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THESIS

**PROCESS INNOVATION: ANALYSIS AND REDESIGN OF
THE CALIFORNIA ARMY NATIONAL GUARD STATE
EMERGENCY MOBILIZATION PROCESS**

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September 1998

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ARMY NATIONAL GUARD STATE EMERGENCY MOBILIZATION PROCESS**

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ABSTRACT

Process innovation can empower an organization to realize orders of magnitude improvement in its key business processes. Through process redesign, information technology can be used as an enabler to support effective, efficient, and cross-functional business processes. The area of research for this thesis is the analysis and redesign of the State Emergency Mobilization Process of the California Army National Guard. This is accomplished through a detailed study of the State Emergency Mobilization Process with an emphasis of the key business processes of the California Army National Guard. The baseline process will be measured and diagnosed for inhibiting pathologies, and redesigned processes will be proposed based on benchmarking best practices of other organizations and by utilizing Process Innovation best practices. Critical process enablers such as people, culture and technology will be examined and applied to redesign alternatives. Once completed, the best redesigned business process will be recommended and an implementation plan drafted to integrate with the CA-ARNG Strategic Information Systems Plan.

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LIST OF ABBREVIATIONS

□ ADP	Automated Data Processing
□ ADSW	Active Duty (Special Work)
□ AG	Adjutant General
□ AGR	Active Guard and Reserve
□ ATM	Asynchronous Transfer Mode
□ BPR	Business Process Reengineering
□ CA-ARNG	California Army National Guard
□ CAPT	Captain (United States Marine Corps)
□ CNG	California National Guard
□ COL	Colonel (United States Army)
□ COTS	Commercial Off-the-Shelf
□ CPT	Captain (United States Army)
□ DA	Department of the Army
□ DOIM	Department of Information Management
□ DoD	Department of Defense
□ ID	Infantry Division
□ IMAC	Information Management Advisory Council
□ ISDN	Integrated Services Digital Network
□ ISP	Information Systems Plan
□ IT	Information Technology
□ ITM	Information Technology Management

□ LAN	Local Area Network
□ LT	Lieutenant (United States Navy/Army)
□ LTC	Lieutenant Colonel (United States Army)
□ MAJ	Major (United States Army/USMC)
□ MSCA	Military Support to Civilian Authorities
□ NGB	National Guard Bureau
□ NICI	National Interagency Counterdrug Institute
□ ODBC	Open Database Connectivity
□ OES	Office of Emergency Services
□ OTAG	Office of the Adjutant General
□ PC	Personal Computer
□ RCAS	Reserve Component Automation System
□ RIMS	Resource Information Management System
□ SGI	Silicon Graphics, Inc.
□ SGM	Sergeant Major (United States Army)
□ SQL	Structured Query Language
□ STARC	State Area Command
□ UCMJ	Uniform Code of Military Justice
□ USA	United States Army
□ USMC	United States Marine Corps
□ USPFO	United States Property and Fiscal Office
□ WAN	Wide Area Network
□ WWW	World Wide Web

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I. INTRODUCTION

A. HISTORICAL PERSPECTIVES

The historical foundation upon which nearly all American businesses and governmental organizations are built can be traced back to 1776, when Adam Smith published *The Wealth of Nations*. This seminal publication revolutionized the notion of how workers manufactured products, and more fundamentally, how work was accomplished. Smith theorized that through the notion of job specialization, individuals specifically trained to handle distinct parts of a production cycle could produce order-of-magnitude increases in manufacturing output. Each person, or group of people, would be responsible for only a particular facet of product manufacturing. The idea of dividing labor into specialized functions had a profound impact on business, one that continues to shape the manner in which most organizations deploy their workforce.

The 200-year reign of Smith's division of labor principle can be attributed to the explosive population growth and the need to manufacture products to satisfy demand. The division of labor methodology was proven to be the most effective method of mass production as evidenced in America's success in manufacturing dating from the advent of the industrial age in 1850.

As companies grew, so did their need for control of the organization. The industrial age honed the organizational structure through the creation of bureaucracies, which became the standard business management apparatus. The precipitation of the management-separate-from-ownership model of the modern business enterprise manifested with the massive management reorganization of the railroad and utility industries primarily owned by J. P. Morgan, John D. Rockefeller, Sr. and Andrew S. Carnegie. Companies that emerged from this period "distinguished management from ownership and established management as work and task." [Ref. 101, p. 11]

The development of the modern corporation is most noticeably associated with Alfred P. Sloan's redesign of General Motors in the 1920's. Sloan's management principle of "decentralization with coordinated control" is known as divisionalization. [Ref. 2, p. 14] In essence, Sloan created smaller, divisionalized business units that managers could oversee from a small corporate headquarters simply by monitoring production and financial data [Ref. 3]. The work of Sloan is visible today in nearly all

large American organizations. In particular, General Motors' Cadillac, Pontiac, Chevrolet, Buick and Oldsmobile divisions are still alive and well today. Their organizational structure has changed little since Sloan's time.

Sloan theorized that executives primarily needed financial knowledge to monitor and control the decentralized business units. Management by numbers -- profit, loss, inventory and market share -- became the primary means of command and control. The command and control organization is characterized, according to Peter Drucker, by an emphasis on decentralization, central service staffs, personnel management, the whole apparatus of budgets and controls, and the important distinction between policy and operations. [Ref. 6, p. 5] The GM redesign firmly established the division of professional labor (management) in parallel with the division of manual workers that had already taken place on the factory floor. [Ref. 3]

The culmination of this second evolutionary change in corporate structure, heralded by the GM reorganization, was the reorganization of General Electric in the early 1950's. Reginald Jones at General Electric perfected corporate management techniques. Senior managers set corporate financial objectives, determined the amount of capital investment required to reach the targets and then controlled the activities of line managers to attain to the financial objectives. Large staffs of controllers, planners, and auditors acted as the executive's eyes and ears, ferreting out data about divisional performance, and intervening to adjust the plans and activities of operational managers. [Ref. 3, p. 15]

The postwar economy and its insatiable need for products fueled the growth of the American economy. The hierarchical structure of the modern business organization was well suited to accommodate the growth in demand. Scalability could be obtained by hiring additional laborers and filling in the middle management structure. The ability of manufacturers to produce and satisfy market demand became the critical success factor of the post-war American business environment. Over time, more intricate production control, planning, and budgeting mechanisms continuously honed production. The continued growth of industry further divided tasks into continuously smaller parts. Aided by the introduction of commercially available office technology, management functions were also divided into smaller tasks that could be done more quickly and accurately with computers.

1. The Price of Efficiency

As the big business organizational model perfected its fiscal control of the functionally organized labor force, managing work over the entire spectrum of business activity became increasingly difficult. The divided labor tasks increased the level of difficulty of managing a production process with so many steps. The number of middle managers required to oversee production and communicate with executives swelled. Corporate expenses resulting from the cost of large management ranks overseeing production became an enormous problem. Hammer and Champy point toward the distance that separates senior management from customers as another factor contributing to the manifestation of new management problems. [Ref. 3, p. 16] Executives had little to no contact with employees and customers; what they knew about the business was tied to what they knew about the numbers.

