

# **Applying Interactive Planning at DuPont: The Case of Transforming a Safety, Health, and Environmental Function to Deliver Business Value**

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Organizational transformation is a dynamic process that astounds those who attempt to create better work environments. Corporations often use transformations to downsize and/or outsource functions. Although the Safety, Health, and Environmental (SHE) function has experienced little change in the past 25 years, pressure is increasing to reduce costs and deliver business value. Often, cost reduction means downsizing and memory loss. Delivering business value means moving the SHE function into the business, with modest attention given to integrating the work. Four major findings resulted in the transformation of a SHE function in DuPont using Interactive Planning: (1) SHE professionals transformed from independent to interdependent knowledge workers, (2) SHE performance improved by almost 50%, (3) enabling factors were participation and personal commitment and disabling factors were organizational turbulence and lack of recognition, and (4) organizational learning flourished among SHE professionals and tacit SHE knowledge became explicit on the factory floor.

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**KEY WORDS:** Ackoff; Interactive Planning; transformation; DuPont; safety; health; environment.

## **1. THE DuPONT COMPANY SHE MANAGEMENT SYSTEM: 1802–PRESENT**

Since its early beginnings manufacturing reliable black powder on the banks of the Brandywine Creek just outside of Wilmington, Delaware, DuPont has considered safety, occupational health, and environmental protection to be among the fundamental reasons for achieving business success. Although the importance given to safety, health, and the environment came at different points during DuPont's 200-year history, the significance of each arena preceded essentially all other

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chemical manufacturing companies. To appreciate the challenge of transforming a DuPont SHE function, a brief overview of each function follows.

### 1.1. Safety in DuPont

DuPont's zeal for safety began when soon-to-be-president Thomas Jefferson asked Eleuthere Irenee du Pont to manufacture reliable black powder in 1802. The powder mills were designed to protect the employees, who entered the mills only to start or stop the manufacturing process. Even with the safety precautions that were taken, accidents and fatalities occurred, which included members of the du Pont family (E. I. du Pont de Nemours & Company, 1952). Each mishap led to further precautionary measures being implemented to reduce the risk of accidental explosions (Peterson, 1986). Throughout DuPont's long history, it has taken pride in striving to be the safest company in the world. DuPont has invented many of the techniques that are used today by numerous corporations for managing safety. DuPont's safety heritage has enabled it to research, design, and build manufacturing processes for extremely high-risk chemical production that most other chemical manufacturers do not want to handle. The keystone of DuPont's success has been its attention—some say its passion—to employee safety. By any measure of injury and illness rates, DuPont is one of the safest company in the world. Safety *is* the culture of DuPont and it is considered a condition of continued employment (Mottel *et al.*, 1995).

### 1.2. Occupational Health

Attention to occupational health began to surface in the early 1900s when the means to discover the symptoms of occupational diseases were becoming available in the United States through the work of Alice Hamilton, M.D. By then DuPont had already encountered its first occupational illnesses during the 1880s with the manufacturing of dynamite (Hounshell and Smith, 1988). Although other incidents of occupational disease surfaced during World War I and shortly thereafter, probably the most significant occupational health crisis occurred between 1929 and 1932, when a number of dye plant employees were diagnosed with bladder cancer (Chambless, 1985; Hounshell and Smith, 1988). These cases prompted DuPont to establish a toxicological laboratory, which was opened in 1935 as the Haskell Laboratory for Toxicology and Industrial Medicine. One of the initial discoveries at the laboratory revealed that  $\beta$ -naphthylamine was probably the most likely cause of the dye workers' bladder cancer (Sellers, 1997). Since its opening, Haskell Laboratory has pushed the frontiers of occupational health and industrial medicine in the development of very sophisticated biomonitoring techniques and understanding the toxicity of numerous complex chemical compounds. Armed with this information, occupational health professionals and industrial hygienists

set about implementing practical approaches to identify, control, reduce, and ultimately eliminate the health hazards in the chemical manufacturing process, along with educating the employees and customers on the safe handling of the raw, intermediate, and finished chemical products.

### 1.3. Environmental Protection

The 1970s and 1980s were spent preparing encyclopedic-sized environmental impact statements for new and existing facilities and applying for numerous environmental permits to operate these facilities. In addition, significant time was spent on reviewing and commenting on proposed federal and state environmental regulations driven by Congress' obsession to regulate every activity that could potentially impact the air, land, and water. It was during the later part of this period that companies began to realize the costs to comply with this profusion of government regulations was becoming horrendous and few, at the time, had any breakthrough ideas for getting these costs under control. In May of 1989, DuPont's newly elected CEO, Edgar S. Woolard, Jr., presented his first public speech before the American Chamber of Commerce (UK) in London on the environmental challenges facing industry (Woolard, 1989). Woolard's speech marked the beginning of a new environmental era for DuPont that would lead it into the 21st century. Five years later, DuPont's management rewrote its 1971 SHE policy and released it as *The DuPont Commitment—Safety, Health and the Environment*. This commitment led to the corporate slogan—The Goal Is ZERO—which prominently remains today as DuPont's commitment to zero injuries and illnesses, zero wastes and emissions, and zero environmental, process, and transportation accidents and incidents.

## 2. THE DuPONT COMPANY TRANSFORMATION: 1993–1998

Along with this heightened attention to safety, health, and environment, the DuPont Company was undergoing a major corporatwide transformation of its businesses and how it would structure itself going into the 21st century. In 1993, CEO Woolard set about the task of transforming the corporation from five huge business sectors to 23 strategic business units (SBUs), which were aligned along their value chains. Even though the corporate functional areas remained relatively intact, they could not impose their agendas on the SBUs and they had to become cost competitive with like services provided from outside DuPont. The SBUs were no longer required to use the services of staff functions.

During this 5-year period, DuPont downsized the organization by 40,000 employees, or 33% of the total workforce. In addition, a \$1 billion cost-reduction program was initiated which led to a \$2 billion fixed-cost reduction. Financial results were impressive with DuPont stock and total market value doubling. The

overall gain on return in equity was 241% and the gain in net income per employee was 221% (Schoonover, 1998).

In 1998, newly elected President, Chad Holliday, launched an effort to re-deploy as many corporate staff functional employees as possible into the SBUs so they could be closer to the employees they were serving. Care was taken to ensure that certain core capabilities that were located within these staff functions were not lost, and in some cases smaller core units were established with the stewardship responsibility for these core capabilities.

