for the chapter. We will discuss the role of ISE in corporate transformation, in the achievement of organizational full potential performance. As you see in Figure 1, there are three roles that the ISE can play in this model:

1. Strategy and positioning (e.g., what is the value proposition? Are we doing the right things? What is the strategic planning process, who is involved, what is the system, how do we ensure it works?)
2. Conditions for success (what are the conditions surrounding the actions that drive results? Is the environment right to support success?)
3. “Drivers,” or operations improvement (are we doing the right things right? How are we doing things?)

We will discuss these roles in that order in the chapter. Note that the third role has been the traditional focus of ISE; we will suggest an expansion of the ISE “domain.” Rather than cover what is well covered in the rest of this handbook in the three roles for ISE in the future state organization, we will highlight, in each of the three roles, work that we believe ISEs will migrate to in achieving full potential.

1.3. ISE Domain Defined

As James Thompson points out, a domain can be defined by the “technologies employed,” the “diseases treated,” and/or the “populations served” (Thompson 1967).

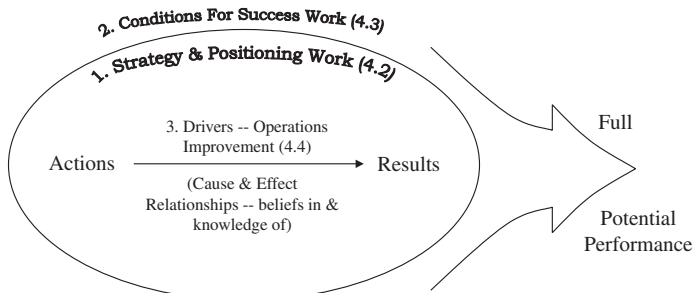


Figure 1 Actions → Results in Context of Conditions for Success.

Consider the remaining sections of this Handbook: Information Technology, Manufacturing and Production Systems, Service Systems, Organization and Work Design, Human Factors and Ergonomics, Project Management, Product Planning, Manpower Resource Planning, Systems and Facilities Design, Planning and Control, Quality, Supply Chain Management and Logistics, Probabilistic Models and Statistics, Economic Evaluation, Computer Simulation, and Optimization. All speak, in one way or another, to technologies employed by ISEs, diseases treated by ISEs, and/or to a lesser extent populations served by ISEs. Again, we will propose expanding the ISE role. Let's begin by examining the traditional definition of ISE and then explore a broader domain definition in the context of full potential performance.

1.4. Operational Definition of ISE

"An Industrial and Systems Engineer is one who is concerned with the design, installation, and improvement of integrated systems of people, material, information, equipment, and energy by drawing upon specialized knowledge and skills in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems" (Womack and Jones 1996). This is the current and fairly traditional definition for ISE.

1.5. Applying the Definition

According to Dr. W. Edward Deming, an operational definition is a definition you can "do business with." Let's see if we can do business with the formal definition.

The key word in the definition is "system." It prompts the question "What system is it that ISE's work to optimize?" Our contention is that the ultimate system of interest is the extended enterprise. Ken Wilbur (1996), a challenging author to read and understand, says growth is about "transcending" and "including." To contribute to full potential, ISEs must include and also transcend the subsystem they are working on. ISEs must also transcend and include the roles they play and the work they do. ISEs must see how performance improvement in the target subsystem (warehouse layout, work cell configuration, display/human-equipment interface, queue design, simulation, supply chain, etc.) serves the higher good or works to optimize the performance of the larger system. Jim Tompkins (1999) speaks to this and provides an example in his lectures on the migration from warehouse management to supply chain management to supply chain synthesis. Transcending the ISEs traditional system of interest may be the most profound change facing our profession. Inability or unwillingness to address the larger system may hold a clue to the decline our professional society has experienced in the 1980s and 1990s.

Figure 2 is a portrayal of ISE extracted from the perspective of an academic program.

Notice how in this model ISE builds on a core engineering curriculum foundation and then specializes in four basic areas: human factors engineering, manufacturing systems engineering, operations research, and management systems engineering. Each of these four specialty areas dovetails

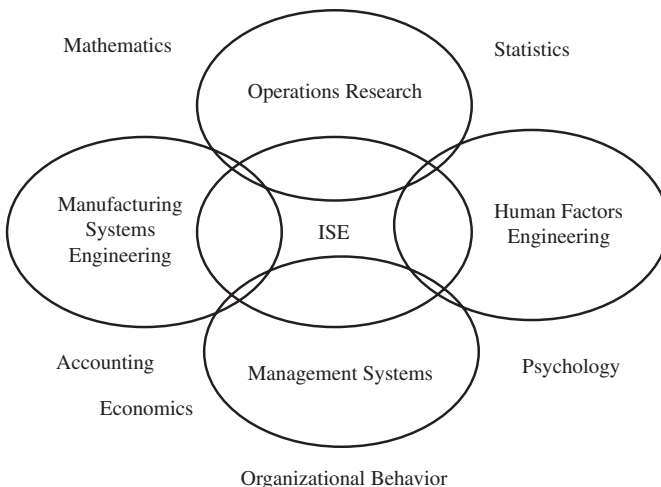


Figure 2 An Academic Portrayal of Part of the "Domain" Definition for ISE.

with basic knowledge areas and/or application areas such as statistics, psychology, mathematics, information sciences, accounting, and economics.

While this model is useful for portraying ISE from a curricular perspective, it is much less useful from an application perspective. Once the ISE begins reduction of theory to practice, the academic distinctions rapidly disappear. The ISE typically migrates to a setting that is defined by business processes rather than subdiscipline. The fledgling ISE is thrown into a system of people and capital that survives and thrives by continuing to enhance customer loyalty while at the same time reducing costs and improving efficiency. Fortunately, the ISE value proposition is so robust that enterprising ISEs find that they can contribute at any point and any level in the enterprise system.

ISEs at work are more accurately portrayed by the potential value contribution or offerings they bring to the enterprise as it migrates to full potential and future state. ISEs at work will increasingly find that they must transcend and include their academic training in order to contribute meaningfully to the quest for full potential. Figure 3 is an example of such a portrayal.

The specific contribution that ISEs make, the true value contribution, is the focus of this model. One example might be creating more effective measurement systems that lead to better information about the connection between improvement interventions and customer behaviors. Others might include optimized supply chain systems or increased safety and reduced lost time injuries. What is important in these examples is their impact on business results rather than their particular tools, techniques, or disciplinary focus. It is the cause-and-effect relationship between the value proposition and the business result that is the emerging emphasis. The disciplinary tool, knowledge, or technique becomes valuable when it is applied and we see its instrumentality for achieving positive business results. The ISE value proposition isn't only knowledge; it is the ability to reduce that knowledge to practice in such a way that it produces positive business results. In the coming decades, ISE practice is going to be very, very focused on creating results that move ISEs and their organizations toward full potential.

1.6. Integrating Work in Strategy and Policy, Conditions for Success, and Operations Improvement Leads to Full Potential

Our point of view is that integrating work done to achieve strategy and positioning, the management of conditions for success, and operations improvement create full potential performance (again, see Figure 1). The role of ISE needs to expand to include more involvement with this integration. ISE work in operations improvement, at minimum, needs to be seen in the context of the other two roles. At the extreme, ISE needs to be active in strategy and positioning and condition for success work. And it is value creation for the organization that is the end in the coming decades. A profession that

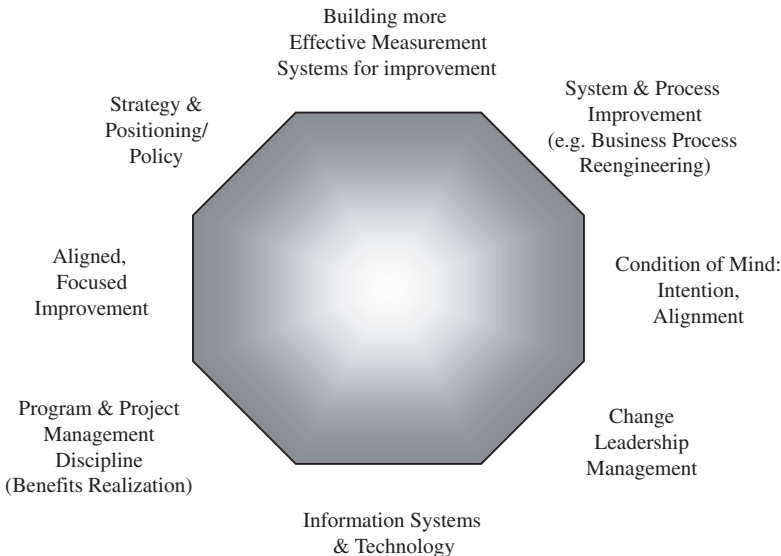


Figure 3 ISE Value Proposition: A Real World Perspective.

is so constrained by the technologies it employs and doesn't focus on the end will continue to struggle. We will explain what we mean further into this chapter.

2. THE FULL POTENTIAL MODEL FOR THE ORGANIZATION

2.1. Overview

Full potential organizations are made up of full potential individuals. We will address individual full potential briefly at the end of the chapter. Our discussion of organizational full potential will be more extensive, including specific examples of full potential for organizations, discussed in the context of the enterprise or business excellence model. We will also explore the implications of the expanded role of the ISE on our profession.