In general, the Smith model grew cumbersome as work became too fragmented. Coupled with the Sloan model of scientific management and command and control, the management infrastructure became large enough that costs to support the modern organization began to significantly impact the financial reports. The numerous small tasks that once simplified complex manufacturing processes and management controls developed into the root of the problem. The costs become evident as the business environment changed beginning in the late 1970's.

2. The Change Environment

In the 30-year period following World War II, America's demand for goods and services outpaced the ability of industry to satisfy it. Corporations flourished in this sellers' market. Although the Smith and Sloan models of the corporation had many benefits that helped make them successful in this period of massive growth, a fundamental shift in the marketplace occurred in the mid-1970's. Hammer and Champy characterize three primary forces that have caused companies to take notice of the new business environment: customers, competition, and change. [Ref. 3, p. 17] These concepts are hardly new factors in business, however the new characteristics of competition, customers and change are shaping the business world as never seen before.

Customers are shaping the new business environment due to the availability of product quality information and their ability to choose among many similar products. In the past, lack of choice among products gave consumers few avenues for selection.

According to Hammer and Champy, American consumers were not necessarily dissatisfied with available product choices; they simply had fewer choices. It was not until the early 1980's, and the influx of Japanese products that the American consumer expectations for higher quality at lower prices rose. [Ref. 3, p. 19] Consumer expectations shifted away from products designed for a mass market to products that were specifically tailored to meet their tastes. The concept of a market-of-one was developing and American companies were slow to recognize this phenomenon.

The influx of global competition in markets where American hegemony reigned has fundamentally shifted balance from a supplier to consumer dominated marketplace. American companies are now competing with foreign companies on their own ground. Products that were once successful in a particular market now face competition from companies with new operating procedures that focus on quality, service and low price.

Caterpillar competes with Komatsu, DuPont with Hoechst, Chase Manhattan with Barclays. Good performers drive out the inferior; because the lowest price, the highest quality, and the best service available from any one of them soon becomes the standard for all competitors. [Ref. 3, p. 21]

Product maturity obscures the lines that previously differentiated one product from another, forcing companies to seek new ways to make their products more applicable to more narrowly defined markets. Issues such as customer service, easy access to purchasing, increased styles to fit particular markets and low prices now become critical to corporate survival.

Perhaps most significant in Hammer and Champy "3C's" is the element of change, particularly the rate of change. The unprecedented rate of change forces companies to turn their corporate resources toward meeting consumer demands and anticipating future demands, always with a close eye on the competition. Although the customer and competition factors have always been key in operating a successful business, the constant rate of change leaves little time to focus on managing internal corporate activities. The sequential task driven manufacturing cycle and the traditionally large middle management structure of previous corporate models now detract from customer facing activities needed to keep up in the marketplace. Corporations slow to recognize the new face of change were literally breaking at the seams. On one hand, they were trying to maintain monolithic command and control organizations, yet on the other, preaching the flexibility necessary for the constant change environment.

Competition, customers and change forced American companies to take notice that the methodologies of the 30-year boon that had propelled them to economic success were no longer relevant. Hammer and Champy view the consequences of the "3C's" and their impact upon American corporations as based on 1) a lack of process understanding and ownership and 2) the inevitability of errors with large and complex division of labor cycles. [Ref. 3, p. 27] No one was responsible for understanding how the series of task driven steps impacted the structure of the organization, its profit, and each customer. In essence, the Smith model, designed for its task simplicity, had created complex series of task driven activities that fractured the natural flow of work.

American companies needed to rethink how they accomplished their work, not the amount of products they were producing. An examination of how work was done demanded total visibility from customer order to delivery. American companies were in need of an organizational overhaul.

B. DAWN OF THE INFORMATION AGE

The new realities of competition, customers and change placed enormous transformational pressure on the modern organization. A new approach to business was required. In the words of Hammer and Champy, "discontinuous thinking" implies the relinquishing of traditional ideas about business operations and the formal questioning of paradigms that once made them successful. [Ref. 3, p. 25] Executives and managers had to begin deconstructing long-held beliefs in the practices that made the post-World War II corporations successful, including their "Smith and Sloan" organizational structures. Peter Drucker refers to the fundamental shift in organizational structure now required to meet modern challenges as the "3rd period of change":

The shift from the command-and-control organization, the organization of departments and divisions, to the information-based organization, an organization of knowledge specialists. [Ref. 1, p. 11]

Drucker called this new entity the "information-based organization." [Ref. 1, p. 1] In the information-based organization workers become self-guiding knowledge specialists who have a significantly broader scope of work. [Ref 1, p. 2] Information organizations often combine knowledge specialists in empowered teams who are responsible for a wide variety of activities and decision-making once reserved for

management. [Ref. 1, p. 5] By collapsing multiple tasks performed by several people, the underlying notion of the information-based organization is that knowledgeable workers and managers can assume the responsibilities and actions once accomplished by many. Information technologies provide new opportunities to combine multiple tasks, directed by knowledge specialists, into more robust activities performed by fewer people.

1. New Assumptions

The information-based organization will operate in a different environment, underscored by new set of basic assumptions. Robert Kaplan and David Norton offer insight into the new set of assumptions based upon: "cross-functions, links to customers and suppliers, customer segmentation, global scale, innovation, and knowledge workers." [Ref. 4, p. 5]

Organizations of the industrial age did not fully understand the importance of integrated relationships between themselves and their customers and suppliers. Production schedules were preplanned and management science techniques were heavily utilized to forecast supply needs. Today's information technology capabilities allow for customer generated orders as the trigger for production. [Ref. 4, p. 4] Information age organizations are capable of deploying an integrated supply and production system, driven by customer orders, directly connected to the suppliers to provide on-time delivery of supplies.

Customers are demanding products that are tailored to their needs. Gone are the times when a few sizes, colors, or styles would suffice. Information age companies must learn how to produce goods that increasingly target smaller segments of large markets. To do this, internal processes must produce value and contribute directly to product development, production and delivery. Successful companies will learn how to produce market specific products/services without, "paying the usual cost penalty for high-variety, low-volume operations." [Ref. 4, p. 5]

Information age companies now compete in a global market. Traditional borders of the industrial age have been crossed. However, this can be viewed as an advantage. As companies make large capital investments, they will often need to seek new opportunities in world markets to achieve an acceptable return on investment. In essence, information age companies must remain loyal and sensitive to their traditional local

customers while developing knowledge about new markets perhaps located elsewhere in the world. [Ref. 4, p. 4]

Workers in the information age require more analytical skills than perhaps ever before. In sharp distinction with industrial age thought, information age workers are sought after for their knowledge and ability to contribute to the success of the organization, not solely for the physical skills. In the words of Kaplan and Norton:

At the end of the twentieth century, automation and productivity have reduced the percentage of people in the organization who perform traditional work functions, while competitive demands have increased the number of people performing analytic functions: engineering, marketing, management, and administration. [Ref. 4, p. 5]

Information age workers are involved in all facets of the business. The need for knowledge workers is present at all levels of the organization. Just as knowledge workers involved in manufacturing would need to know production targets, customer order deadlines, operating budgets and quality information, the same holds true for middle management as their responsibilities expand into the levels once held closely by executives. Everyone contributes to the success of the organization. New criteria for hiring information workers and a new emphasis on education now present significant challenges to organizations that understand their success depends on knowledgeable people at all levels of the business.