Ned Jackson, the vice president and general manager of one of the more complex SBUs in DuPont, Specialty Chemicals, aggressively approached the corporatewide transformation that was taking place in 1993 by organizing his 23 businesses along their value chains and dividing these businesses among five business directors. The SBU's leadership team stressed a more synergistic approach to business growth from a strong platform of healthy businesses using high-performance work teams, integrating functional services into the line organization, introducing innovative information technology tools, and striving for 10% business growth per year. During this 5-year period, the SBU underwent significant turnover at the leadership levels. The changes included 2 new VP/GMs, 4 manufacturing directors, 5 business directors, 8 functional directors, and 29 plant managers. To say that there was a great deal of change going on in the corporation and within the SBU would be an understatement.

### 3. THE CHALLENGE

Most Fortune 500 corporations have organized their safety, occupational health, and environmental functions into very centralized—hierarchical structures that are responsible for ensuring the business units comply with laws and regulations and corporate policies. Many believe that this role of the SHE function serves corporations well; however, I believe that the role of the function is better served by integrating the function into becoming an important part of the business' competitive advantage versus policing business activities. To accomplish this conversion, the SHE work must be aligned with the business' goals and objectives. In addition, the people doing the work needed to begin to think of their work in the context of being an interacting component within the larger business "system." Undertaking these changes does not occur because someone thinks it is a good idea. To integrate fully SHE knowledge and understanding into the daily business decision-making process, one must rethink, or redesign, the way work is going to be done to capitalize on the competitive advantage.

The challenge to bring about a transformation of the SHE function within Specialty Chemicals SBU was going to be a daunting task, but for the SBU to meet the goal of zero injuries, illnesses, wastes and emissions, and incidents, the SHE function had to change the way work was being accomplished. Gaining approval

for launching the transformation effort began with providing management with an overview of the Specialty Chemicals' SHE system and how it was incompatible with the current business system, especially in light of the SBU's desire to meet the new challenges of the DuPont SHE Commitment and sustain business growth.

In 1995, Specialty Chemicals was home to 23 small independent businesses that specialized in manufacturing, distributing, and selling virtually all of DuPont's highly hazardous and toxic chemicals to almost 4000 internal and external customers with gross revenues of \$1.6 billion. The SBU's business strategy included seeking growth opportunities with new products, for new market spaces in new global marketplaces. The SBU SHE function, illustrated in Fig. 1, was structured as a centralized-hierarchical organization responsible for ensuring the businesses complied with laws, regulations, and corporate policies. SHE expertise was rarely integrated into business decision-making processes. She knowledge was not captured resulting in SHE professionals having to reinvent their know how every 2 to 3 years. SHE professionals continued to be trapped in performing very

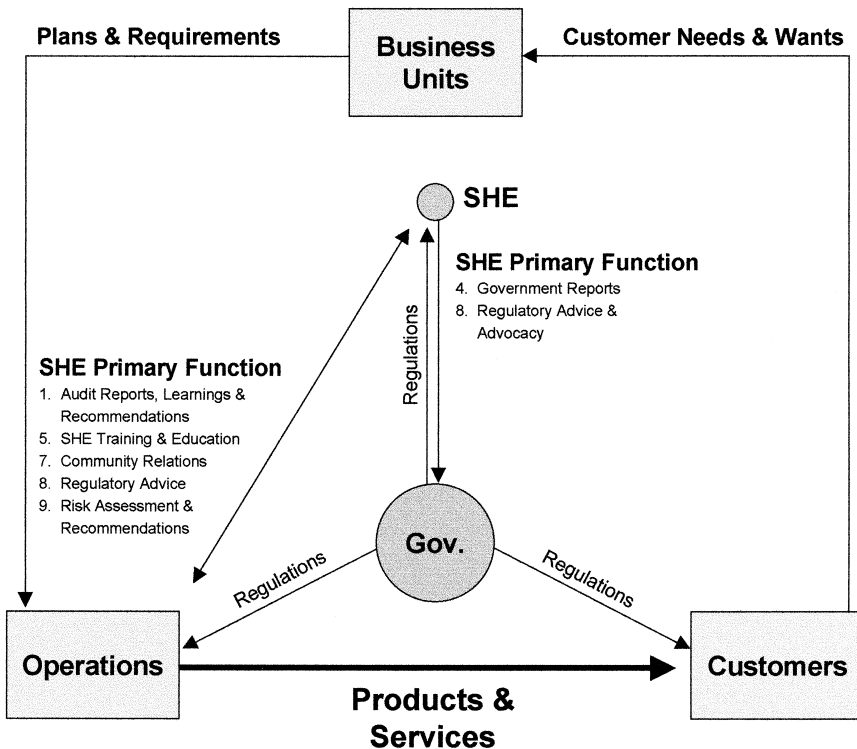


Fig. 1. Specialty chemicals SHE function: current state.

time-consuming transactional work (i.e., managing data, filling out government forms, etc.), reacting to operational crises, and not having time for professional growth and development.

Approval for the transformation was obtained in May 1995 with the provisos of ensuring that SHE performance would not deteriorate and would hopefully improve and that an organizational memory of the transformation would be recorded for possible use in other parts of the SBU or the corporation.

#### **4. SELECTING THE TRANSFORMATION METHODOLOGY**

During this period, many corporations were experimenting with a variety of techniques to reduce costs and try to grow their business. It seemed like every week a new book sermonizing the benefits of reengineering, reframing, restructuring, revitalizing, renewing, etc., hit the “best-seller” list. All of these processes were being used within DuPont with varying degrees of success and failure. “Reengineering” was becoming a synonym for downsizing. By 1995, Gemini Consulting had become deeply entrenched in many DuPont SBUs applying their brand of transformation—Reframing—Restructuring—Revitalizing—Renewing. Although this brand of transformation led to reduced costs and more downsizing, there was little to no business revitalization or growth and essentially no renewing of people’s skills through training or development. A central theme of most of these transformation techniques that was becoming apparent to me was that virtually none of them focused first on the work and then on how the work was going to get done. The prevailing belief was that the survivors of the last downsizing would somehow intuitively figure out what work needed to get done and how they would go about doing their work and their downsized colleague’s work.

The ongoing DuPont transformation that was in progress provided an opportunity to redesign the Specialty Chemicals’ SHE work and to align better the SHE professionals with their work and the business’ goals and objectives. Two key methodological attributes would be necessary to gain management’s financial and human resources support and ensure a successful transformation of the SHE function. First, the methodology had to target the right work that needed to be done and then process ways to do the work. Once this was done the next step had to address how the organization would be structured to do the work and who was actually going to do the work. The second key attribute required a methodology that promoted a high degree of participation at all levels of the organization, not just within the SHE function.