2.2. Examples of Full Potential

Two seminal books come to mind when we think about full-potential organizations: *Built to Last* (Collins and Porras 1994) and *The Living Company* (DeGeus 1997). Collins and Porras portrayed eighteen "visionary" companies, companies that are more than successful, more than enduring. They are best of best in their industries and have been that way for decades; in fact, they performed well over some 70 years. The visionary companies were matched with 18 comparison firms* for the analysis. The DeGeus study, commissioned by Dutch Royal Shell, looked at 27 firms that were larger and older than Shell. These "living companies" had thrived for 100–200 years. We will review these studies to provide you with a glimpse of the "full potential" model (see Figure 4) and to highlight the "causal variables" identified by the studies. We will then explore the implications of these studies for the ISE profession.

Collins and Porras's visionary companies attained extraordinary long-term performance. Consider three \$1 investments on January 1, 1926: one in a general market stock fund, one in a visionary company, and one in a comparison company. By 1996, \$1 in the general market investment would have grown to \$415; in the comparison firms, to \$955; and in the visionary firms, to \$6356 (see Figure 4).

What was full potential? What was possible? The point to be made from these numbers is that there are orders-of-magnitude differences in market performance between the visionary companies and the comparison organizations. One might even contend that "full potential" was in fact \$10,000 or more! Surviving for 70+ years is an accomplishment in and of itself; we believe that *thriving* over that period begins to describe full potential. Collins and Porras concluded that "visionary companies display a powerful drive for progress that enables them to change and adapt without compromising their cherished core ideals (1994, 9).

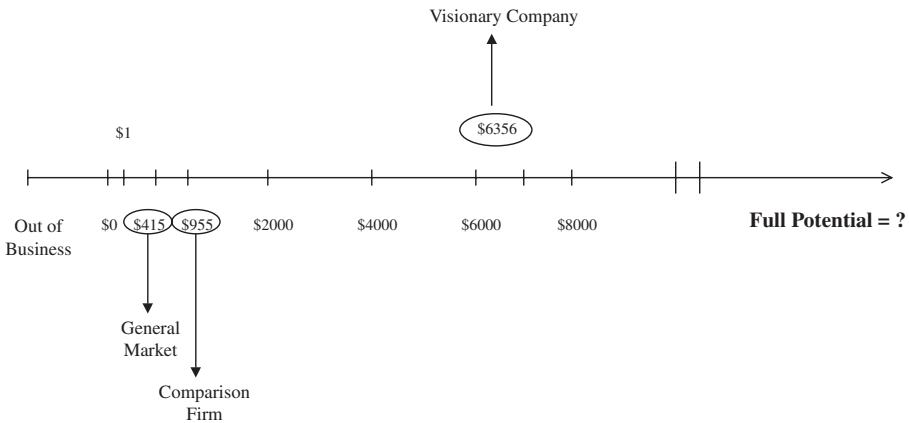


Figure 4 Relative Performance Data from Collins and Porras (1994): What Was Full Potential?

*E.g., 3M the visionary company, Norton the comparison firm; Boeing the visionary company, McDonnell Douglas the comparison firm; Citicorp the visionary company, Chase Manhattan the comparison firm.

What are the attributes of full potential organizations? In living companies, DeGeus found four significant factors:

1. *Sensitivity to the environment*: the ability to learn and adapt (we might add, in a timely fashion)
2. *Cohesion and identity*: the ability to build community and a distinct cultural identity (we might add, that supports full potential performance)
3. *Tolerance and decentralization*: the ability to build constructive relationships with other entities, within and without the primary organization
4. *Conservative financing*: the ability to manage growth and evolution effectively

DeGeus states, “Like all organisms, the living company exists primarily for its own survival and improvement: to fulfill its potential and to become as great as it can be” (1997, 11).

Collins and Porras went beyond DeGeus, identifying one distinguishing variable and six “explanatory” variables they attributed to performance differences between visionary companies and comparison firms. The distinguishing variable for the visionary firms was “Leadership during the formative stages.” The six explanatory variables that they identified were:

1. *Evidence of core ideology*: statements of ideology, historical continuity of ideology, balance in ideology (beyond profits), and consistency between ideology and actions (walk the talk)
2. *Evidence of the use of stretch goals, visioning, defining full potential for a given period of time*: “bold hairy audacious goals” (BHAGs); use of BHAGs, audacity of BHAGs, historical pattern of BHAGs.
3. *Evidence of “cultism”*: building and sustaining a strong culture, seeing culture as an independent variable, not a context variable; indoctrination process, tightness of fit (alignment and attunement)
4. *Evidence of purposeful evolution*: conscious use of evolutionary progress, operational autonomy, and other mechanisms to stimulate and enable variation and innovation
5. *Evidence of management continuity*: internal vs. external CEOs, no “post-heroic-leader vacuum,” formal management development programs and mechanisms, careful succession planning and CEO selection mechanisms
6. *Evidence of self-improvement*: long-term investments, investments in human capabilities (recruiting, training and development), early adoption of new technologies and methods and processes, mechanisms to stimulate improvement; effective improvement cycles established and a way of doing business.

We will highlight this last finding particularly as we explore the expanding role for the ISE in the future.

2.3. Enterprise Excellence Models

We find enterprise models or business excellence models to be increasingly relevant to the central message of this chapter. They are a way to portray the lessons from the work of DeGeus and Collins and Porras. For example, the Lean Enterprise Institute is working with MIT to develop a Lean Enterprise Model (LEM) (Womack and Jones 1996). The Malcolm Baldrige Award has created a Performance Excellence Framework (National Institute of Standards and Technology 1999). We believe that the Baldrige model provides valuable insight into the variables and relationships, consistent with the lessons from Collins and Porras.

Figure 5 depicts the Baldrige Criteria for Performance Excellence: (1) leadership; (2) strategic planning; (3) customer and market focus; (4) information and analysis; (5) human resource focus; (6) process management; and (7) business results (overarching—customer- and market-focused strategy and action plans). Compare and contrast these variables to the seven identified in Collins and Porras.

Each of these models prescribes strategies for achieving full potential. Our contention is that this striving for full potential is the context within which ISE will be practiced. ISE will be challenged to present a value proposition in the context of large-scale organizational transformation. Enterprise models of excellence provide insights into how to position our profession and the work of ISE in organizations. With this base, each and every ISE has the potential to be a visionary representative of our profession. This is an excellent way to think about both personal and collective value propositions.

2.4. Implications for ISE

The context shift we describe above for ISE has several specific implications. First, each and every initiative undertaken by an ISE must be causally linked to business results. Let’s use a large retail

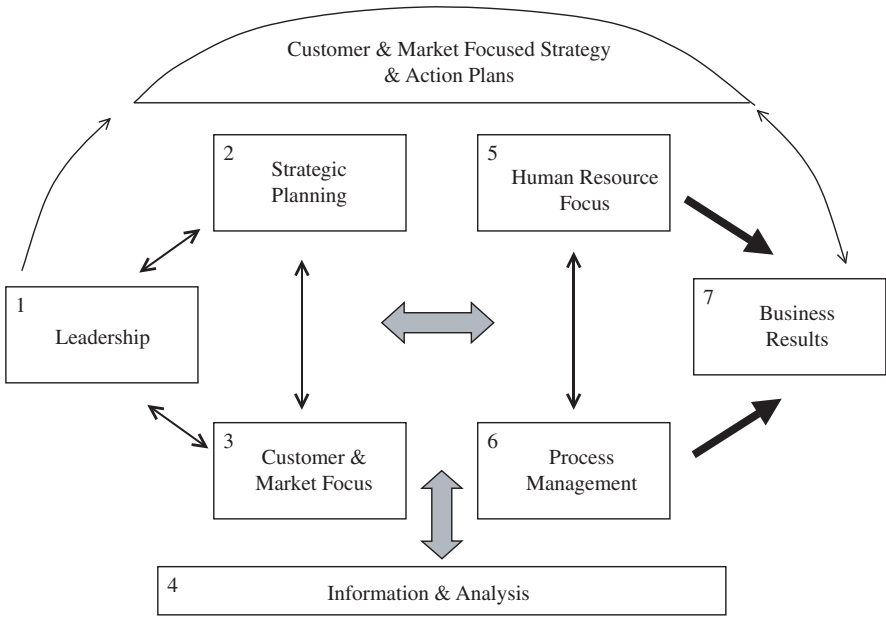


Figure 5 Baldrige Criteria for Performance Excellence.

organization as an example. One of the major business outcomes for this type of business is to fill what we call the “treasure chest.” As depicted in Figure 6, the treasure chest’s three dimensions are (1) market share, (2) percent spend, and (3) length of relationship or customer loyalty.

Retail businesses want to optimize market share, get their customers to spend more of their disposable income (percent spend) in their stores, and keep their customers (optimize the value stream from customers). How can ISEs help fill the treasure chest?

Consider a profit ratio. Typically, ISEs have worked to reduce the inputs (the denominator) of the profit ratio by driving costs down and increasing efficiency. Focusing ISEs on outcomes (the nu-

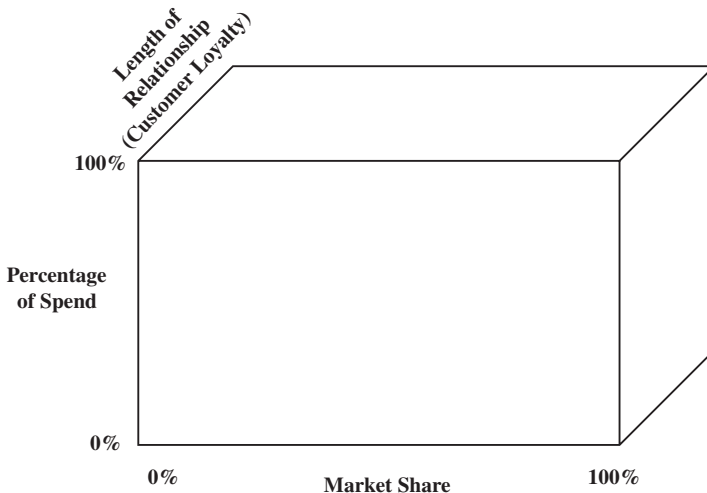


Figure 6 Filling the Treasure Chest as a Major Business Goal: What Does the Treasure Chest Model Look Like in Your Organization?