Of critical importance to the success of information age businesses is the notion that business is conducted across intra-organizational functional boundaries such as departments and business units. In industrial age organizations, the highly specialized functions performed by individual departments created well-honed functional "machines". However, over time, these functions became islands of information and skills. In effect, departments formed artificial boundaries that not only inaccurately reflected the natural flow of work, but actually impeded it.

Handoffs (passing of information from one part of the process to the next) among departments create non-value-added work that unnecessarily increases costs and slows response time. Hammer and Champy observe that "information age organizations operate with integrated business processes that cut across traditional business functions." [Ref. 3, p. 15] Successful businesses in the information age will develop cross-functional

processes that map the true flow of work across the organization and develop systems to support these processes.

Innovation is defined as the introduction of something new or creative. Companies that wish to survive in the information age will develop innovative products and services that not only meet current customer expectations, but plan on meeting them in the future. Creating an organizational environment that allows innovation to develop might perhaps be the strongest tool available to anticipate the impact of new customer expectations, increasing competition and constant change.

Information age organizations are developing new ways of designing internal processes that deliver meaningful information by harnessing knowledge across the spectrum of activities critical to corporate survival. For example, business processes, and their relative degree of “linkage” or relationship to strategic objectives, now determine the success of the organization [Ref. 1, p. 117]. How the work is done (process) and how that work performance contributes to the organization’s strategic objectives (alignment) are now no less important, if not more important, than which corporate divisions make what products or how and by whom this managerial hierarchy is organized and controlled. Leadership, management styles and organization structure remain critical factors, but business processes describe how work is performed and represent more accurate indicators of how the products and services of an organization are produced. For instance, most business processes cut across multiple organizational departments and management levels.

Davenport describes the methodology of Process Innovation which “combines the adaptation of a process view of the business with the application of innovation to key processes.” [Ref. 1, p. 1] Process Innovation asks leaders to focus on how organizations deliver value to their customers through its processes. However, viewing the organization as a collection of processes is a difficult paradigm shift from a predominately vertical “wire-diagram” notion of the organization.

Whereas an organization’s hierarchical structure is typically a slice-in-time view of responsibilities and report relationships, its process structure is a dynamic view of how the organization delivers value. Furthermore, while we cannot measure or improve hierarchical structure in any absolute sense, processes have cost, time, output quality, and customer satisfaction. [Ref. 1, p. 6].

Through an understanding of how existing processes succeed or fail to deliver value to the customer, executives, managers and workers can see where their actions directly contribute (or not) to the strategic objectives of the organization. This provides focused information about process pathologies such as bottlenecks, duplications of effort and non value-added steps, in addition to enabling technologies and other transformations that can be employed to redesign processes and effect dramatic performance improvements. Such dramatic or order-of-magnitude improvement in process performance represents a fundamental objective of process innovation [Ref. 2, p. 2]. Information technology offers one of the most powerful means to redesign organizational processes and enable processes to deliver information to all that contribute to the organization's success. In the information age, that means everyone who is on the payroll.

The California Army National Guard (CA-ARNG) pre-dates the industrial age by a few years and now faces the challenges of bringing this organization into the information era. These challenges are similar to those affecting most organizations born in the industrial age, many of which are burdened by enormous bureaucracy such as the federal government. An additional challenge is posed by the CA-ARNG's role as a combined federal and state government organization. The above challenges provide the imperative for process innovation.

This thesis examines a process -- the State Emergency Mobilization Process (SEMP) -- of critical importance to the CA-ARNG. The State Emergency Mobilization Process is used to respond to a wide variety of emergencies. These consist of, but are not limited to, large scale fires, floods, search and rescue and civil disorder and have earned the Guard a world-wide reputation as the most effective organization in the business. We examine its overall business process flow, diagnose its pathologies, and make redesign recommendations on how to dramatically improve its performance. The key performance dimensions of interest to CA-ARNG management include decision-making time and solution quality. The goal of this study is to design a more responsive process that delivers information required to make more timely decisions that provide the best solution tailored to each emergency. This study has been authorized and sponsored in part by CA-ARNG.

C. OBJECTIVES

The area of research for this thesis is the analysis and redesign of the CA-ARNG SEMP. The research is organized into several distinct phases: baseline mapping, redesign alternatives and change management. First, the baseline process is represented and its corresponding pathologies are diagnosed and measured to provide a common understanding of the SEMP and its shortcomings. Next, redesign alternatives are generated based upon findings in the baseline as well as input received from members of the CA-ARNG SEMP. The alternatives also reflect the consideration of benchmarking best practices of other organizations. Critical process enablers such as people, culture and technology are examined and applied to redesign alternatives to dramatically improve process performance and its alignment with strategic objectives. Finally, the redesigned business process judged to offer the greatest potential for improvement is recommended, and a change management plan is drafted to edify the issues associated with managing complex change in a large organization.

D. RESEARCH QUESTIONS

The primary research question is how can the Guard's key business processes be redesigned to dramatically improve performance?

The secondary questions are as follows:

- How can the CA-ARNG align key business processes with the organization's overall strategy?
- What processes of the CA-ARNG offer the best potential for performance improvement?
- How is the State Emergency Mobilization Process system designed and what are its strengths and weaknesses? Boundaries?
- How do the key processes support the State Emergency Mobilization Process and what pathologies can be diagnosed for the process?
- What measures of effectiveness can be developed for the process?
- What re-design alternatives offer the best potential for dramatic process improvement?

- How can the CA-ARNG implement the new process?
- What IT strategies can be applied to the organization as a whole?
- How can this research be generalized to other key processes and organizations?

E. SCOPE

The thesis addresses the California Army National Guard's role in the State Emergency Mobilization Process. The scope of the thesis is limited to analysis and redesign of the SEMP. The research utilizes the Davenport method of Process Innovation and incorporates Camp's Business Process Benchmarking method of examining case studies of similar organizations. We integrate the process innovation and benchmarking techniques with a top down strategic emphasis. Our intent is to produce a robust redesigned process that will yield a decreased cycle (response) time with the appropriate response to state emergencies.

F. RESEARCH METHODOLOGY

The authors embarked upon a pilot study commencing in August of 1997 to learn about the customer. Three goals were established and prioritized concerning the customer. These were to learn about the organization, investigate the technologies, and to map the business processes. All goals were achieved in the course of the pilot study and helped to lay the foundation for the themes of process innovation, benchmarking, and redesign, which would be instrumental in formulating this thesis.