After reviewing the pros and cons of the techniques being used and the literature behind these techniques and visiting with colleagues who had facilitated and/or gone through these techniques, I realized that none of these approaches met the attributes I was seeking. Through a rather serendipitous meeting with Russell L. Ackoff and using Flood and Jackson’s (1991) groupings of systems thinking

methods, it became readily apparent that Ackoff's Interactive Planning methodology, with some modification based on Ackoff's advice, would be the best-suited methodology to undertake an idealized redesign of the SHE transformation.

## **5. INTERACTIVE PLANNING IN ACTION**

Interactive Planning provides a platform for driving change from the bottom up, allowing for significant input from those, the SHE professionals, who are being asked to change. One of the true strengths of Interactive planning is being able to account for not only the ongoing changes being experienced during the change process, but also how these changes are affecting the outside environment, and vice versa.

### **5.1. Mess Formulation**

Typically, Mess Formulation begins with a systems analysis and obstruction analysis followed by the development of reference projections and reference scenarios. In this case, Dr. Ackoff and Dr. John Pourdehnad advised me to modify this step of the Interactive Planning process because DuPont is already recognized as one of the leaders in safety, occupational health, and environmental protection. Indeed, during the initial presentation to management to gain support, the Interactive Planning process and its idealized design step was so appealing to management because it offered a way to maintain and improve its leadership position along with developing its SHE functional excellence into a competitive advantage.

The modified Mess Formulation included a systems analysis that covered the current status of Specialty Chemicals' businesses and an overview of the businesses the SBU wants to be in. It was important that the SHE professionals understood the business goals and objectives in the context of redesigning the SHE function to avoid working at cross-purposes with each other. The obstruction analysis focused on the conflicts that surface between the business and the function and the function and business. In addition, conflicts within the function were identified. Once these two analyses were completed, it was imminently clear that for the businesses to meet the DuPont SHE Commitment and the Goal Is Zero objectives, the SHE function had to change the way work was going to be done in the future. A team was organized to prepare an idealized redesign of the SHE function.

### **5.2. Ends Planning**

For Ends Planning, I used a two-step process that included a consumer group and a designer group leading to the creation of a consumer idealized design developed by Ackoff. A consumer design involves actual or potential consumers in an unconstrained design of their ideal SHE service (Ciccantelli and Magidson, 1993).

### 5.2.1. *The Consumer Group*

The consumer group consisted of individuals in Specialty Chemicals that are the recipients of SHE information and knowledge. These participants were chosen based on six criteria: (1) they use SHE information, (2) they are responsible for its implementation, (3) they are capable of specifying what they need from a SHE system, (4) they represented diversity in thought and in gender and race, (5) they are capable of thinking “out-of-the-box,” and (6) they understand the need for SHE and its role in business. The 17 consumer group participants included union and nonunion manufacturing operators and mechanics, plant managers, manufacturing unit managers, product managers, business managers and directors, functional managers, and one SHE professional. The consumer group participants were tasked during a 1-day planning session meeting with identifying the specifications they believed would be necessary for an idealized SHE system. I recall several of my colleagues mentioning that none of these consumers, with the exception of one, could possibly identify the specifications of a newly redesigned SHE system. In fact, some of my colleagues were quite irritated with me for choosing a group of non-SHE professionals to provide specifications for a new system that they were going to be tasked with redesigning in the next planning phase.

The consumer planning session began with a brief background on the overall Interactive Planning process and why they were brought together to help in developing an idealized SHE system. Because there were significant differences in salary grade levels in the group, each individual was asked to only state their name, where they worked, and briefly state why they thought they could help in the process. It was important that everyone in the room was comfortable with the selected participants and was not intimidated by the managerial hierarchy.

The consumer session participants initially identified the positive and negative output issues of the current SHE system. This exercise helped the participants to connect with each other on a common theme. The next step involved specifying the properties for an ideal SHE system. This step was based on two assumptions: (1) the existing Specialty Chemicals SHE system had been destroyed the night before, but the remaining parts and systems were intact; and (2) the properties of the ideal SHE system should not be constrained by the possibility of feasibility. The group identified the output issues that they believed distinguished the current SHE system and categorized these issues using Peter Senge’s three multiple levels of explanation: systemic structure, patterns of behavior, and events. In *The Fifth Discipline*, Senge (1990) notes that from a systems perspective multiple levels of explanation exist in any complex situation. Event explanations answer the question “Who did what to whom?” Senge contends event explanations are one reason reactive management prevails in today’s organizations. Patterns of behavior explanations focus on identifying long-term trends and determining their implications. Systemic structure explanations answer the question, “What causes the patterns of behavior?”

The *systemic structure* concerns raised by the consumer group surfaced a variety of issues that could be summarized by stating that the SHE function was not connected to the business needs. The *pattern of behavior* concerns also covered a lot of areas that could be summarized by stating that the SHE function provides a great deal of information but very little knowledge on how to use the information on the factory floor. The *event* concerns focused on the corporate SHE function's false belief that there are universal regulatory solutions to SHE issues at all DuPont plant sites.

In the afternoon of the day-long planning session, the consumer group set about the task of identifying the ideal specifications for the new SHE system that was destroyed the previous night, remembering that the other business systems remained intact. The criteria used for this portion of the session included the following: (1) specifications should not be constrained by economic feasibility, (2) specifications must not violate the law, and (3) specifications must be technologically feasible.

The consumer group identified 58 specifications they believed would be essential for a recently destroyed SHE system that needed to get back up and running immediately. The 58 specifications were narrowed to 19 and categorized into nine major arenas. Several days after the consumer planning session, the participants were asked to confirm their agreement on the final 19 specifications. All the consumer group participants were satisfied with their compilation of specifications and were willing to turn the specifications over to the designer group for the next step in the process.

### 5.2.2. *The Designer Group*

The 26 participants in the designer group were comprised of 13 SHE professionals along with functional managers, business and functional directors, business managers, manufacturing unit managers, and marketing managers. All of these participants were from within Specialty Chemicals and were chosen based on four criteria: (1) they had detailed SHE knowledge, (2) they were capable of thinking out-of-the-box, (3) they had a positive attitude, and (4) they represented diversity in thought and in gender and race.

With the consumer group's output issues and specifications in hand, the designer group was tasked with developing an ideal SHE system that would replace the destroyed SHE system from the previous night. The redesigned SHE system had to use all of the specifications and *dissolve* all of the output issues identified by the consumer group. After spending some time reviewing the materials turned over by the consumer group, I was pleasantly surprised that the SHE professionals in the designer group were quite pleased with the specifications and agreed with all of the output issues and the current state of the SHE function.