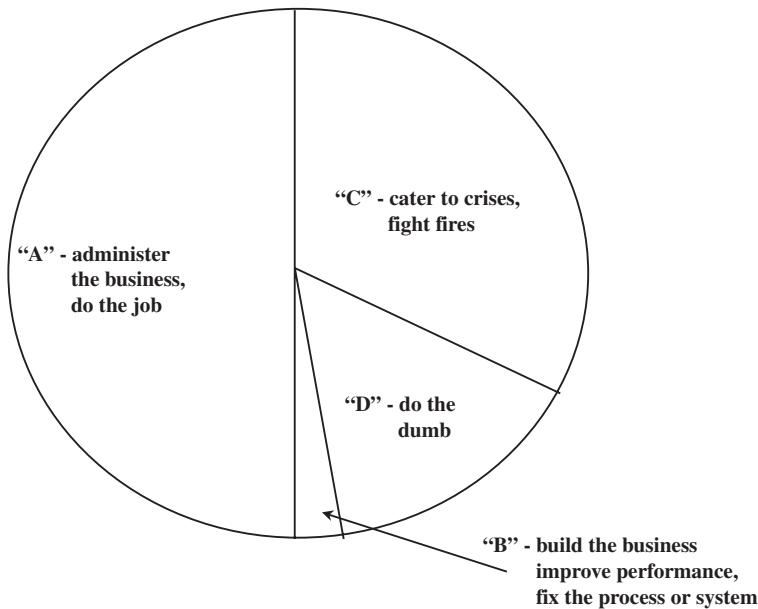


Figure 7 ABCD Model: How We Spend Our Time.

merator) shifts the paradigm about our value contribution. Our contention is that ISEs will be challenged to work on both the numerator and the denominator of the profit equation.

ISEs and the ISE function will be required to explain our contribution in terms of the profit ratio. It won't be enough to say that we improved the efficiency of a process or work cell. We will have to demonstrate how our actions lead to filling the treasure chest.

The seventh variable that Collins and Porras (1994) identified was "evidence of self-improvement." Time is the most critical resource in the knowledge-based organization. People at all levels spend their time doing four things: they **Administer** the business, that is, do jobs ("A" work); they **Build** the business, that is, improve performance and fix systems or processes ("B" work); they **Cater** to crises, that is, fight fires, fix problems ("C" work); and they **Do** the dumb, that is, non-value-adding things ("D" work). Figure 7 depicts how we spend our time.

Organizations that intend to achieve full potential will spend more time on B work. They will establish improvement cycles such as the Deming and Shewhart Plan-Do-Study-Act model. Rather than addressing "targets of opportunity," ISEs will deploy improvement cycles that are thought through strategically, comprehensive in scope, and well integrated. Enterprise excellence models clearly indicate this. Systems thinking will be applied at the enterprise level. This has been the clear migratory path for the past 30 years, and it will continue to be. Our profession's value proposition will focus on the special knowledge and skills the ISE brings to the quest for full potential.

In the more traditional model, ISE work is often detached from the work of transformation. ISE improvement efforts tend to be done outside the context of the enterprise improvement cycle, so they lack a clear causal connection to organizational business results (e.g., filling the treasure chest).

So the big implication for ISEs in the next several decades is that they must think enterprise, think total systems, and be connected to the enterprise improvement cycle. ISEs cannot afford to (sub)optimize targeted subsystems at the expense of the larger system, and they cannot afford to be isolated from the large-scale transformation work that characterizes the full potential organization. We might go a bit further and suggest that increasingly ISEs are going to be challenged to prescribe migration paths that move an organizational system toward full potential at a faster rate.

3. THE FUTURE STATE VALUE PROPOSITION FOR ISE

3.1. Overview

On the threshold of the 21st century, Michael Porter is perhaps the best-known researcher, author, teacher, and consultant on the subject of competitive strategy. Porter (1996) makes a distinction

between operating effectiveness and efficiency and positioning and strategy; balance between the two contributes to organizational full potential. Whereas operating effectiveness and efficiency is the traditional core of ISE academic programs, positioning and strategy is rarely, if ever, addressed in ISE academic programs. We believe that our model of full potential depicts that balance. In this section of the chapter, we will approach positioning and strategy from an ISE perspective. Then we'll talk about another subject missing from most academic programs—conditions for success. Finally, we'll make some observations about a more familiar topic, the ISE's role in operations improvement. (For more on this subject, see Sink and Poirier 1999.)

3.2. The Planning System: Position, Strategy, Implementation, and Deployment

The first role in this new model for ISE contribution focuses on the planning system. The planning system includes processes by which high-level strategy and policy are determined and all processes that lead to effective implementation and benefits realization from strategy and policy deployment. In many organizations, this system is not defined, not documented, not systematic, and hence the results it creates are highly variable. We contend that the planning system needs to be reengineered, and we offer this work as a role that ISEs can and should impact. Figures 8, 9(a) and 9(b) are simple versions of what we mean by this contention.

Figure 8 is a depiction of what we call a “grand strategy system.” It is a high-level picture of strategy and policy deployment. Once strategy and policy (positioning) is decided, a transformation plan needs to be developed. The vision and definition of the future state is on the right-hand side of the picture, the current reality is on the left, and the work in front of the organization is in the middle. Conceptually, it will take many improvement cycles (Plan, Do, Study, Adjust/Act) to pull off a large-scale transformation. Figure 9(a) depicts the improvement cycle process itself in general terms. It is not important to understand all the details of these figures; it is important that you see that ISE skills of system and process design are being applied at the strategy and policy deployment level. The premise is that more defined and explicit systems and processes for strategy and policy deployment will lead to more consistent results (benefits realization).

Positioning deals with what an organization offers and how that offering is portrayed to the customer. It has to do with whether your value proposition is clear to the customer and whether those propositions are distinctive and attractive. It has to do with whether your customers see your offering

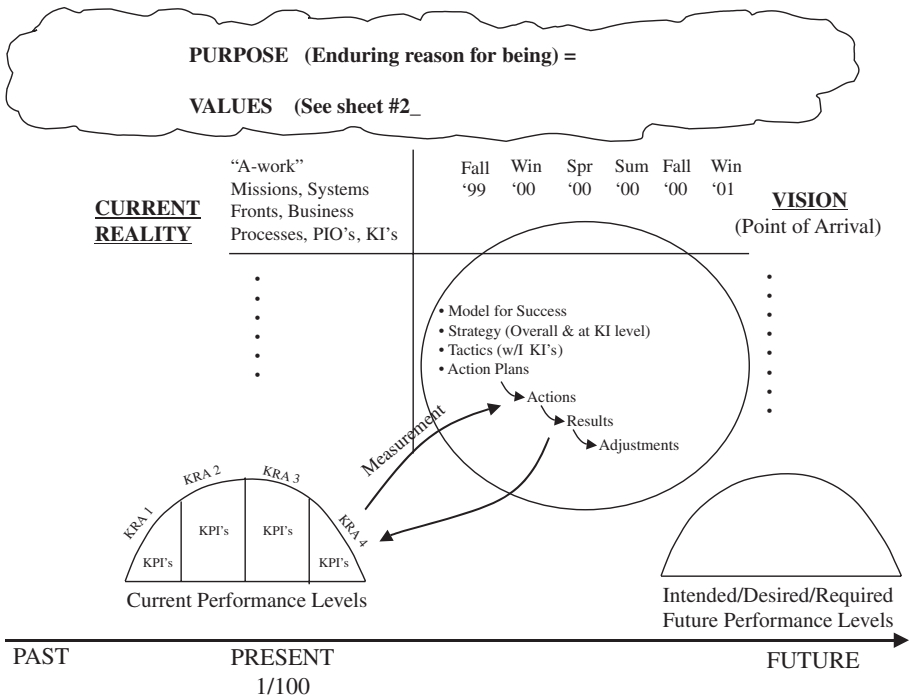


Figure 8 Grand Strategy System.