The research techniques used in this thesis include a thorough literature review, both online and hardcopy, of topics consisting of Process Innovation, Business Process Benchmarking, Business Process Reengineering and information technology strategy. We also utilize a combination of deductive and inductive methods. Deductive Analysis follows Davenport's process innovation framework, as it is employed to analyze and redesign the CA-ARNG SEMP. Inductive analysis draws from Camp's benchmarking method, as other, best-in-class emergency response processes are examined for applicability to the CA-ARNG SEMP. This includes a detailed description of the Emergency Mobilization Process as well as looking at a "best practices" organization involved with mobilization in the generic sense. During the last 12 months, this team has

conducted numerous on-site formal and informal interviews (State Headquarters, Sacramento/40th Infantry Division HQ, Los Alamitos/, Governors Office of Emergency Services, Sacramento/Los Angeles County Sheriffs Office Crisis Action Center, LA County) with nearly all the senior military officers and civilians involved with managing the high level business processes of the CA-ARNG. Additionally, the thesis team enrolled in a directed study course on process innovation techniques and metrics. Detailed accounts of this class and the pilot study are provided in Chapter II.

G. ASSUMPTIONS

The authors assume the reader has no formal education in Process Innovation, Reengineering, Redesign, or Business Process Benchmarking techniques yet recognizes that senior CA-ARNG officers are highly experienced leaders who understand the significance of aligning the organizational practices toward fulfilling strategic goals and objectives. Furthermore, the authors assume that many readers are not National Guardsmen and as such, do not have an understanding of the SEMP of the CA-ARNG.

H. CHAPTER OUTLINE

This thesis is organized as follows: Chapter I discusses the overall goal of the thesis, its scope, methodology, and outline of the chapters. Chapter II discusses the history and organizational factors of the California Army National Guard, the initial Pilot Study, and current, salient CA-ARNG issues. Chapter III provides an overview of existing innovation doctrines consisting of Davenport's High Level Approach and Camp's approach to Business Process Benchmarking. Chapter IV provides an overview of Camp's business process benchmarking and illustrates this technique by benchmarking a civilian rapid response emergency organization. Chapter V looks at the existing State Emergency Mobilization Process of the CA-ARNG and develops process redesign alternatives. Chapter VI uses the innovation and benchmarking theory from above to propose a set of redesigned processes along with a change management strategy to guide the CA-ARNG in understanding the complex human and technical aspects of organization wide change management. Chapter VII includes a summary of the results, recommendations, and topics for further research.

II. BACKGROUND

This chapter introduces the California Army National Guard (CA-ARNG), beginning with its history and role in the State of California as well as its federal responsibilities. It also provides background information on the pilot study used to develop thesis research questions.

A. THE CALIFORNIA ARMY NATIONAL GUARD

1. History

The California National Guard has been in existence for over a century now, tracing its roots back to the first all-volunteer militia companies organized in 1854. It began as an army of citizen-soldiers, men who lived and worked in the communities they helped protect. When called upon, they also served the needs of their country by supporting the United States Army in foreign wars and conflicts. These humble beginnings led to the creation of California's modern National Guard forces in 1903, with the enactment of the Dick Law for the Standardization and Federalization of State Military Forces. Since that time, California's Army National Guard has participated in every major war and conflict, from World Wars I and II, the Korean War, and the Vietnam War to Desert Shield/Desert Storm and Bosnia as a reserve component of the United States Army. In addition, the Guard has participated in humanitarian relief projects, peacekeeping missions, and other federally assigned tasks like counterdrug operations and drug demand reduction missions. It also operates the National Interagency Counterdrug Institute (NICI), supporting federal as well as state and local forces in their counterdrug operations.

In addition to these federal missions, the Guard is also responsible for a wide variety of missions for the State of California. Its most significant role is to provide Military Support to Civil Authorities (MSCA). Relief from forest fires, floods, earthquakes, mudslides, and other natural disasters is one of the Guard's most frequent responsibilities in California. The Loma Prieta and Northridge Earthquakes, 1997 floods, yearly wildfires and other natural disasters are just a few examples of the state emergencies that the Guard deals with. They also provide search and rescue capabilities,

riot control (used during several infamous Los Angeles riots, including the most recent in 1992) and other law enforcement support, as well as a host of functions like youth and community programs, veteran's assistance programs, shelters for homeless people, parades, and others.

Due to the federal and state aspects of its missions, and as the only military force specifically called for in the Constitution, the National Guard is a unique organization within the Department of Defense. Organizational factors such as internal structure, reward systems, command and control, personnel composition, and the resultant culture, which have evolved over time in the California National Guard, separate it even further from its DoD counterparts, such as the Army and Marine Corps Reserves. In order to perform process innovation on a long-established, complex organization such as the Guard, consideration must be given for these uncommon qualities and its history.

2. Organizational Structure

The California Army National Guard consists of five senior commands, with 127 different armories in 112 cities throughout California. The first and largest of these is the 40th Infantry Division (Mechanized), headquartered at the Los Alamitos Armed Forces Reserve Center in Long Beach, California. The 40th ID comprises the vast majority of the California Army National Guard's forces, with almost 14,000 personnel. The Division has nearly 150 units in 80 different armories throughout the state of California, as well as some located in Arizona, Nevada, and Utah. In its primary (federal) role, the Division's mission is to close with and destroy the enemy with firepower, mobility and shock effect. The 40th Division is the organization that actually commands the bulk of the soldiers executing the state and federal missions. The Commanding General of the 40th Division, a brigadier general appointed by the Adjutant General, is someone who traditionally has risen through the ranks of the drilling reservists as an AGR (Active Guard and Reserve; see below for description) soldier. Therefore, he or she is very familiar with the operational environment, and has learned the formal and informal business of the Division from the ground up.

Below the Division Headquarters level is what is referred to in the Guard vernacular as the "unit level." This term refers to the actual operating forces of the Guard, comprising the standard Army unit hierarchy from Battalion down to individual companies and platoons. The type of employees at each unit fall into two categories:

Guard Reservists and their AGR counterparts. While the units are composed almost entirely of part-time Guardsmen who work one weekend per month (and two weeks each summer), it is the two or three full-time AGR soldiers at each Guard unit who see to the everyday tasks and details associated with running a National Guard unit.

The remaining senior commands are as follows: 100th Troop Command, which oversees a diverse collection of units including a press unit, military intelligence battalion, an aviation battalion, engineers, Special Forces, and an Army Band; the 115th Area Support Group, a combat service support organization, which provides vital functions like vehicle and equipment maintenance, transportation, water purification and other hygiene-related capabilities (field laundry and shower units, etc.), and supply services to the 40th ID and other California Army National Guard forces; the 49th Military Police Brigade, a 900-soldier organization which supports the Guard by providing area security, law enforcement and enemy Prisoner of War (POW) operations during wartime; and finally, the 175th Medical Brigade, which provides medical support, operationally as well as in peacetime.

The senior leadership, staff and administrative sections for all of the organizations listed above are located at the California National Guard State Headquarters (STARC, or State Area Command), which also acts as the interface between the California National Guard and both of its sponsors, the National Guard Bureau in Washington, D.C. (part of the Department of the Army) and the State of California. Located in Sacramento, California, the State Headquarters is home to the Office of the Adjutant General (OTAG), the highest echelon of command in the state structure (see Figure 2.1 below). It is predominantly staffed by full-time personnel, a composite of a few AGR soldiers, a large number of State Active Duty and Military Technicians, and the majority of the State Civil Servant personnel (the various personnel components are explained in the following section). This headquarters is the sole interface with all external organizations, including the National Guard Bureau, the State Government, the Office of Emergency Services (OES), and others.