The designer planning session involved three 2-day meetings that were held approximately 2 weeks apart from each other. The first designer planning session

began with a brief background on the overall Interactive Planning process and, in particular, the iterative design process they would use to develop the idealized SHE system. In addition, a brief review of the current economic state of the Specialty Chemicals businesses was presented.

Since the 26 participants had never met as a group before, it was important that they begin their work by understanding each other's perspectives. To begin the process, I asked the designers to identify all the SHE system's stakeholders, those that could affect or be affected by the new SHE system. The designers identified nine stakeholders, which included customers, employees, and representatives from plant sites, business functions, government agencies, SBU businesses, local communities, the DuPont Company, and the corporate SHE function. Brief statements were prepared on each of these stakeholder's expectations of a SHE system.

Dr. Pourdehnad (1992), of the Ackoff Center for Advancement of Systems Approaches, University of Pennsylvania, developed the iterative design process shown in Fig. 2. The process includes four major steps that are revisited three times. The steps include (1) creating a mission statement, (2) identifying the functions of the SHE system, (3) formulating the processes for doing the SHE work, and (4) organizing the SHE structure to do the SHE work. A unique quality of the iterative design process centers on first dealing with the work, then focusing on

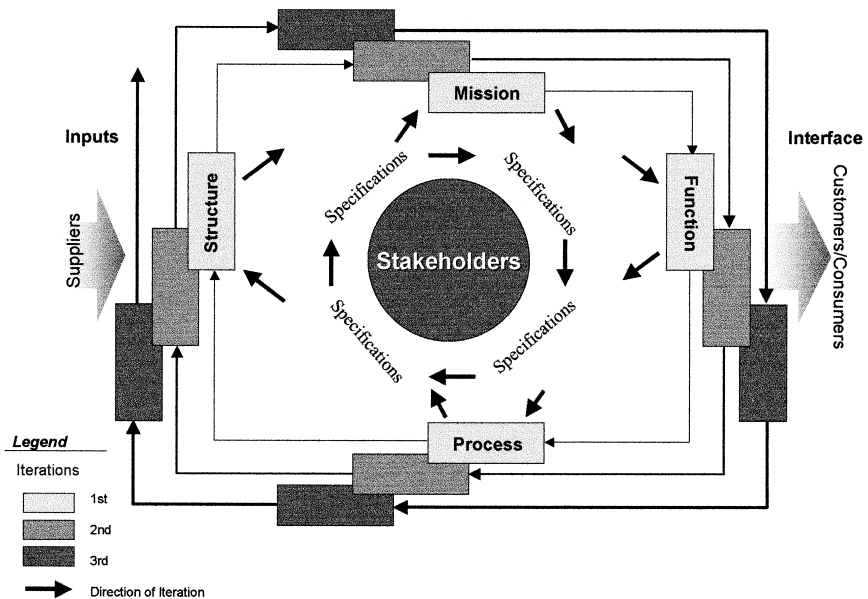


Fig. 2. The iterative design process.

organizing the SHE structure to get the work done and meet the goals and objectives of the mission statement. Too often, management seeks to improve bottomline performance quickly by redesigning the structure of the organization, either through reorganization or downsizing. In the short term certain benefits are realized; however, in the long run, by not redesigning the functions or work processes of the organization, the remaining employees are left with coping with their work and their colleagues' work while, at the same time, constantly trying to reduce costs and deliver value.

The designer group participants began the iterative design process by creating a mission statement using the Ackoff (1999) criteria for developing a purposeful mission statement. After three iterations, the final SHE mission statement read as follows:

A seamless SHE system that integrates, enables, and installs the core DuPont SHE competency to successfully make chemicals, win in business, and sustain our communities.

The SHE functions were identified in the next step of the iterative design process. The designer group participants referred to the output issues and the stakeholder expectations developed by the consumer group as the basis for identifying the SHE functions to meet the business' goals and objectives. The functions are the services and offerings the idealized redesign SHE system will supply to the SHE system's stakeholders. During this stage of the design process the participants ran into a barrier that was impeding progress. The barrier centered on opposing tendencies. In particular, the participants were caught in the dichotomy of trying to decide if a SHE function should be done in a centralized SHE organization or should SHE professionals integrated into the business do it. To overcome this barrier, I used Jamshid Gharajedaghi's work on social dynamics and the illustration in Fig. 3 to help the designers move from *resolving* conflict with "either/or" solutions that are "good enough" to *dissolving* conflict by changing the nature of the system with "and" relationships which recognize the mutual interdependence of the opposing tendencies (Gharajedaghi, 1983). This turned out to be a major breakthrough for the designers because they had never thought of tackling problems in this manner. This breakthrough resurfaced during the course of the entire Interactive Planning process. The SHE functions that were identified after the third iterations were as follows.

- Performance Auditing and Analysis
- Related Project Front-End Loading Guidance
- Training and Education
- Personnel Development
- Knowledge and Learning

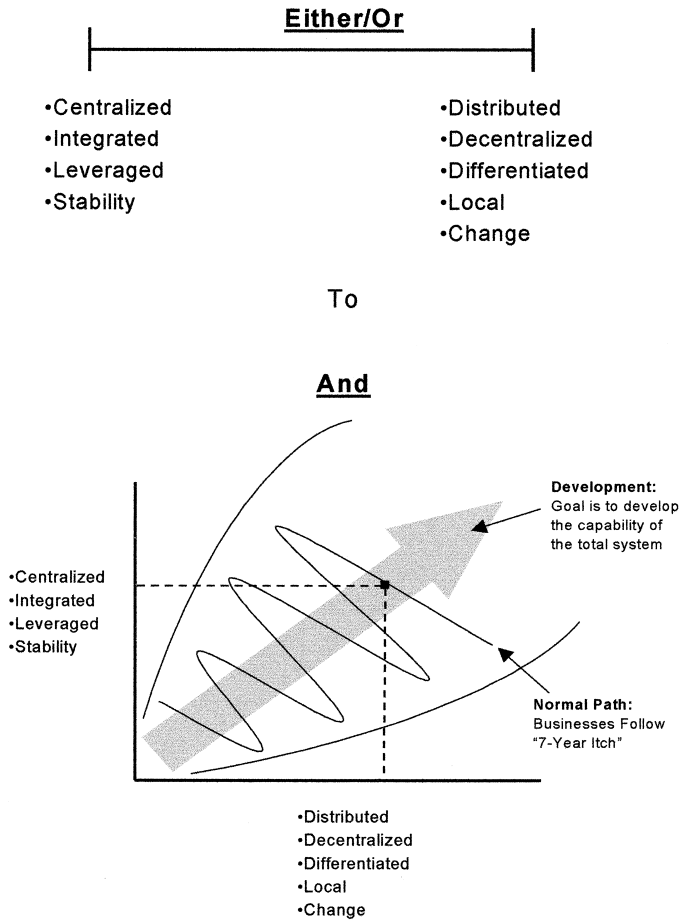


Fig. 3. "Either/or"—"and" dichotomy.