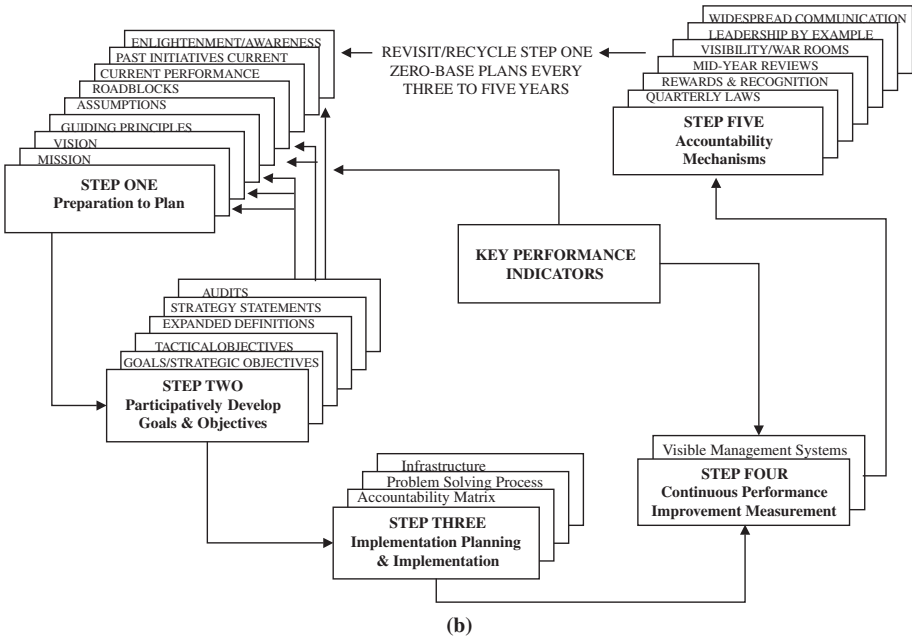
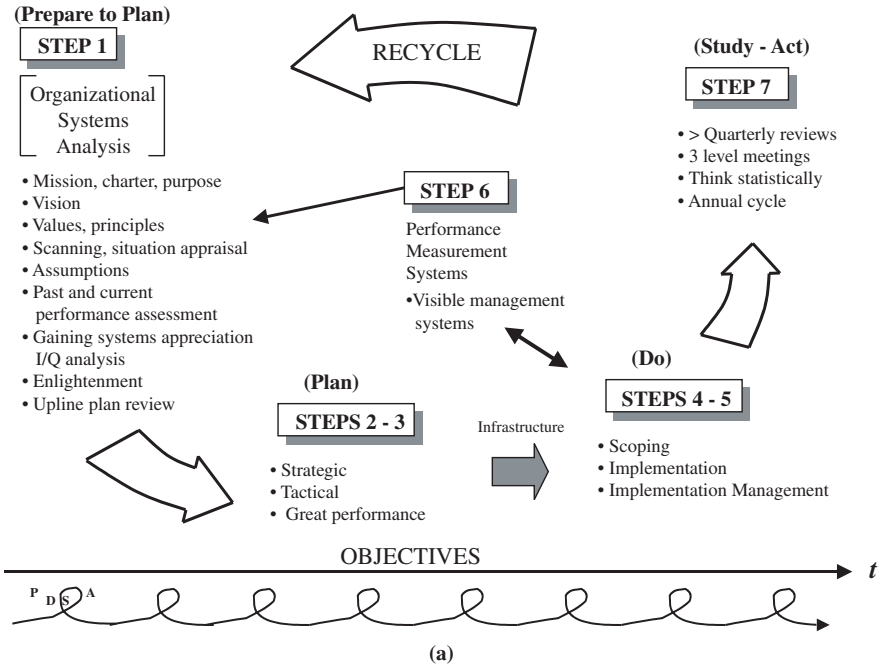


Figure 9 Improvement Cycle Process.

as instrumental to their success. Positioning decisions occur in step 1 of the Improvement Cycle (see Figure 9(b)). Positioning decisions end up being articulated and portrayed on the far right side of the transformation plan (see Figure 8). *Strategy*, on the other hand, has to do with how the organization plans to deploy its offering and execute on its position. Strategy ensures that the customer takes up the offering. Success must be operationally defined; you must have a clear vision of what success looks and feels like. *Successfully executing strategy and policy* throughout the organization involves what is called policy deployment. Strategy is reflected in the middle part of the grand strategy plan (Figure 8). Strategy is fleshed out in the improvement cycle (Figures 9(a) and 9(b) in step 2.

Improvement cycles in context of positioning and strategy are similar to the relationship between a game plan, perfect practice (as Vince Lombardi used to say), and actually playing the game. Strategy and positioning are the game plan; improvement cycles are perfect practice and also playing the game. The key role we see for ISEs in the planning system is in effective implementation and deployment of strategy and policy. This may well be several levels higher in thinking and involvement than many ISEs have traditionally been.

3.2.1. Policy Deployment

Policy deployment involves the successful implementation of the strategy for success (Akao 1991). The Japanese describe it as a “waterfall-down” process consisting of communication and ensuing coordination of activities. Effective policy deployment processes and practices ensure alignment and attunement. It is the policy deployment process that causes improvement efforts inside the organization to be aligned with the vision for the organization. Improvement cycles become aligned as a result of the deployment processes and practices. An example of such a practice is what are called three-level meetings. Periodically, leaders and managers and employees on three levels of the business gather for an “all-hands” meeting to share progress and performance on key initiatives or performance improvement objectives (PIOs). During these reviews, the dialogue ensures that critical adjustments are made to refine alignment in efforts (pace, focus, resource allocation, etc.). We have found that ISEs can be effective in supporting policy deployment policy and practices; their systems thinking background makes them well suited for this activity.

3.2.2. Relationship Management

In the full potential model of the organization (see Figure 10) are at least four categories of relationships that need to be managed and optimized: (1) customers, (2) employees, (3) stakeholder/stockholders, and (4) business partners (internal and external).

At a micro level, the ISE will be expected to contribute to the conception, design, development, and implementation of improvement initiatives. The extent to which relationships are managed ef-

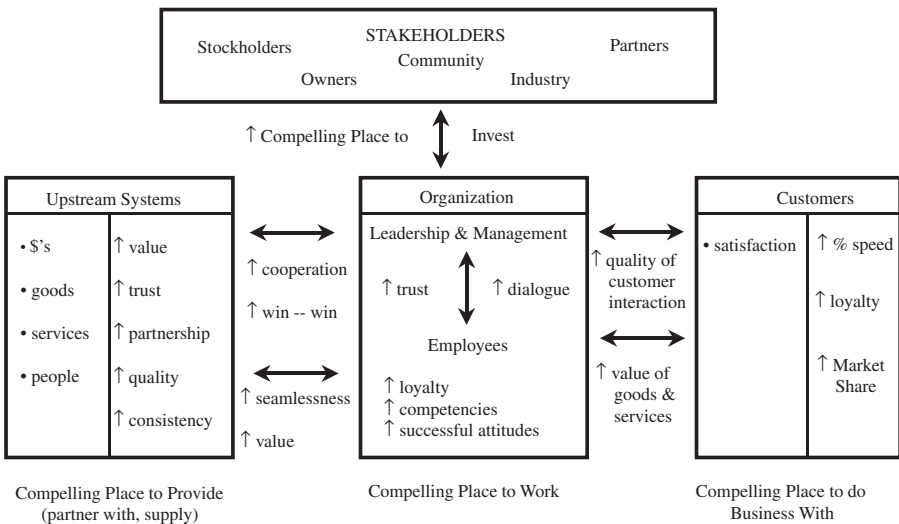


Figure 10 Full-Potential Performance Requires the Optimization of Key Relationships. (↔ represents relationships (or value exchanges) we will optimize in this transformation.)

fectively will ultimately determine the effectiveness of the implementation. At the macro level and with a focus on business results, it will be the relationship with the customer that will determine how well the treasure chest is filled. Acquiring information about the customer, monitoring how that information is used, and helping the customer be successful are all key aspects of customer relationship management (CRM). The role ISE should play is, at a minimum, to be keenly aware of the importance of CRM and to align ISE project work with CRM efforts.

In that larger context and domain, value creation will derive from the ISEs ability to manage our relationship with various partner and customer segments and create results for and with them. In our view there is only one customer, the consumer. The end users or customers are the population we serve. There are no internal customers in our model. Everyone inside the organization should function as a partner on a team working to serve the customer. The ISE is in partnership with others in the enterprise, and all are working to achieve organizational full potential performance. The ISE brings technologies to the enterprise that will facilitate achieving full potential performance.

At the maximum, ISE professionals would be part of the CRM program team. This would involve designing the strategy, working on information systems, and thinking through how to deploy CRM data and information to achieve alignment and optimize the lifetime value of the customer.

Perhaps the most dramatic change for ISEs in the decades to come will be the requirement that they understand the needs of the customers and have a role in managing customer relationships. ISEs understand the process of converting data to information, using information to support decisions and actions. This understanding is sorely needed in organizations today and is a key to unlocking full potential. How will ISE solutions enhance the organization's relationships with its customers? This will be a key area of emphasis for the ISE in the future.

The relationship management aspect of strategy and policy deployment goes well beyond just improved customer relationship management systems and processes. As Figure 10 shows, full potential performance requires that all relationships be managed differently. It has not been uncommon for supplier and vendor relationships to be in transition in the past; what has the role of ISE been in that transition? We contend that relationships with employees must also be managed differently; what is the role of ISE in that? Sears has a well-publicized transformation effort that focuses on being a compelling place to invest, a compelling place to shop, and a compelling place to work. This concept will show up in Figure 10. We would argue that ISEs can and should play a role in the relationship management associated with making the organization compelling from all constituent vantage points. This will lead to full potential performance.

Managing these relationships differently will take different levels of personal mastery. Listening skills will be even more important. How we hold ourselves in relationship to others in the system is foundational; do we see ourselves as partners or as competitors/adversaries to be negotiated with? First we need a different model for full potential. Then we need to develop the skills to work the model effectively.

We have discussed grand strategy, improvement cycle, policy deployment, and relationship management as key elements of planning system (strategy and policy development and execution) transformation. Other changes are required in the planning system in order for an organization to migrate to full potential performance, which we will either mention here and not elaborate on or mention in upcoming sections. The transformation to full potential is a stream of improvement cycles. There are improvement cycles embedded in improvement cycles. There is one for the overall enterprise and then embedded improvement cycles (aligned) for subsystems. Coordinating all these improvement cycles is critical to overall success—yet another natural role for ISEs to play in the future.