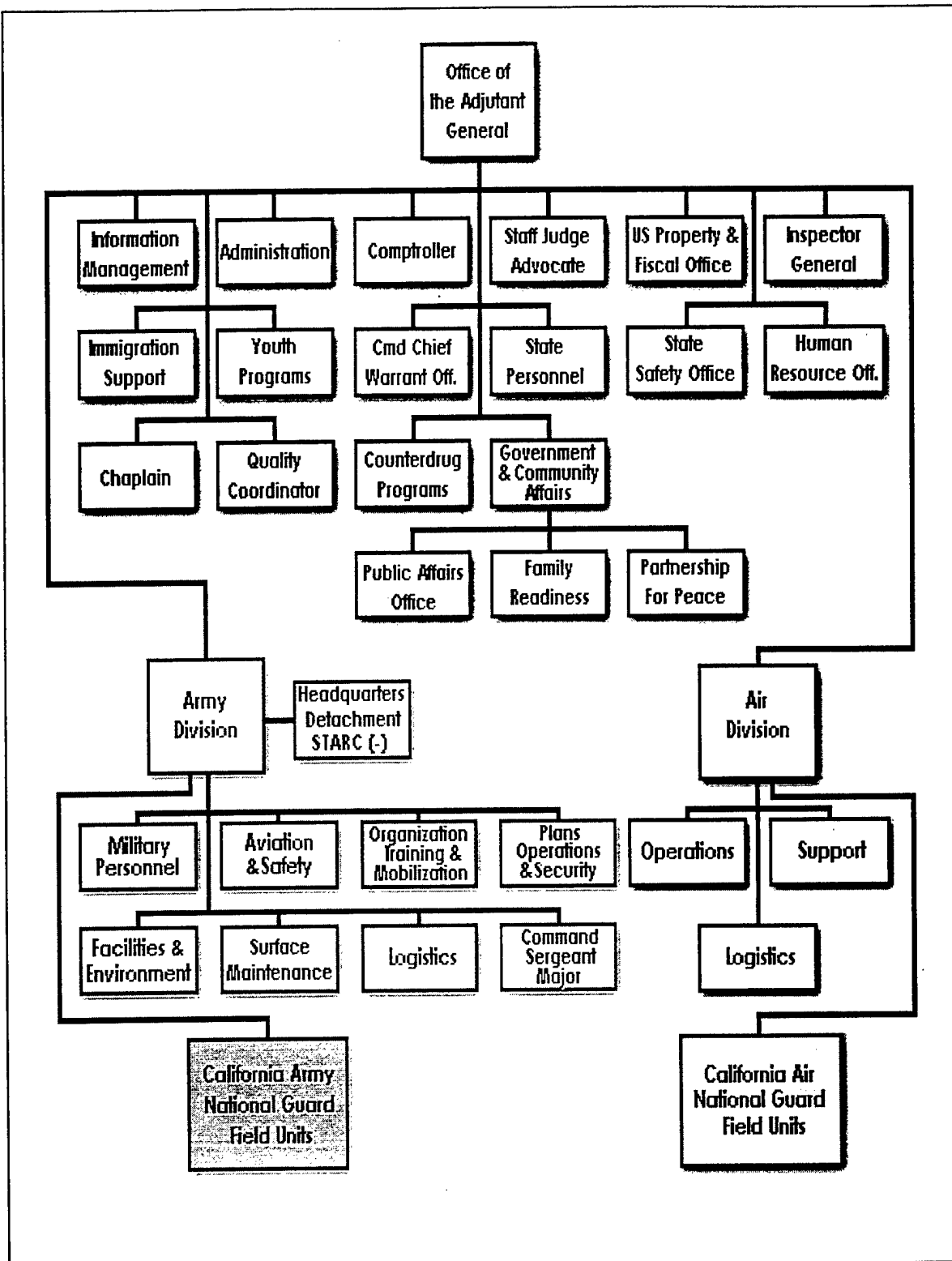


Figure 2.1 - California Army National Guard Echelon

For small and medium sized state emergencies, operational unit personnel and equipment are tasked and tracked through the various staff sections in coordination with the OES, also headquartered in Sacramento. Natural disasters or other emergencies requiring substantially increased Guard assets are handled differently. In these cases, the OTAG mobilizes the 40th Division Headquarters, in Los Alamitos, California to task and monitor its own assets directly. This procedure was used for the Los Angeles riots in 1992.

The OTAG also controls all funding and state-level budgeting for its supported units. Both federal and state funding flow through the OTAG Finance Office (federal funding actually goes through the USPFO (United States Property and Fiscal Office) in Camp San Luis Obispo before being disbursed to the OTAG) down to the 40th Division and other supported units. The National Guard Bureau, which divides up the federal funds it receives among the National Guard forces in all fifty states, controls to some extent the manner in which this money is spent through the USPFO. For its part, the State of California Finance Office also provides some guidance on budget matters to the OTAG. Even so, the OTAG still has a great deal of discretion as to which programs will be included in its budget, as well as how much its supported units will receive for their annual operating budgets in a variety of areas (training, hiring of new employees/Active Duty Special Work (ADSW) members, automation and telecommunications issues, etc). Additionally, the USPFO provides a large variety of fiscal, administrative, and information system support to the California Guard. Although tightly intertwined with the day-to-day functioning of the Guard, USPFO is fundamentally a locally administered extension of the National Guard Bureau.

3. Personnel Components

The two primary classes of personnel that exist in the Guard structure are federal employees and state employees, in keeping with the dual nature of the Guard's missions. As roughly 90% of the CA-ARNG's funding comes from the federal government, the vast majority of its personnel (about 18,700 out of 19,770, or 94%) are federal employees. State Guard personnel consist of Active Duty members and State civil servants. However, between the full-time portion of the Guard and the part-time personnel exists a fundamental cultural division between the various components, even more so than the split between federal and state employees.

The typical image or conception held in the minds of most people when thinking of a National Guard soldier is that of the part-time soldier, or "weekend warrior." This image is quite valid close, considering that about 89% of the federal Guard forces in California, approximately 16,630 soldiers, are part-time soldiers. The diverse characteristics of each component, as well as the role it plays in the overall force structure of the Guard, contribute significantly to the Guard's complex culture. Provided below are descriptions of each type of component, including factors like selection method/criteria, pay, benefits, and reward systems.

a. Federal Army National Guard Soldiers and Employees

Active Guard and Reserve (AGR). These are full time active duty soldiers, according to Title 32 of the U.S. Code. They receive the same pay, privileges, benefits, retirement, medical/dental coverage, and so on as active duty Army personnel. Also, they are subject to the same selection criteria as other Department of the Army (DA) personnel. Career progression in the AGR component also mirrors that of the regular services, i.e., alternating staff and command billets, periodic rotation to new duty stations, promotion schedule and path, etc. Compared to other components, notably Military Technicians and State Active Duty members, this is a very dynamic, fast-paced system with a great deal of independence required in many AGR billets.