- Risk Assessment and Recommendations
- Federal, State, and Local Regulatory Advocacy
- Community Interaction

Once the designers were in agreement on the SHE functions, they turned their attention to designing the SHE work processes that would get the work done. The framework provided by Dr. Ackoff assisted the designers in developing the work processes. The framework focused on the following.

- Organizational Processes—These processes address the planning and decisions making system, the learning control system, and the management and reward system.

- Throughput Processes—These processes address reducing complexity and improving operational efficiency and quality.
- Latent Processes—These processes address capturing and translating the implicit needs of the end users and preparing the organization to break with the past.

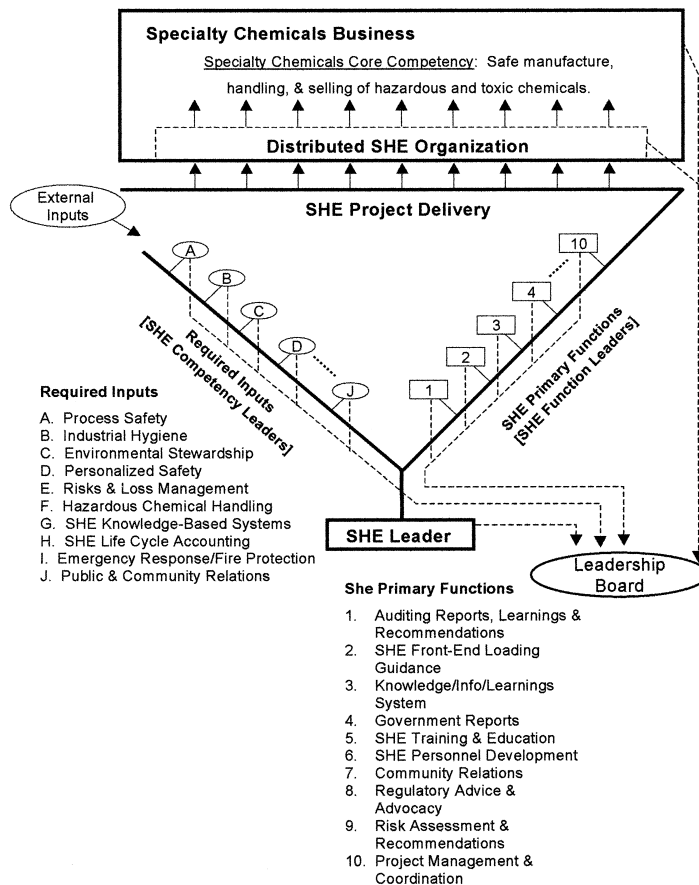
For each of the SHE functions the designers developed work processes to deliver the functions they had identified in the previous step. While going through this step the designers' understanding of the SHE functions expanded to include these additional functions.

- Methodology and Technology Development
- Management and Decision Making (Planning)
- Core Competency Management
- Information Management

Once the work processes were developed, the designers went one step further and decided on whether the work process was broad enough to be applied across the SBU (i.e., Leveraged SHE Processes) or the work process was specific to a plant site (i.e., Distributed SHE Processes). The designers were sensitive to the fact that the learning from Distributed SHE Processes might indeed be applicable to other plant sites so assurances were made to leverage these learnings across the SBU.

The final step in the iterative design process involved creating an organizational SHE structure that would be capable of delivering the functions to the businesses. This step focuses on the flow of responsibility and authority within the SHE organization, the relationships between units, the flow of internal communications, and how resources will be distributed. Figure 4 illustrates the final structure that the designers developed. Figure 5 illustrates the relationships of the new idealized system.

Journeying through the iterative design process three times was torturous for some of the designer participants. In fact, two dropped out of the process after the first 2-day session, saying that what they had contributed was "good enough." By the end of the second 2-day session, the designers saw that their initial design had changed significantly for the better and they began to question the need for another 2-day session. Dr. Ackoff helped to convince the designers that one more round would help the team tasked with bringing their ideal SHE system into reality. The third round resulted in a better-quality mission statement, a refined set of functions, more precise work processes, and a totally new structure. All the designers were satisfied that this new ideal SHE system would *dissolve* the output issues the consumers provided and more than adequately meet the necessary specifications to deliver business value.



**Guiding Principles**

- Each local SHE unit can do whatever it wants provided that it affects no other SHE unit and that it has the necessary resources. If a SHE unit wants to do something that affects others, it must get their approval or a management override. If there are inadequate resources, a SHE unit must get approval from appropriate management.
- Leveraged and Distributed SHE will be stakeholder driven.
- Leadership of the SHE system will be through "Circular Boards."
- SHE work will be accomplished through collaborative SHE networks.
- SHE professionals will have dual roles: Leveraged and Distributed.

Fig. 4. SHE structure and guiding principles.

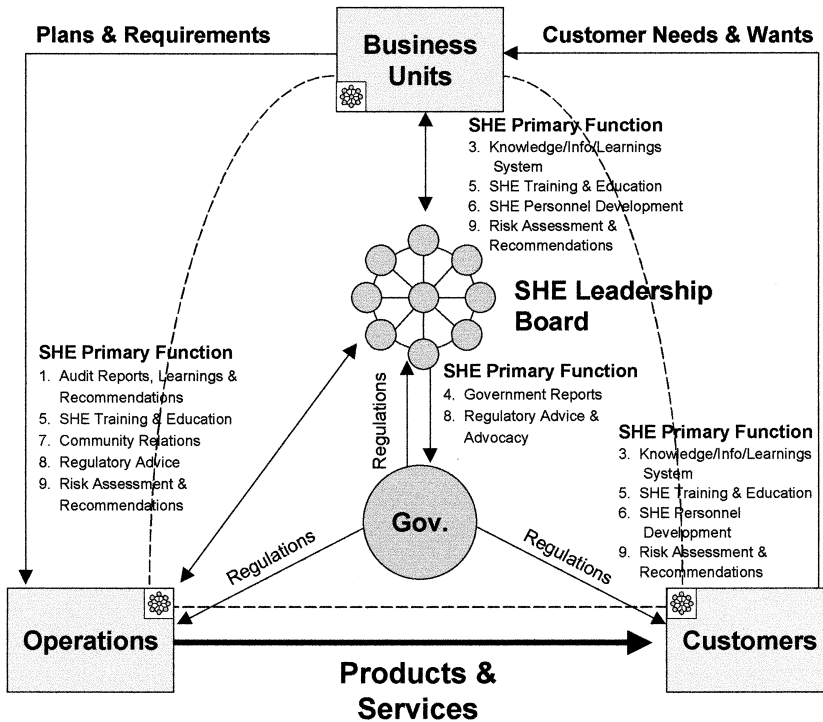


Fig. 5. Ideal SHE system relationships.