Improvement cycles, at all levels, are conceptually a process of Planning, Doing, Studying (progress and performance), and then Adjusting plans based on results. We've addressed the Plan and Do steps. In the third role, operations effectiveness and efficiency, we'll discuss the role of measurement in the Study process and outline how to build more effective measurement systems—yet another key role for ISEs in the work to achieve full potential performance.

All the Planning and Doing and Studying and Adjusting is being done in a context or organizational environment. Figure 1 depicted this. Culture shift is central to creating conditions that will support migration to full potential performance. We would once again contend that ISEs can and should play a role in designing and executing the culture shift to create conditions that will fully support transformation to full potential. This might be a support role to the HR function, team member/collaborator, and so on. We will flesh this out in the next section.

3.2.3. Change Leadership: The IE as Change Master

Pulling off a major shift in the improvement cycle process in organizations will require many, if not most, to get outside their comfort zones. People are going to be asked to do different things differently. One key function of ISE in the context of improvement cycles will be bringing solutions to the business that help fill the treasure chest. Ensuring that the benefits of improvement are actually realized is a three-ball juggling challenge. The first ball is solution design and development. Solutions

must be thought through in the context of strategy and policy of the larger system. The second ball is project leadership and management: delivering the solution. The third ball, and often the most critical, is change leadership and management (Sink 1998). It is the ISEs smooth juggling of these three balls that creates effective change. Clearly there is a science and an art to this, and ISEs can become its foremost practitioners. In large-scale transformation, the three-ball challenge becomes the threerd-ball challenge. Full potential will require that many (n) solutions be delivered concurrently. The challenge is to manage multiple projects rather than a single project. We find that as ISEs gain experience they become excellent candidates for this challenge due to their training in dealing with system interactions and complexity.

Here is a model that is especially useful for understanding change leadership and management:

$$\text{Readiness for change } (R) = V \times BP \times A$$

Change will occur if $R > C$, where:

V = vision, i.e., people's connection to success, their clarity on what success looks like and feels like, an operationally defined desired point of arrival

BP = burning platform, i.e., sense of urgency, level of dissatisfaction with the status quo

A = approach, i.e., clear and pragmatic first steps, knowing what to do next to move in direction of vision

C = Perceived cost and/or risk associated with change, i.e., level of discomfort associated with moving outside the comfort zone

We believe that in the new environment the power of creation will supplant problem solving. It is easier to get people motivated to deal with an uncertain future if they are clear on the vision and they choose for it. (However, in fairness to problem solving, you don't need a vision to fix a broken window.) So we suggest strongly that ISEs work on developing creation skills to complement their highly developed problem-solving skills (Fritz 1991). Once people are in the creation mode, there will be little resistance to change and change leadership will be quite natural and almost easy.

3.3. Conditions for Success

We will now turn from the planning system to look at what we call *conditions for success*. Recall the action-results and conditions for success model (see Figure 1). Much of the work of ISE tends to be in the domain of action to results; working on what we call drivers of change that directly result in improved business results. Often the effectiveness of efforts to influence drivers is diminished because the conditions for enabling the efforts to be effective are not present. So we identify "enablers" that are collectively constitute conditions for success. We will introduce four enablers that are central to conditions for success:

1. *Culture system*: shaping values/attitudes/behaviors that will support full potential performance
2. *Infrastructure*: how we are organized to do B and implications that B work will have on the A work infrastructure
3. *Communication system*: sharing information necessary to ensure that people are informed as we migrate to full potential performance
4. *Learning system*: ensuring that knowledge and skills keep pace to support the transformation

3.3.1. Culture System

Culture is "a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (Schein 1992).

The fundamental question for organizations aspiring to reach full potential (or should we say leaders who wish to lead groups to full potential?) is, "What is the full potential culture?" Figure 11 is a pictorial we use to describe our answer. The descriptors on the right side reflect values, attitudes, and behaviors that we believe are consistent with achieving full potential. Listed on the left are commonly experienced values, attitudes, and behaviors typical of underperforming organizations. We believe that most people inherently have core values that match those on the right: serving, learning, integrity, and excellence. Unfortunately, we have found that when individuals come together in organizations, things conspire to cause their attitudes and behaviors to migrate to the left. By raising consciousness about personal choices and what motivates those choices, it is possible to induce a shift to the right. We might more accurately say it is possible to create conditions that will naturally bring people back to their core values and to the attitudes and behaviors that are so critical to full

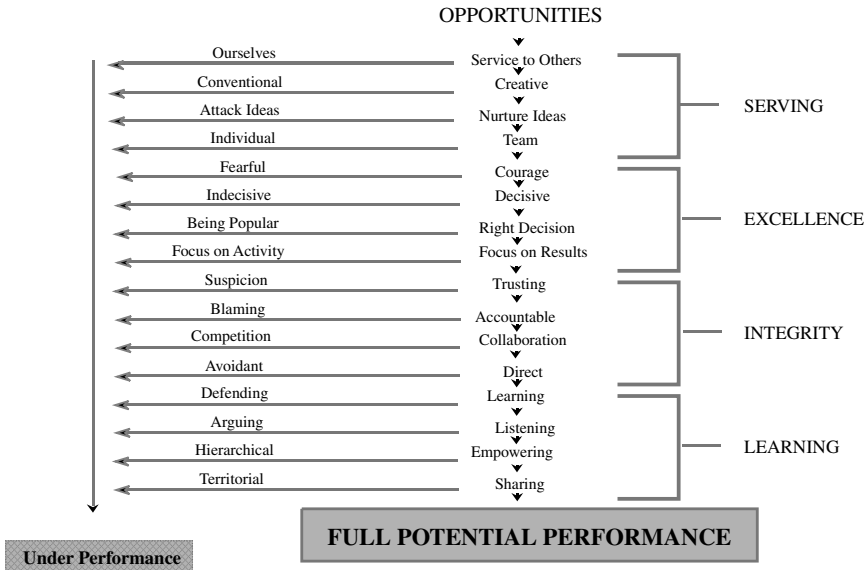


Figure 11 Leadership Values Model.

potential performance. Whether the ISE is an active or a passive player in this process, there still must be an awareness of the role culture plays in performance improvement. Having said this, we are convinced that there can be no passive players. Everyone’s behavior must reflect full-potential values. (i.e., “walk the talk.”) The ISE function is too important to be ignored. The ISEs must model these core values in order to be effective as individuals and as a collective force for improvement.

Note that we entitled the section “Culture System.” The implication is that culture is the product of a system. If we want/need the culture to be different in order to achieve full potential, then we need to change the system that shapes culture. This is an active rather than passive approach to culture. We are consciously shifting culture toward what is natural (in our view) and toward values-attitudes-behaviors that support achievement of full potential. Because ISEs are about integrating systems to optimize performance, recognizing that culture is a subsystem that needs to be led and managed is integral to our work—yet another area of potential work for ISEs in the future.

3.3.2. Infrastructure for Improvement

Earlier we alluded to the ABCD model (Figure 7) depicting how we spend our time. Spear and Bowen (1999) highlight the importance of integrating administering the business (A work) with building the business. What are the roles and rules in the context of A and “B?” Toyota manages to demand rigid performance specifications while at the same time ensuring flexibility and creativity. This seeming paradox is the “DNA” or essence of their success. Disciplined execution of A makes it possible to also do B. The infrastructure for this is supported by culture, discipline, learning, role clarity, and rules.

The potential ISE role in this regard is tremendous. Many organizations lack discipline and specification relative to A work, leading to a great deal of variation and unpredictability. This variability in performance is a source of D and ineffective management of C. Established methods and procedures are central to gaining control of A-work and freeing up more time for B. It is important for ISEs to reestablish their role in the continued “rationalization” of A. As Spear and Bowen (1999) mention, rationalizing A involves using experimentation and the scientific method to improve things. A word of caution: things will get worse before they get better. If the experiments are well designed and carefully thought through, the loss in performance will be manageable and the final results will be well worth the cost. Ideally, one could create a system that would perform and improve simultaneously. How to organize this and make it happen is clearly an important domain of activity for ISEs.

How is your organization organized to do B, and what role should ISE play in the infrastructure piece? We have found that the infrastructure for B will determine how effective and efficient the B work is. ISEs can play an important role in this design variable.

3.3.3. *Communication System*

Noted organizational authority Dr. Edward Lawler (1986) recommends that organizations first share information, then knowledge, then power, and only then share rewards. Communication is sharing information. The theory is that better-informed people perform better. Our experience and a host of research results confirm that hypothesis. Sharing information leads to better coordination, and better coordination creates the conditions for realizing full potential. The communication system needs to be thought through and well designed for effective and efficient implementation and deployment. We have found that ISEs can help improve the information sharing system. We see this as a key area of ISE contribution in the future.

Remember the sequence Lawler recommends: Reengineer the communication system before addressing the learning system, then create the involvement system, and finally, put into place the reward and recognition system. Taken in order, these four steps produce an integrated system that can benefit from key capabilities of the ISE. Taken randomly, as is too often the case, valuable resources are wasted and the value proposition to the enterprise gets diluted and disappears.

3.3.4. *Learning System*

Full-potential organizations are also learning organizations. Learning organizations must be made up of learning individuals. Each of us is a product of our experience. For the better part of 16–20+ years we participate in a particular educational process. The curriculum and the syllabi are provided for us. The goals, the things to be learned, the sequence, the practice, and so on are all prescribed. And then, suddenly, teachers are no longer part of the process, and we must make choices: either drift away from learning and growth or take charge of our own learning. Unfortunately, most people drift, and as a result their value proposition—their ability to continue to add value—diminishes over time. In the 1990s, as technology, competition, and complexity increased, organizational leaders began to stress the importance of learning and growth as part of the personnel development process. However, stressing importance typically has little or no effect. Lifelong learning is something that must be “chosen for” if we are to continue to contribute.