As Active Duty soldiers, AGR members cannot be "fired", as can personnel in several of the other components. AGR members must either be involuntarily separated, or given early retirement if force structure downsizing requires reduced personnel strength for this component. To enter the AGR component, an applicant must already be a part-time National Guard member, or a reserve or active duty member in another service; the program is not open to civilians. AGR recruitment and selection are performed from within part-time Guard forces. A centralized monitoring and management system is put in place in 1989, ten years after the program was begun, and was administered by one officer and five assistants at the California Army National Guard State Headquarters, in Sacramento, California. Prior to that time, applicants were selected by local units, and the tracking and monitoring performed at the state level consisted only of the application package screening. Because of the program's relative immaturity, program management has varied according to the current billet holder and the political atmosphere at the State Headquarters level.

Even so, job motivation in this component is very high, and most of its members are extremely committed to the Guard. Billets open to AGR soldiers offer a wealth of opportunity for individual achievement, and are usually receptive to positive innovation. There are approximately 920 Active Guard and Reserve members in the CA-ARNG.

Military Technicians. This element of the Guard's federal forces is composed of full-time civil servants, culled from part-time Guard personnel. Candidates submit applications to and are screened at the OTAG, which then sends the selected applications to the relevant units. From the applications received, the unit itself actually selects the individuals desired. The individuals selected are then given a position as a Military Technician; normal federal civil service rules and regulations apply. The program is managed by a specific staff section at the State Headquarters level, according to the relevant Office of Personnel Management (OPM) rules. This office handles all hiring and firing, as well as other career progression issues.

Although they wear a uniform on the job, they are not regular active duty soldiers. They are paid according to the federal government's General Service schedule, and are subject to federal civil service codes concerning advancement of position, conduct, benefits, medical and dental coverage, etc. The positions offered to part-time Guard soldiers are influenced by their rank and training, and are normally long-term, stable jobs. Typical jobs are not very dynamic in nature. In many respects, it is very much like a factory line at a large manufacturer. There are approximately 1420 Military Technicians in the CA-ARNG at present.

Active Duty Special Work. This category, called ADSW for short, is basically a special assignment duty status given to part-time Guard soldiers. It allows them to work at the requesting unit on active duty status, as if they were on an extended drill period, for up to three months. While on ADSW status, soldiers are subject to the normal active duty rules, regulations, and pay. The intent behind this strategy is to allow part-time soldiers to fill in on short-term projects requiring a temporary personnel boost. Part-time personnel are assigned ADSW status for the specified three month maximum (although occasionally, after the three-month period has officially ended, they are hired back to ADSW for another three months, if necessary).

National Guard Reservists. The vast majority of California's Army National Guard forces are members of this category. Referred to as "M-dayers", where the "M" refers to "Mobilization," these soldiers serve on active duty for two days per

month. Drill periods, as they are known, are served at a specific unit, which may or may not be the geographically closest unit to the soldier. Although civilians joining the Army National Guard are normally assigned to the unit closest to them, as they grow more experienced and are promoted over time, they can be asked to rotate to other units for their drill mobilizations. This enables units to maintain designated personnel and occupational billet strengths.

Soldiers are on a modified version of active duty status during drill periods (the modification basically enables them to receive double pay for the two-day drill period), and all normal rules and regulations apply. For the remainder of month, Army National Guard members maintain jobs in the civilian workplace, and are legally in a civilian status. Rank, promotion, and career path follow same path as AGR; in fact, command billets are specifically left open for M-dayers, in order to provide the incentive for these working professionals to stay involved with an Army National Guard career. They also participate in one month of active duty training annually. There are approximately 16,630 part-time soldiers in the CA-ARNG.

b. State Army National Guard Soldiers and Employees

State Active Duty. Similar in some ways to the federal AGR component, these soldiers are full-time, uniformed members of the CA-ARNG under statutes enacted by the California State Legislature. The California Military Veterans Code, which essentially contains the state's version of the Uniform Code of Military Justice (UCMJ), among other regulations, allows for the creation of this position and its corresponding rules and selection criteria. These members are paid by the same scale as AGR members, but do not have the same benefits and privileges as do regular active duty soldiers, nor do they have the same set of requirements for service, or the same protections. As employees of the State Military Department of California, they can be fired for job performance, or let go for budgetary reasons. In addition, they do not necessarily alternate between staff and command billets, nor rotate to different units periodically. They participate in monthly mobilizations as part-time Guard soldiers, as well as the two-week Annual Training, during which time they are paid by the same rate table as part time Guardsmen. To illustrate the differences between a State Active Duty Guardsman and a federal AGR soldier, State Active Duty soldiers are not authorized to wear their

uniforms outside the State of California - they are paid employees of the California State Government, not soldiers in the federal government.

The Adjutant General (AG) of the Guard forces in California, a two-star general appointed by the State legislature, has some authority to create and fill these positions as he or she feels appropriate. Funding comes through the State Finance Office, and allows for certain rank billets to be created and filled by the Adjutant General. There are approximately 219 State Active Duty members in the CA-ARNG.

State Civil Service. As the component description suggests, these members are civil service workers paid by the State of California, and are not uniformed soldiers. They typically fill technical or clerical jobs, as well as a host of other support staff positions. They are mainly concentrated at State Headquarters and subordinate headquarters offices. Approximately 294 State Civil Servants work for the CA-ARNG.

State Military Reserve (volunteers). Volunteers in the truest sense of the word (i.e., they are not paid), these individuals comprise a small but useful segment (564 members) of the overall Guard personnel makeup.

B. PILOT STUDY

From the initial stages of thesis work begun in August 1997, the primary objective of the thesis has been to produce a tangible product, one that would provide concrete guidance on key information technology management issues facing the customer/sponsor. The original direction of the thesis topic, ostensibly a continuation of "Garrison Based Intranet Prototype For The 40th Infantry Division (Mechanized)" by Heckroth and Nelson [Ref. 5], served as the baseline for the initiation of the pilot study. Throughout the study, the overall goal was to identify thesis research questions. All work performed during the pilot study was aimed at satisfying three objectives: 1) learn about the organization, 2) investigate the technologies, and 3) map the business processes. In this section, we outline these objectives, along with the corresponding research methods and approach, and summarize the collective results of the pilot study.

1. Objectives

The decision to initiate a pilot study in order develop a useful set of thesis research questions was influenced by several factors. First, the sheer size and complexity of the CA-ARNG organization make it difficult to suggest a beneficial technological

solution, such as an intranet, without first understanding the business processes of the organization. Learning about the Guard itself, then, becomes one of the main priorities. To this end, the study focused on developing a deeper understanding of the Guard's organizational structure, missions, environment, and other characteristics necessary to begin to map its primary business processes. Accurately determining and diagnosing these processes would prove to be a time-consuming endeavor. Independent study into business process reengineering, measures of effectiveness for processes and productivity, as related to information systems, was essential in meeting this objective. Exploration into these subjects was performed in parallel with the study of the Guard's processes.