### 5.3. Means Planning

Once the idealized system redesign was complete, a team was organized to close the gaps between the current state and the idealized redesign state. The team comprised of SHE professionals within Specialty Chemicals, most of whom work at manufacturing plants and were involved with the Ends Planning phase. All of these professionals had at least 10 years of experience in one or more of the SHE fields, as either generalists or specialists. This step in the Interactive Planning process turned out to be quite difficult, primarily because for the first time these individuals were being given the opportunity to redesign their work completely by inventing ways to bring about the idealized SHE system redesign. Another difficulty surfaced with team members having strong opinions about how they should approximate the idealized redesign.

Regular planning meetings were held to scope the overall project and begin to undertake some selected projects to learn how to work together as a team across the SBU to change deeply entrenched SHE work processes to meet the specifications

and expectations of the idealized SHE system redesign. To help the SHE professionals establish a framework for change, several workshops were held. These workshops covered Robert Shaw's "Capacity to Act" model (Nadler *et al.*, 1992), John Kotter's (1995) "Eight Steps to Transforming Your Organization," and Chris Argyris' (1962) "Involvement and Commitment" model. In addition, a change readiness assessment questionnaire was used to anticipate the organizational and individual resistance to change and the team's capability to successfully manage and lead through the transition. The team completed the selected projects and tackled other SHE work processes with the intent of improving how they work by eliminating redundancies and focusing on delivering new approaches that could be used at all manufacturing sites, as opposed to having a separate approach at each site.

As the team was learning how to change SHE work processes using the surrogate projects and adapting the organization to accomplish the work, the team identified the fundamental changes that would need to take place to succeed. These fundamental changes are illustrated in Fig. 6. From this work, the team identified the critical SHE gaps that would need to be addressed (Fig. 7).

### 5.3.1. Key Steps in Means Planning

Even though all the SHE professionals that were in the designer group were members of this team, there were enough new members that work was needed to align the new members with all the previous work. Some of the key steps taken to drive the Means Planning phase to success included the following.

- Providing a thorough appreciation of the mission statement, functions, processes, and structure of the idealized SHE system redesign, along with the expectations and specifications of the consumer group
- Ensuring that the team understood the business needs and why it was necessary to implement the idealized redesign to meet these needs
- Obtaining agreement from the team members on their roles and responsibilities for undertaking the change effort
- Understanding the true full costs of doing SHE work versus merely adding up SHE professionals' salaries
- Teaching everyone how teams work in a business environment, how struggles will surface in startup, and how to sustain the effort
- Confining the overall effort to a manageable business unit, in this case Specialty Chemicals, and avoiding the temptation to share the process with outside businesses before any business results were realized
- Dealing upfront with personal issues, such as job security, downsizing, future roles, rewards, and job satisfaction
- Incorporating the SHE redesign efforts goals and objectives into annual business goals

SHE Current State	SHE Ideal State
<p><b>Mission</b></p> <ol style="list-style-type: none"> <li>1. Compliance Driven</li> <li>2. Reactive/Intervention</li> <li>3. Not Aligned with Business</li> <li>4. Cost of Doing Business</li> </ol>	<p><b>Mission</b></p> <ol style="list-style-type: none"> <li>1. Stakeholder Driven</li> <li>2. Proactive/Prevention</li> <li>3. Fully Integrated within the Business</li> <li>4. Revenue Enhancer/Value Adder</li> </ol>
<p><b>Function</b></p> <ol style="list-style-type: none"> <li>1. SHE is Operations Support</li> <li>2. Regulation Tracking and Interpretation</li> <li>3. SHE Training</li> <li>4. Data/Information Generation</li> </ol>	<p><b>Function</b></p> <ol style="list-style-type: none"> <li>1. SHE is Business, Operations, and Customer Support</li> <li>2. Regulation Knowledge                         <ul style="list-style-type: none"> <li>—Shaping Regulations</li> <li>—Quick Access to Regulation Interpretations</li> <li>—Shaping Business Plans</li> </ul> </li> <li>3. SHE Education</li> <li>4. Knowledge/Understanding Generation</li> </ol>
<p><b>Process</b></p> <ol style="list-style-type: none"> <li>1. Policing through Auditing</li> <li>2. Government Report Preparation</li> <li>3. Manual Data Collection/Documentation</li> <li>4. Classroom Training</li> </ol>	<p><b>Process</b></p> <ol style="list-style-type: none"> <li>1. Risk Assessment and Loss Prevention</li> <li>2. Automated/Electronic Reporting</li> <li>3. Automated Data Collection/Documentation</li> <li>4. On-Line Learn-Teach-Learn SHE System</li> </ol>
<p><b>Structure</b></p> <ol style="list-style-type: none"> <li>1. SHE is “Centralized”</li> <li>2. “Stovepiped”</li> <li>3. Hierarchical</li> <li>4. SHE Personnel Confined to Plant</li> <li>5. Line Accountable for Safety</li> <li>6. SHE Reports to Operations</li> </ol>	<p><b>Structure</b></p> <ol style="list-style-type: none"> <li>1. SHE is Leveraged and Distributed</li> <li>2. SHE is on Cross-Functional Business Teams</li> <li>3. “Lowerarchical”</li> <li>4. SHE Personnel on Trans Unit Teams</li> <li>5. Business &amp; Line Accountable for SHE</li> <li>6. SHE Reports to VP/GM</li> </ol>

Fig. 6. SHE fundamental changes.

- Engaging a trained facilitator to maintain the pace, establishing meeting dates and agendas, bringing new collaboration tools to the table, and serving as a third-party catalyst to *dissolve* conflict

5.3.2. Key Missteps in Means Planning

Some of the key missteps that occurred during the Means Planning phase included the following.

- Even though all the team members agreed to commit 20% of their time to the effort, in reality the commitment was more like 5 to 10% due to pressing business needs.