Clearly, the ISEs can play at least two roles in the learning process. First, ISEs of the future will need to be more systematic and more disciplined about continuing education and development. Our professional society—in this case, the Institute of Industrial Engineers—will play an increasingly important role through its conferences and seminars. Additionally, many companies and agencies provide formal programs to support the learning process. Second, the ISE can and should play a role in assisting the organization with the design and execution of the learning (education, training, and development) process. Learning is a key business process. Improving the competencies and capabilities of the human resource requires a well-designed and executed process. Business process reengineering is often required if an organization is to move beyond the minimally effective training systems of the past to the learning systems that support the creation of positive business results and keep employees vital.

We are proposing that learning is the result of a process. The education, training, development process in most organizations is not effective. A work knowledge and skills as well as B work knowledge and skills are needed. This will require being a team member with the HR function. Our experience is that the HR personnel have welcomed the contribution that ISEs can make to rethinking how to spark and sustain learning. The migration to full potential performance will require a tremendous amount of new learning. This will require, first, recognition that this is important, and second, willingness and desire to learn. We believe that creating a learning orientation is part of the culture shift work. People have a natural tendency and desire to learn and grow. When you change the condition within which people are working, this natural tendency will reappear. Then it is just a matter of directing the learning toward the knowledge and skills that support performance improvement. Much of this will be quality and productivity and improvement related, and this is where the ISE comes in. Changing the culture and then changing the system for learning are central to creating conditions that support full potential performance. ISEs can and should play a role in this shift.

3.3.5. *Summary*

The involvement of ISE in strategy and positioning and in conditions for success occurs too infrequently. Full potential, as we have posited, requires an integration of work in the three areas. We asserted earlier that for ISE to be positioned differently, to adopt a broader domain, a senior champion or sponsor is often required. This will be someone who is an ISE or understands the value proposition of ISE and is constantly looking for effective pieces of work to involve them in, ways to use ISE to migrate to full potential. Each month, *Industrial Management* features ISEs who are in these roles.*

*An outstanding example of an executive champion of ISE is our coauthor and colleague, David Poirier. His story appears in the May/June 1998 issue of *Industrial Management*.

The true impact of leadership in achieving and sustaining full potential performance is most often seen in the work they do in establishing conditions for success. All ISEs would be well served to consider the role they play in establishing and sustaining the proper conditions or environment to support full potential performance.

We believe that ISE modes of thinking will be valuable in the challenging strategy and positioning work of the organizations of the future and in creating optimal conditions for success. A perspective built on systems thinking is ideally suited for the type of planning and analysis required as organizations work to enhance positioning and strategy and creating positive internal conditions in the ever-changing markets.

The challenge to practicing ISEs is to understand the connection between their work and organizational attainment of its full potential. Seminal questions include “How does my work support the overall positioning and strategies of the organization?” “What are the cause-and-effect linkages between my work and ‘filling the treasure chest’?” “How is my work connected to other efforts in the organization, and how can I strengthen the connection and create synergies where they don’t currently exist?” “What is full potential performance and how is my work moving the organization toward that goal?” “How can the ISE role work on key condition for success issues in a way that enables or enhances the success we achieve over time?”

We have offered some examples of what we call “strategy and positioning” and “conditions for success” and described the roles that ISE can play in these categories of endeavor. Too often the work of ISE gets over- or underemphasized due to a lack of understanding of where they fit in the organization. ISEs need to be aware of the big picture and the leverage points to ensure that their work is contributing in an optimal fashion to the greater good.

To ensure that we are not misunderstood, we would offer the following. We are not calling for ISEs to be all things to all people. We understand the core value proposition of ISE, what it has been, and we have our views on what it will be. We are simply suggesting that if ISEs are to live up to their lofty definition as systems integrators, the future will require us to continue to transcend and include more traditional roles and migrate to enterprise level contributions.

3.4. Operations Improvement Role

3.4.1. Overview

We will now turn to the traditional role of ISE, that of problem solving and operations improvement. We place improvements in efficiency, quality, and technology (e.g., methods, hardware, software, procedures, processes) in this category. Regardless of whether the ISE specializes in operations research, human factors, manufacturing systems, or management systems methodology, the challenge will be to change how things are done such that total system performance is improved.

Traditionally, ISEs have operated at the work center level. Over the past 30+ years the scope of the system of interest has broadened. The word “system” in industrial and systems engineering has taken on increased importance. This migration has occurred naturally; it is what was required for the ISE to be more successful. Unfortunately, industrial engineering tended to lag behind other disciplines in the evolutionary process. Our profession has missed opportunities to continue to add value over the past 30 years. The more striking examples include abandoning the quality movement, and missing both the tactic of business process reengineering and the emergence of the balanced scorecard in the measurement domain. We believe that the decades to come will provide opportunities for ISE to reintegrate and reposition itself as a leader and doer in the field of performance improvement. At the risk of being repetitive, this requires rethinking the role and relationship among positioning and strategy, conditions for success, and operations improvement.

We will not duplicate material in the remaining chapters of this Handbook. However, we do want to fill in some blanks by highlighting a couple of areas of operations improvement that we feel might not be represented: systems and process improvement (more specifically, business process reengineering) and measurement systems. Again, our contention is that the bulk of this Handbook focuses on the traditional ISE role in achieving operations effectiveness.

3.4.2. Business Process Improvement

The term *unit of analysis* applies to the scope of the system of interest. When IE first began, the unit of analysis—the scope of the system of interest—was confined to the worker, the work cell, and individual work methods. Over time, the scope of the system of interest to the ISE has increased—for example, from economic lot size to inventory control to warehouse management system to supply chain optimization to enterprise or supply chain synthesis. It is important to keep in mind that this expansion in focus is an “and,” not an “or.” Attending to larger units of analysis is a “transcend and include” strategy. Inventory control remains in the ISE toolkit, but now it is being applied in the context of larger systems. This causes the ISE to rethink what it means to optimize the system of interest. If a system’s performance objective is simply to fill customer orders, one might employ a

“just-in-case” inventory policy that relies on very high inventory levels to ensure satisfied customers. Vendor relationships of one type might drive inventory even higher. If the unit of analysis is shifted to the next-more inclusive system, so that it includes different relationships with vendors, high weighting on holding costs, preference for short lead times, high values placed on shortage costs, and so on, then the outcome could very well be an entirely different strategy for inventory management. It is interesting to note that the “dot com” organizations have to reinvent supply chain models in order to thrive in the high-paced and fast-moving environment. The real challenge will be for more traditional organizations with legacy systems to migrate to a dot com pace.

This migration to a larger system of interest also happened to process improvement. Total Quality Management (TQM) revitalized the interest of organizations in quality issues.* The focus on improving embedded processes has shifted to an enterprise-level focus on improving business processes. Once again we see the transcend-and-include principle being required. A business process begins and ends with the customer. Organizations can no longer afford to optimize a subsystem (embedded process) at the expense of the performance of the larger system (business process). So the techniques and methods that were employed to improve smaller processes are being adapted and enhanced with some expertise borrowed from organizational leadership and management of change, creating a whole new line of business for a large group of professionals.

At the time we go to press, our experience is that few ISE undergraduates are being introduced to business process engineering. Our plea is that ISEs embrace this technology. For example, business process reengineering, we believe, is a context within which most ISE improvement efforts will be done in the near future.

Figure 12 is an example of a business process reengineering roadmap to provide insight as to how the ISE might contribute. First, systems thinking is required to do BPR. ISEs are trained to

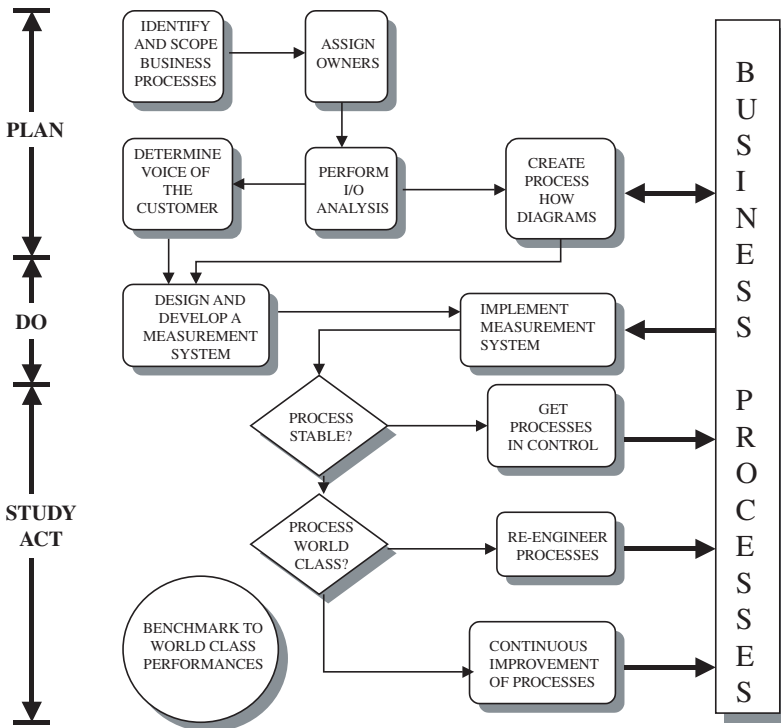


Figure 12 Business Process Reengineering Roadmap: How the ISE Might Contribute.