Second, as the answer to these questions was yet to be determined, it was not immediately clear what type of technological solution would be the most promising, if indeed one was even required. Although the Guard sponsors were leaning heavily towards implementing specific information technology solutions from the outset of the study, a strong effort was made to focus their energies instead on first analyzing their processes and information systems needs. As the study progressed, and more knowledge was developed about the Guard, certain basic information systems architectures and technologies emerged as possibilities. The intranet concept was initially explored as a carryover project from the Heckroth and Nelson [Ref. 5] thesis. As further investigation into the current state of information resources within the Guard was performed, however, it became clear that an intranet would not address larger issues which were encountered. For example, the underdeveloped state of the Guard's internal wide area network and low percentage of desktop computers and trained users at the lowest unit levels, combined with a lack of understanding (and consequently support) by users and senior leadership concerning intranets, indicated that further intranet development projects were doomed to become "shelfware", (i.e., disregarded). Other areas of information technology needed to be researched and measured against the Guard's requirements. The pilot study approach fulfilled this necessity by allowing concurrent research into the Guard itself and into potential information technology solutions to its needs.

Third, the pilot study method provided enough time to successfully interact with constituents of the Guard's bureaucracy. As the study progressed, some delays (although infrequent) from sponsors in providing information or coordination occurred. Personnel turnover within positions (such as the key Automation Chief position in the Information Management Directorate), leave periods (e.g., vacations) and temporary duty assignments as well as higher priority tasks all contributed to significant delays on various points.

Changes in Guard policies affecting the study were occasionally made by the Guard itself, as well. For instance, while researching virtual private network (VPN) implementations as a potential solution to the Guard's internal connectivity issues, the Department Of Information Management (DOIM) was informed that the Reserve Automation Component System (RCAS) program had already addressed them. RCAS specified a hub-and-spoke frame relay WAN architecture with dedicated lines between the larger Guard armories and the State Headquarters, with smaller armories utilizing dial-in hardware solutions to piggyback on these dedicated lines. The VPN information, therefore, was no longer relevant.

Another beneficial facet of the pilot study was the level of rapport and close interface established with the sponsor organization. Communication began at the 40th Infantry Division staff level, utilizing the contacts made by the previous thesis team. Through exploration of the Guard's hierarchy, contact was established at many levels within the organization's leadership. The personal and professional ties engendered over time were instrumental in capturing the interest of the California Army National Guard's top leadership. The interest of the leaders at this level was crucial to moving the thesis forward in the desired direction, and would be crucial to the successful implementation of any recommendations put forth in it. Also, the insight into the political, cultural, and organizational situation gained through these contacts was invaluable. For these three central reasons, utilizing a pilot study as a means to develop thesis research questions was selected as the best alternative. The objectives, methods, approach and results of this pilot study are explained below.

a. Learn About the Organization

The first step in researching the Guard was to learn its organizational structure, missions, customers and strategic partners. Specifically, the following areas were of interest:

- Organizational structure, personnel components, reward systems, missions, strategic vision, customers, strategic partners, and relationship between federal and state government responsibilities
- Culture, political situation, vital signs of organizational health such as organizational learning, morale, retention, and others

- Status of automation efforts - availability, usage, and level of integration of information technology resources throughout organizational hierarchy
- Information technology resources - network infrastructure, end-user systems, servers
- E-mail, Internet access, intranet status, Internet domain status
- User training & familiarity with all of the above
- Reserve Component Automation System (RCAS) - brief history, basic architecture, software components involved
- Status RCAS fielding effort - deployment schedule, approach
- Developing contacts at higher headquarters in order to interface with this layer of the organization for thesis development
- Learn customer's areas of interest for thesis research

b. Investigate the Technologies

As learning about the customer progressed, key technology issues were identified which required further study. These issues entailed both immediate concerns, such as network operating system deployment, and long-range considerations, like network management/remote administration and information systems strategies. The specific areas identified were:

- Intranet development, implementation, usage strategies in supporting business processes
- Network infrastructure - topologies, transport protocols and technologies, design architecture, remote access capability
- Network operating system implementation (Windows NT) and policies
- E-mail and the Internet – usage, structure, connectivity options - WAN access options (T-1, frame relay, ISDN, dial-up, etc)
- Lotus Notes (Domino) GroupWare implementation
- Strategic information systems plans and strategies

c. Map the Business Processes

A fundamental theme, echoed again and again in both business and the DoD, is the need to accurately map information technology resources to real business needs before simply trying to integrate IT into existing processes. Simply automating existing processes leads to faster, but not necessarily efficient or effective processes - an effect referred to as "paving the cowpaths". [Ref. 9, p. 104] The processes must be analyzed, validated, and improved if necessary through business process reengineering, benchmarking, or other techniques before introducing information technology, where the role of IT is to enable these processes. Process mapping and measuring techniques, measures of effectiveness, and reengineering principles are key areas of interest in this endeavor. The areas of interest are as follows:

- Business process reengineering concepts
- Benchmarking techniques and examples
- Systems analysis and design approach to project management
- Educating the customer on Business Process Reengineering (BPR) and providing a process viewpoint
- Investigating the Guard's business processes and information systems
- Orienting technical focus of thesis towards supporting the Guard's business processes

2. Methods and Approach

The pilot study research was conducted through several traditional means, including interviews, questionnaires, literature searches, graduate Information Technology Management courses, e-mail and other written correspondence. The three pilot study objectives were addressed concurrently, with research into one objective often influencing the focus of study in the others as new material was synthesized. The specific actions taken in achieving the objectives are as follows:

a. Learning About the Organization

Interviews were conducted with the following individuals:

Maj Tom Heckroth, USMC and MAJ Tom Nelson, USA.

Authors of "Garrison Based Intranet Prototype For The 40th Infantry Division (Mechanized)", MAJ's Heckroth and Nelson provided the initial introduction to the customer and information on the Guard's missions, state and federal organizational structure, culture and political situation, as well as a brief description of RCAS over the course of several meetings. They provided partial information on the state of the Guard's e-mail capabilities and intranet status. They also explained the nature of their thesis research and provided suggestions for further study topics. (Objectives 1, 2, 3b)

Key 40th Infantry Division (Mechanized) Personnel:

COL James Combs, Chief of Staff. COL Combs provided direction to the thesis research from a 40th ID senior leadership perspective, offering possible areas of interest as well as the strategic vision and missions of the 40th ID. (Objectives 4, 5)

LTC John Menter, CO, 1/149th Tank Battalion. LTC Menter provided an in-depth appraisal into the culture and organization of the 40th ID, as well as a snapshot into the availability, level of integration, and other indicators of the Guard's status of automation efforts. LTC Menter showed examples of how e-mail message traffic was sent and received, how Internet access was gained, and gave a frank appraisal of the inherent inefficiencies and difficulties of the methods available to his unit for communicating with higher headquarters as well as subordinate units. There was a significant lack of user training and familiarity with IT resources in his unit (characteristic of conditions throughout the 40th ID). (Objectives 1, 2, 3a, 3b, 3c)

LTC Barham, CO, 240th Signal Battalion. LTC Barham helped initiate the process of seeking assistance from thesis students from the Naval Postgraduate School, and provided a great deal of background into the Guard's areas of interest concerning IT. And by making MAJ Smith available to the thesis team for all liaison activities, he indirectly helped the team gain contacts at other levels in the organization. (Objectives 1, 4, 5)