Critical Gaps	Ideal Design Elements
<ul style="list-style-type: none"> <li>• Current SHE system does not adjust to changing needs.</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly defined leveraged and distributed SHE accountabilities.</li> <li>• New accountabilities for plant floor.</li> <li>• Integration of changing need through “Circular Boards.”</li> <li>• Staffing driven by demand for services.</li> </ul>
<ul style="list-style-type: none"> <li>• SHE professionals do not have time to deliver the “High Value” functions. —Prevention vs. Intervention</li> </ul>	<ul style="list-style-type: none"> <li>• SHE Information/Knowledge technology tools to increase productivity.</li> <li>• Plant floor will perform routine functions.</li> </ul>
<ul style="list-style-type: none"> <li>• We currently do not deliver many of the Ideal State Primary Functions</li> </ul>	<ul style="list-style-type: none"> <li>• Assign accountable leaders for each “Primary Function.”</li> <li>• Define a process for creating/sharing each function.</li> <li>• Establish an SBU-wide network for each function.</li> </ul>
<ul style="list-style-type: none"> <li>• We do not know where the “Required Inputs” reside.</li> </ul>	<ul style="list-style-type: none"> <li>• Assign accountable leaders for each “Required Input.”</li> <li>• Define a process for giving access for all to the “Required Input” knowledge (i.e., input knowledge catalog).</li> <li>• Establish an SBU-wide network for each function.</li> </ul>
<ul style="list-style-type: none"> <li>• SHE is focused on operations, not on increasing the business competitive advantage.</li> </ul>	<ul style="list-style-type: none"> <li>• Clearly defined connection between SHE and business leaders.</li> <li>• Clearly defined and supported SHE functions for business teams and customers.</li> <li>• Make SHE part of the SBU staff to increase status.</li> </ul>

Fig. 7. Critical SHE gaps.

- Although high-level management fully supported the effort, midlevel management considered their support to be optional.
- Members of management were chosen to be sponsors of network subteams; however, the degree of their participation varied quite considerably and team leaders did not always approach their sponsors when confronted with an issue.

One of the central attributes of Interactive Planning is being able to pay attention to what is not only going on within the planning effort, but also what is going on outside the planning effort. By being attentive to the factors that were

affecting the effort, the team was able to build on its successful steps and learn and adapt to its missteps.

#### 5.4. Resource Planning

Once the Means Plan was developed, the team was prepared to move to the next phase of Interactive Planning and begin developing the Resource Plan. After being the SBU SHE Manager for almost 7 years, I was placed on special assignment to focus my whole attention on completing the realization of the idealized SHE system redesign. Following the transition of day-to-day SHE manager's work to the new SHE manager, we both focused on developing the Resource Plan to carry out the implementation. The resources that we turned our attention to were personnel, money, facilities and equipment, and materials supplies and services.

- *Personnel Planning*—A full-time project manager and a new facilitator were hired for an estimated 2-year assignment. Eight SHE knowledge networks were established, with leaders and 10 to 15 members along with a core leadership team. The purpose of these networks was to undertake the tactical work of implementation. The purpose of the core leadership team was to deal with common tactical issues that surfaced and to address strategic issues of implementation.
- *Financial Planning*—During the entire Interactive Planning process the SBU was dedicating significant time to reducing costs to meet profit objectives. To align the SHE redesign effort better with the stop spending effort, the team undertook a detailed cost accounting of doing SHE work in Specialty Chemicals. The results revealed an annualized cost of \$106 million/year, of which the major portion of the costs went to wastewater treatment (31%), factory floor-level SHE activities (16%), and federally mandated training (10%). Never before had anyone in the company identified in such detail the costs for doing SHE work. For Specialty Chemicals, this amounted to 7% of the SBU's total revenues (i.e., sales and transfers). With this cost information and running the numbers on two cost saving examples (i.e., the cost to update standard operating procedures and the cost to design one safety meeting topic per plant), the team was able to secure the necessary funds to proceed with the implementation.
- *Facilities and Equipment Planning*—This planning focused primarily on the acquisition and deployment of computer hardware to team leaders and their network members. Even though some plant managers had not anticipated the financial outlay within their business budgeting cycle, all agreed to accelerate the deployment to advance the implementation. Interestingly, some of the team members used this deployment as a measure as to whether management was committed to the effort. Once the deployment was completed the enthusiasm soared for implementation.

- *Materials, Supplies, and Services Planning*—The team agreed on Lotus Notes® 4.5 as the software platform for SHE redesign work collaboration. Once this software was deployed and all the team members had gone through training on the software, collaboration among the networks began immediately. The cost cutting extended to the elimination of travel. Since face-to-face meetings could no longer be held, the team and the network members installed Microsoft's NetMeeting™ software from the Internet and began having regular meetings and continuing to do SHE redesign work across the company's Intranet.

## 5.5. Implementation

Now that the Resource Planning phase was complete it was time to begin the actual Implementation phase. This phase of the Interactive Planning process is all about who is going to do what, when, where, and how. The pressures of downsizing, cost reduction, integration of functional work into the line organization, and meeting profit objectives continued. There were five key factors that significantly influenced the successful implementation of the idealized SHE system redesign: (1) the Human Factor, (2) the Organizational Factor, (3) the Work Factor, (4) the Technology Factor, and (5) the Commitment Factor.

- *The Human Factor*—Without a doubt, the most important success factor of the effort involved the people who worked on realizing the idealized SHE system redesign. The entire implementation was accomplished in a virtual collaborative fashion through the SHE knowledge network teams located in different geographical places. Once the network team members were convinced that their work would lead to actually changing SHE work processes that would provide value to the business, they showed a great deal of enthusiasm and excitement to implement fully the idealized SHE redesign.
- *The Organizational Factor*—Undertaking such a significant transformation requires full support from management at all levels. To gain this support it was important to engage management in authentic participation versus merely showing support because it is politically correct. Approaching selected members of management and soliciting them to become sponsors of the implementation accomplished this. The core team leaders identified specific attributes they expected sponsors to emulate. For those members of management that were not chosen as sponsors, individual and group discussions were held with them to gain their insights on issues and concerns they had with the SHE redesign effort. The plant managers' supervisor realized that the implementation of the idealized SHE redesign was a "... journey leading to transferring of SHE knowledge and capability to the line organization rather than just an event."