* Interestingly, quality assurance, control, and sampling, etc. were taught almost exclusively in ISE programs before the 1980s. Now it would be surprising to find an MBA program without TQM coursework.

think systems. Second, many of the substeps in the process (see Figure 12) require specific knowledge and skills that ISEs are grounded in. We understand that ISEs are involved in many BPR efforts in organizations today. We also know that many BPR efforts are information technology-driven and many exclude ISE involvement. We believe this is an error that leads to underperformance.

At several points in the chapter we have mentioned the importance of measurement in transforming to full potential performance. Let's turn our attention to a specific focus on this role and see if we can highlight differences we see in the future in terms of ISE contribution.

3.4.3. *Building Effective Measurement Systems*

Work measurement and *methods engineering* are terms that have traditionally described actions taken to quantify the performance of a worker or a work unit and to improve the performance of the individual and the unit. The relevant body of knowledge has been developed and preserved through the entire history of ISE. Throughout that history, one principle has served as its unifying force: *an appreciation for and the applied knowledge of systems*. In fact, Frederick Taylor (1856–1915), who is generally recognized as the father of industrial engineering, wrote in 1911, “The system must be first.” Methods engineering was pioneered by Frank Gilbreth and his wife Lillian, whose lives were memorialized in the Hollywood film *Cheaper by the Dozen*. Soon after methods engineering began to be practiced, the need for measurement technology became clear. This was inevitable. Once analysts proposed improvements to the way a job was done, natural curiosity led to the question “How much better is it?” The ISEs translation of and response to that question led to the development of tools and techniques for measuring work.

More recently, the importance of methods engineering and work measurement was underscored by the late W. Edwards Deming in his legendary seminars. Dr. Deming, when questioned about a system performance deficit, would confront his audience with the challenge “By what method?” He virtually browbeat thousands of paying customers into the realization that insufficient thought and planning went into the design of work systems. Dr. Deming believed that workers, by and large, strive to meet our expectations of them. The lack of sufficient high-quality output, he taught, stemmed not from poor worker attitude, but from poor management and poor design of the methods, tools, and systems we provide to the otherwise willing worker.

Dr. Deming also promoted the ISEs contribution through work measurement with an additional challenge. Once a solution to the “By what method” question was offered, Deming would ask, “How would you know?” This query highlighted his insistence that decisions regarding process improvements be data driven. In practice, this means that effective systems improvement activities require evidence as to whether the changes make any difference. The requirement is that we use our measurement expertise to quantify the results of our efforts to design and implement better systems. The Deming questions—“By what method?” and “How would you know?”—articulate the defining concerns of the early ISEs, concerns that continue to this very day.

The ability to measure individual and group performance allowed organizations to anticipate work cycle times, which led to more control over costs and ultimately more profitability and better positioning in the marketplace. Understanding how long it *actually* takes to do a task led to inquiry about how long it *should* take to do work through the application of scientific methods. Standard times became prescriptive rather than descriptive. The next step in the evolution was the integration of production standards into incentive pay systems that encouraged workers to exceed prescribed levels of output. Application of extrinsic rewards became an additional instrument in the ISE toolbox, vestiges of which linger on.

So much for the evolution of the work measurement and methods aspects of traditional ISE practice. The following are some evolutionary enhancements that have become part of the ISE measurement value proposition:

- Statistical thinking plays a more critical role in understanding work performance. Variation is inherent in all processes and systems. Discovering the underlying nature of variation and managing the key variables has become more critical than just establishing a standard.
- The role of production quotas is being reexamined. Should we throw out all standards, quotas, and targets, as Dr. Deming suggested? We think not. We contend that the effective approach is to establish a system within which teams of employees hold themselves and each other accountable for system performance and are encouraged to reduce variation and improve performance on their own. Standards that control and limit employee creativity should be eliminated. The key is understanding performance variation and what causes it and creating a partnership with employees so that they are integral members of the team working to improve it.
- Work measurement and methods improvement became detached, to some extent, from the larger system of improvement efforts. Today, efforts to improve what workers do and how they do it is being tied to overall business strategy and actions. This means that measures of performance at the work unit level will have to be tied to and integrated with measures of performance for

larger units of analysis. Linkages between individual worker and team performance and system-level measures of performance are becoming better understood and managed. Here again, our message is “transcend and include.” Efforts to understand how long something does or should take at the employee or work center level will expand to include understanding of how the unit-level systems need to perform in order to fill the treasure chest of the organization.

- Time and quality are no longer the only indicators of organizational performance for which ISEs are being held responsible. This is manifest in a vector of performance indicators, including efficiency, effectiveness, productivity, financial performance, quality of work life, customer satisfaction, and innovation, which are being made elements in a rich and balanced scorecard on which the organization is being graded (Kaplan and Norton 1996).
- Visibility of measurement systems and portrayal of performance data are being recognized as critical elements in the deployment of enhanced measurement systems. Traditionally, a worker knew the standard and that was it. In the future, employees at every level of the organization will have continual access to their scorecard indicators. Furthermore, they will be aware of how these measures are linked to the performance of more inclusive systems. For example, employees at the checkout counter will understand that their behaviors and attitudes influence whether the store is a compelling place to shop and will have data to tell them how this helps to fill the treasure chest and how that affects them. Store managers will understand that a five-point increase in employee attitudes translates into a 1.3% increase in customer satisfaction, which translates into a 0.5% increase in gross store revenues, and their chart book will portray the data that portray how their unit is performing. As a result, daily, hourly, moment-to-moment decisions will be made on the basis of visible data and facts.

The ISE will be integral to the design, implementation, and maintenance of these comprehensive and very visible measurement systems.

3.4.4. Organizational Systems Performance Measurement

An organizational system is two or more people whose activities are coordinated to accomplish a common purpose. Examples of organizational systems are a work unit, a section, branch, plant, division, company, enterprise.

In Figure 13, the management system is portrayed as consisting of three elements: *who* manages, *what* is managed, and *how* managing is accomplished. In a traditional organization, “who” may be

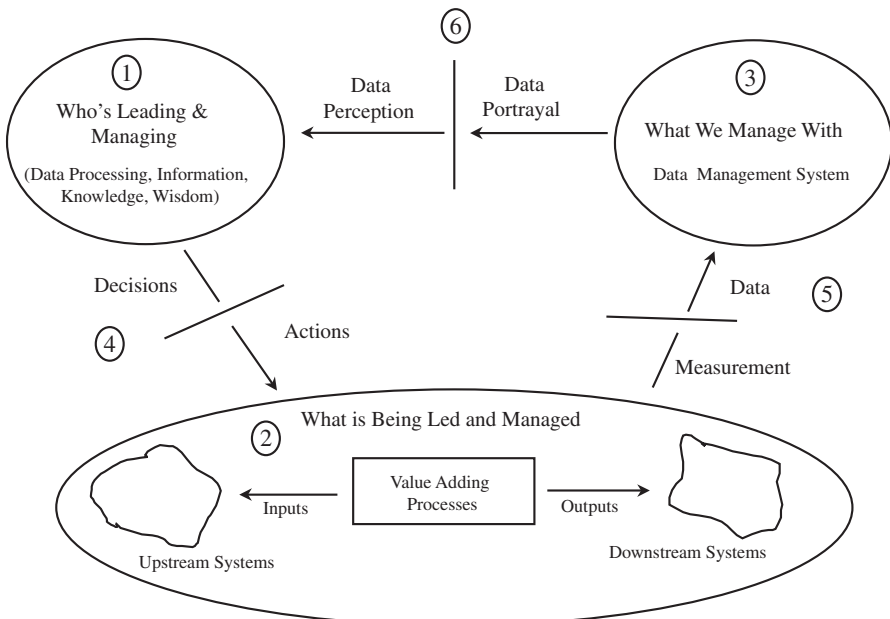


Figure 13 Management System Model.

the manager; but in the contemporary organization, “Who” refers to a management team. For the long-range planning horizon, the management team establishes the goals and objectives—the vision—of what the organization is to become. In the short time horizon, levels of system performance must be specified. The “What” is the system that is being managed; the organization, system, or process of interest, the object of the management efforts. “How” refers to managerial processes and procedures and more specifically to the transformation of data about the performance of the organization (“What”) into information regarding the need for actions or interventions.

The management system model can also be characterized as a feedback or closed-loop control system. In this version, the management team is the controller (who), the process is the system being controlled (what), and the instrumentation (how) monitors the system states and feeds these back to the controller so that deviations between the actual and the desired states can be nulled. The interfaces between each of the elements also represent the management process. Between the “what” and the “how” elements is the measurement-to-data interface. Between the “how” and “who” elements is the information portrayal/information perception interface. And between the “who” and the “what” elements is the decision-to-action interface. Viewed from the perspective of this model, the management of a function would entail:

1. Determining what performance is expected from the system
2. Monitoring the system to determine how well it is performing in light of what is expected
3. Deciding what corrective action is necessary
4. Putting the correction into place

Note that any embedded organizational system is operating in the context of a larger system and the linkages are critical to total system optimization (Sink and Smith 1994).

This model provides the frame and the outline to be followed in building an effective measurement system. The steps one takes to do this are covered in other references we have provided. We will simply restate that understanding what constitutes success for an embedded system must be clearly understood and operationally defined. The model for success must also be operationalized and understood. Senge (1990) and others devote much of their work to helping us understand the tools of systems modeling in this regard. Without a clear, specific, focused understanding of what the key result areas and their related key performance indicators are, it is difficult for workers or managers to assess how they are doing and on what basis to make those assessments. The measurement system allows for effective Study (S) in the Shewhart/Deming PDSA improvement cycle. A modern measurement system will have to be comprehensive, well integrated, and strategic as well as operational. It needs to portray causal linkages from the system of interest to the next-larger system. This assists in ensuring that we do not fall into the trap of optimizing the subsystem at the expense of the larger system.