- *The Work Factor*—As with most of us, changing the way we do work is not something that we take lightly. SHE work consists of a great deal of transactional work (e.g., gathering and manipulating data, completing reams of government forms for permit compliance, preparing permit applications to operate, etc.). Once the SHE professionals realized that the idealized SHE redesign would allow them to transform the way this transactional work would be done in the future, they saw that they would be able to begin doing higher value-adding work that was more interesting and challenging, leading to opportunities for advancement.
- *The Technology Factor*—Another very important factor was having an information technology platform in place that would allow for on-line collaboration and retention of the organizational memory. To succeed it was critically important that the look and feel of the SHE Redesign database were very similar to those of the SBU's business and management database, since all the SBU employees would be accessing the database.
- *The Commitment Factor*—Frequently, change is brought about by a small group of senior management individuals who then essentially force the organization to change through hierarchical command and control means. This popular approach produces results, but managers must continually apply pressure to sustain the results. This leads either to compliant employees who see the benefit of the change and do what is expected, or a little more, or to employees who do what they must to stay employed. There is a big difference between compliant employees and committed employees. Committed employees bring energy, passion, and excitement to their work. A central theme of Interactive planning is the principle of participation by all those who will be affected or can affect the planning process. Commitment soared when SHE professionals realized that they had the power to change their work and began to see success. They accepted personal accountability for delivering the outcomes, an even higher form of commitment.

## 5.6. Design of Controls

Tracking progress was accomplished by designing controls into the implementation process. SHE knowledge teams identified critical operating tasks they needed to accomplish within a given amount of time. These tasks were identified by who was going to do what, when, where, and how and then linked to specific product deliverables identified in the consumer idealized design. Progress on these tasks was reviewed on a monthly basis and adjustments were made where necessary. These adjustments could include schedule timing, financing, and/or resourcing. By deliberately tracking progress in this control fashion, the core team leaders immediately learned of internal and external environmental factors that could impede the progress of the implementation, which led to rapid adaptation to ensure that progress would be sustained.

## 6. OUTCOMES AND IMPLICATIONS FOR INTERACTIVE PLANNING PRACTITIONERS

During the course of idealizing and realizing the SHE redesign, Specialty Chemicals experienced the most significant improvement in operational SHE performance metrics in its history. One of management's primary expectations for supporting the transformation of the SHE system was to maintain or improve safety performance. The SBU's total injury recordable rate improved by almost 50%; wastes and emissions were reduced during a time of increased volume and sales by 10 and 33%, respectively; and environmental, process and transportation incidents were reduced by 87, 29, and 38%, respectively. Overall costs for doing SHE work were substantially reduced by knowing where to target projects to reduce or eliminate the costs.

On the qualitative side, possibly the most fundamental shift occurred in the relationships between SHE professionals and people in the business. In the past, these relationships were quite often adversarial. During and after the implementation of the SHE redesign, these relationships transformed to that of a partnership. This shift in relationships had a concomitant benefit of giving the SHE professionals a sense of adding value to the competitiveness of the business versus simply policing the activities of the business.

The overall intent of this effort was to create a sustainable change in the functional capability of the SBU SHE organization that would lead to significant improvement in SHE performance while, at the same time, delivering valuable competitive advantage to the business. Change efforts that have been attempted in the past have been limited to the SHE function alone, not taking into account the numerous stakeholders that potentially affect and are affected by the SHE function. By embracing the principles of participation, continuity, and holism, the obstacles traditionally encountered in such a major change effort were overcome. In this case, redesigning and implementing new ways to do SHE work were tantamount to conducting genetic engineering on the business' DNA.

Although Interactive Planning has been used in numerous organizations, nowhere in the literature could I find the application of interactive planning to transform a SHE function. Even so, once the SHE professionals understood the theory and practical application of the process, they displayed a compelling sense of excitement, innovation, and creativity. This was the first time these SHE professionals were being given the opportunity to redesign their work and define their future roles and responsibilities to become active contributors to the business' bottomline. From a systems thinking–Interactive Planning perspective, the following major outcomes could prove to be useful to Interactive Planning practitioners working on organizational transformations.

- *Proactive creation and development of a larger number of viable solutions to address SHE issues and problems*—By establishing a work environment

that valued collaboration on common SHE issues and problems, the SHE professionals were willing to pursue a wider range of potential options and experiment with implementation. Historically, offering a wide range of options was viewed as being too risky, especially in the SHE arena. The partnership between SHE professionals and business people was enhanced when the business person was given a variety of solutions with varying degrees of risk, which allowed him or her to make an informed decision based on the conditions of the business.

- *Identify less expensive or cost-avoiding solutions*—Understanding the detailed costs of doing SHE work allowed SHE professionals to develop solutions and seek implementation in a way that would not impact the business' goals. Also, leveraging solutions across the SBU led to further reduction in implementation costs. Learning the business budgeting cycle proved valuable in implementing solutions.
- *Step-change improvement in SHE performance versus continuous improvement in performance*—Achieving the new corporate slogan, The Goal Is Zero, required a total recalibration of one's belief system and a rethinking of how one goes about improving performance. Encouraging participation throughout the entire line-organization and valuing everyone's input contributed significantly to the step-change in SHE performance.
- *Transforming a staff function from a cost-of-doing-business to a value-adding profit center whose services are in high demand, by both the organization and its customers*—Having a mutual understanding of SHE and business concerns and issues, the business managers encouraged the SHE professionals to become actively involved in providing advice and guidance on SHE matters to their customers to differentiate themselves in the marketplace.
- *Creating time to do more higher value-adding work while trained line-organization employees do the more routine work*—Raising the comfort level among SHE professional to turn over their time-consuming transactional work, which they have been rewarded for in the past, to trained line-organization employees, albeit difficult, was by far the most rewarding for all involved. For the first time, SHE professionals felt good about working on higher value-adding work and line-organization employees felt good about contributing to the overall SHE goals.
- *Developing a more robust product offering for customers*—Recognizing that the SBU is in the commodity chemicals business, competitive advantage is based on the price, quality, reliability, and service. Since most competitors can compete on the first three, the differentiator in the marketplace centers on customer service. The SHE knowledge database of experiences in doing SHE work serves as a powerful differentiator to the business' customers.

- *Making SHE knowledge available to everyone in the organization to improve decision making and enhance capability*—Allowing line-organization employees access to the SHE knowledge increased their desire to seek out knowledge that affected their daily work activities. Historically, these same employees would seek out the local SHE professional for advice. Now operators and mechanics can find out what they need to know on their own and even make suggestions for improving the knowledge. This has led to operators and mechanics taking personal accountability for their safety and health.

Much has been learned and continues to be learned by everyone in the organization as the implementation of the idealized SHE system redesign continues to unfold. Once one starts the interactive planning journey, the process allows the system to be redesigned to adapt to the continually changing environment and be prepared for the next step-change in improvement. Looking back over the entire process, the unique idealization steps of the consumer and designer group work can easily seduce one, but the real hard work comes in maintaining the energy and commitment at all levels of the organization to implement the idealized redesign fully.

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