In our experience, ISEs understand measurement perhaps better than other disciplines, and yet the traditional approach is often reductionist in its orientation. The key to ISE being better integrated to enterprise improvement is that we apply our strengths in a way that avoids suboptimization and clearly ties to the higher organizational good. This is especially true with measurement.

4. ORGANIZING FOR FULL-POTENTIAL ISE CONTRIBUTION

4.1. Overview

We’ve portrayed what we believe is an extended and expanded value proposition for ISE. To summarize: the ISE is playing a key role in strategy and positioning, planning, change leadership and management, culture, measurement, learning, reengineering, and infrastructure. When you couple this view with the more traditional focus that is discussed in the bulk of the Handbook, we think you will get a flavor of the full potential for ISE and how exciting ISE will be in the decades to come. The issue here is how to position and organize the ISE role such that the potential contribution can be realized. The traditional view is that the ISE function should be located in a dedicated unit that is well connected to positions of power.

An alternative view is emerging. We believe that the environment that made the ISE department or function effective has changed. The challenge is to position the ISE value proposition, not the function. Once again, this transformation requires that there be strong motivation and enlightened executive sponsorship for deploying ISE skills throughout the organization. ISEs will be positioned in ways that were impossible to envision in the past.

4.2. Executive Sponsorship

At the risk of becoming too repetitive, we will reassert that full-potential organizations will have a senior leader (CEO, VP) who champions the ISE contribution. This sponsor will also have a clear mental model of what needs to be done for the organization to migrate toward full potential and how

ISEs can support that. ISEs will be deployed throughout the business in positions of influence and support relative to key initiatives.

This may not seem too different from the current reality, but the major difference will be the extent to which oversight exists. The executive sponsor will own the process of positioning ISEs as their talents are expanded and applied across the enterprise. Review the readiness for change model presented in Section 3.2.3. All the requirements for successful change are present. We've seen executive sponsorship work, and we believe it is the wave of the future.

4.3. Business Partner Relationship Management

Earlier in the chapter we noted that in our conceptual framework, organizations have only one customer. We have abandoned the term *internal customer*. Everyone inside the organization is a partner working on a team dedicated to serving the customer and filling the treasure chest. In this respect the executive sponsor for ISE is in partnership with other key executives working together to migrate the business toward full potential. ISEs are deployed as resources that can support functional and cross-functional efforts to ensure that improvements are well managed and produce the desired results. The model is value based and relationship based. To achieve full potential, it is necessary (but not sufficient) that relationships among employees, internal business partners, stockholders and stakeholders, customers, and suppliers/vendors be effectively managed. This is true for the executive sponsor of the ISE role, for the ISE, and for the partners of ISEs within the enterprise.

4.4. Integration Role

The word "integration" is central to the operational definition of ISE. It takes a lot of integration to achieve full potential. It should be clear by now that we view the ISE as a key integrator. Businesses are decentralized or differentiated to reduce span of control and enhance agility, responsiveness, and ownership. Differentiation escalates the need for integration, and integration requires information sharing and cooperation to achieve the higher good. The executive sponsor for ISE should be in a position to understand the higher good, be an integral contributor to organization's senior leadership team, and passionately promote integration. ISEs throughout the organization will have to understand the big picture so that they too can promote integration. To do so, they will be in touch with what is going on across the organization, understand the high level strategy and actions, and share this knowledge when working on their projects throughout the business. This ensures that ISE and their colleagues don't lose sight of the forest for the trees.

5. IIE/CIE/CIEADH RELATIONSHIP MANAGEMENT

5.1. Overview

The leadership in the extended ISE community can be portrayed as consisting of three key constituencies. First is our professional society, the Institute of Industrial Engineers (IIE). Second is the academic institutions that teach and certify competency in the knowledge and skills of their graduates, who then become practitioners. This important group is represented by The Council of Industrial Engineering Academic Department Heads (CIEADH). Third is the Council of Industrial Engineering (CIE), a group of "executive sponsors" of ISE in major organizations from around the world. There are other groups in the ISE community; these are three we have chosen for this discussion.

Communication and coordination among these three groups will be essential to our profession achieving full potential. Ideally, from our point of view, CIEADH would view CIE as a focus group of its most influential customers and CIE would view CIEADH as a leadership body representing their supplier organizations. Both CIE and CIEADH would be viewed by IIE as essential customers, suppliers, and stakeholders. IIE would serve both CIE and CIEADH as the organization that encourages and supports lifelong learning and continued personal and professional development for ISE practitioners *and* as their professional society for life. The leaders of all three organizations would accept their roles as stewards of our profession and our professional society.

5.2. Relationship Management

As we've said so many times to this point, much depends on relationships in the context of core values. ISE will achieve full potential in the years to come if and only if those in leadership positions in the three constituencies acknowledge their mutual dependencies and manage their interrelationships. If we truly want our profession to realize its full potential and make the contribution it is capable of, we will opt for improved relationships.

6. MAKING THE FULL-POTENTIAL MODEL WORK FOR YOU: LEADERSHIP AND PERSONAL MASTERY

At the outset we mentioned that it would take full-potential ISEs to create full-potential organizations. We have deferred addressing the issue of personal mastery and making the full-potential model work

for the individual ISE. If ISEs accept personal responsibility for their own growth and development, full potential will be within the grasp of ISEs, our customers, and our organizations. The fundamental questions that make up the process are straightforward:

- What is our purpose in life (our enduring reason for being)? What is our vision (full potential, the look and the feel of success)?
- What will it take for us to be successful?
- What work do we have to do to migrate toward our particular visions?
- What conditions do we have to create for ourselves in order to be successful?
- How will we know how we are doing, on what basis will we make this assessment, and how will we manage our performance over time?

So much good work has been done today to achieve personal and professional mastery that it is difficult to suggest a starting point. Each of us has found Senge's and Covey's work on personal and professional mastery a good place to begin (Senge, 1990; Covey, 1994).

As Dr. Deming used to say, the journey to full potential performance will take a lifetime and that's good because that's all you've got *and* you can begin anytime you want as long as you start now!

REFERENCES

- Akao, Y., Ed. (1991), *Hoshin Kanri: Policy Deployment for Successful TQM*, Productivity Press, Cambridge, MA.
- Collins, J. C., and Porras, J. I., (1994), *Built to Last: Successful Habits of Visionary Companies*, HarperCollins, New York.
- Covey, S. R. (1994), *First Things First*, Simon & Schuster, New York.
- Csikszentmihalyi, M. (1990), *Flow: The Psychology of Optimal Experience*, Harper & Row, New York.
- DeGeus, A. (1997), *The Living Company: Habits for Survival in a Turbulent Business Environment*, Harvard Business School Press, Boston.
- Fritz, R. (1991), *Creating: A Practical Guide to the Creative Process and How to Use It to Create Everything*, Fawcett Columbine, New York.
- Kaplan, R. S., and Norton, D. P. (1996), *Translating Strategy into Action: The Balanced Scorecard*, Harvard Business School Press, Boston.
- Lawler, E. E., III, (1986), *High Involvement Management*, Jossey-Bass, San Francisco.
- National Institute of Standards and Technology (1999), "Criteria for Performance Excellence," in *Malcolm Baldrige Business Criteria*, NIST, Gaithersburg, MD.
- Porter, M. E. (1996), "What Is Strategy," *Harvard Business Review*, Volume 74, November–December, pp. 61–78.
- Schein, E. H. (1992), *Organizational Culture and Leadership*, Jossey-Bass, San Francisco.
- Senge, P. M. (1990), *The Fifth Discipline*, Doubleday-Currency, New York.
- Sink, D. S. (1998), "The IE as Change Master," *IIE Solutions*, Vol. 30, No. 10, pp. 36–40.
- Sink, D. S., and Poirier, D. F. (1999), "Get Better Results: For Performance Improvement, Integrate Strategy and Operations Effectiveness," *IIE Solutions*, Vol. 31, No. 10, pp. 22–28.
- Sink, D. S., and Smith, G. L. (1994), "The Influence of Organizational Linkages and Measurement Practices on Productivity and Management," in *Organizational Linkages: Understanding the Productivity Paradox*, D. H. Harris, Ed., National Academy Press, Washington, DC.
- Spears, S., and Bowen, H. K. (1999), "Decoding the DNA of the Toyota Production System," *Harvard Business Review*, Vol. 77, No. 5, pp. 96–106.
- Thompson, J. D. (1967), *Organizations in Action*, McGraw-Hill, New York.
- Tompkins, J. (1999), *No Boundaries: Moving Beyond Supply Chain Management*, Tompkins Press, Raleigh, NC.
- Wilbur, K. (1996), *A Brief History of Everything*, Shambala Press, Boston.
- Womack, J. T., and Jones, D. T. (1996), *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*, Simon & Schuster, New York.

ADDITIONAL READING

- Miller, D. "Profitability = Productivity \times Price Recovery," *Harvard Business Review*, Vol. 62, May–June, 1984.
- Sink, D. S., and Tuttle, T. C., *Planning and Measurement in Your Organization of the Future*, IEM Press, Norcross, GA, 1989.
- Sink, D. S., and Morris, W. T., *By What Method?*, IEM Press, Norcross, GA, 1995.
- Vaill, P., *Learning as a Way of Being*, Jossey-Bass, San Francisco, 1996.