MAJ Dan Smith, Information Management Officer. MAJ Smith was the primary champion for the thesis team, and overall provided more information than any other single source. As the primary point of contact for the sponsor, dozens of interviews or meetings were conducted with MAJ Smith during the pilot study; organizational information was the primary focus during initial meetings, and remained a part of every interview held, to some extent. As a full-time career Guardsman, with a

large number of contacts and acquaintances throughout all levels of the organization, MAJ Smith also helped introduce the team to key individuals at every step of the study. He provided a wealth of information on the culture and political situation within the Guard, as well as information on RCAS, automation efforts, federal and state missions and roles, strategic visions, personnel components, organizational structure, strategic partners and customers, current IT resources, e-mail and internet issues, user training and familiarity, and network infrastructure status of representative units and armories. (Objectives 1, 2, 3a, 3b, 3c, 3d, 3e, 4, 5)

Key Headquarters, California Army National Guard (and where noted, California National Guard) Personnel:

COL Richards, Chief of Staff (CNG)

COL Robinson, Chief of Staff (CA-ARNG)

LTC Chapman, Director of Information Management (CNG).

As the head of the DOIM, LTC Chapman provided further information on specifics of the Guard's automation efforts, and enabled key individuals on his staff to be available for interviews as well. (Objectives 3d, 3e, 5)

CWO2 Dave Tollefson, Automation Chief. Chief Tollefson, as the outgoing Automation Chief for the DOIM during the initial phase of the pilot study, was instrumental in gaining a clear look at the current state of IT resources within the Guard, especially in regards to the NT infrastructure plans, and RCAS background and status. (Objectives 3a, 3d, 3e)

MAJ Steven Palumbo, Automation Chief. MAJ Palumbo took over the position of Automation Chief and continued to provide the thesis team with plenty of information concerning the status of automation efforts throughout the Guard, as well as multiple areas of interest for the Guard in relation to possible thesis research. He also helped bring top-level attention to the team's efforts. (Objectives 3a, 3b, 4, 5)

Troy Armstrong, Chief of State Operations, California State Office of Emergency Services. Troy also remains in the California Army National Guard Reserves as a Major, in addition to his full-time position as Operations Chief for the OES. He was particularly helpful in illuminating the nature of the relationship the CA-ARNG has with the OES, one of its primary strategic partners, as well as the Guard's customers for state emergency response missions. (Objective 1)

The personnel listed in Table 2.1 were interviewed primarily for help in mapping the business processes of the Guard, and in documenting their many

information systems. In gathering this information, related data on the missions, strategies, federal and state considerations, strategic partners and customers of the Guard was also collected. (Objective 1, 2)

COL Kenneth Kleine	Director Administration Services
COL Tarold Scott	Director Military Personnel
LTC Nelan	Director Aviation & Safety
COL Dan McCann	Director Organizational Training & Mobilization
SGM Mike Donahe	Directorate Sergeant Major Organizational Training & Mobilization
COL William Wade	Director Plans, Operations & Security
LTC Harrison Jack	Special Projects/Strategic Planner
LTCCarolynn Takami	Chief, Military Support Branch
MAJ Terry Edinboro	Emergency Plans Officer
CPT Rick Rabe	Assistant Military Support Officer
CPT Jon Siepmann	Plans Officer
COL Greg Peck	Director Facilities & Environment
LTC Balcao	Facilities & Environment
COL Joseph Luis	Director Surface Maintenance
LTC William Deason	Assistant Surface Maintenance Officer
COL Dennis Heintz	Director Logistics
CPT William Gotham	Surface Maintenance Officer
Pvt Smith	Software Developer

Table 2.1 - Personnel Interviewed

b. Investigate the Technologies

Interviews were conducted with these key individuals:

Professor Barry Frew. Professor Frew's areas of interest and research lie in information technology resource management, planning and strategy, new technology introduction, workforce retooling (training, education, career planning), and ITM executive issues. He is well-suited to providing information and guidance on strategic information systems plans. Development, implementation, and future states of ISP strategies were discussed. (Objective 6)

COL Greg Peck. Colonel Peck was able to provide a wealth of experience and information on strategic information systems plans, due to his full time position as the Chief Information Officer for Pioneer Electronics (USA), Inc. His insight into the California Army National Guard, gained from over twenty years of service, combined with his corporate experience and business-world perspective, furnished him with unique insight into this area. (Objective 6)

Troy Armstrong, Chief of State Operations, California State Office of Emergency Services. Troy provided detailed descriptions and live, interactive demonstrations of the Lotus Notes GroupWare application, as implemented by the OES in RIMS (Resource Information Management System) - their statewide workflow, messaging, emergency response tracking and reporting database system. (Objective 5)

Ms. Ann Anderson, Regional Sales Representative, Silicon Graphics, Inc. Ms. Anderson provided a CD-ROM copy of Silicon Junction, SGI's internal corporate intranet. She provided a hands-on demonstration of how the intranet is used every day (both by the bulk of the company's employees at SGI's corporate offices, as well as by far-flung field sales representatives) to look up component prices, availability, shipping status, and other critical real-time business information. (Objective 1)

A literature search of course textbooks, Internet websites, professional magazines, books, and published thesis research was conducted in meeting this objective. See Appendix B for a list of the sources used.

The following extracurricular courses were taken in order to target specific areas of technical research:

Secure Management of Systems. This course (CS 3670, 3-2) was taught at the Naval Postgraduate School by Professor Dan Warren, and focused on providing an understanding of management concerns associated with computer-based information systems. The problems associated with transitions to new systems and technology were covered in the context of Federal government, and especially DoD, automated data processing (ADP) systems. Capt Palan and LT White attended this course. (Objectives 1, 2, 3, and 6)

Introduction to ATM. This eight-hour course was taught by 3Com instructors at their training facility in San Jose, California. It covered fundamentals of the Asynchronous Transfer Mode (ATM) technology as well as information specific to 3Com ATM products. Capt Palan attended this course. (Objective 4)

c. Learning the Processes

Interviews were conducted with these key individuals:

The following individuals helped provide an overall process perspective on the Guard. Discussions focused on a high-level, top-down view of the Guard's missions, customers, strategic partners, and intra-organizational procedures. Only Colonel Robinson is a direct stakeholder of the processes discussed. (Objectives 4, 5)

COL Robinson
COL Greg Peck
LTC James Chapman
MAJ Dan Smith

Each of the Guard personnel below were interviewed at length about the functional area they command at the CA-ARNG Headquarters, and can be considered the primary stakeholders of these functions. Several were interviewed on multiple occasions, with each meeting successively drilling down deeper into the day-to-day operations of their respective sections. The team focused closely on critical processes as possible subjects for reengineering during these interviews. Each person interviewed provided a detailed process view of their staff section (as noted after each person's name) and description of all section information systems, based on a standard set of questions

developed by the thesis team (see Tables 2.3 and 2.4). Table 2.2 contains the names and billets of each person interviewed. (Objective 5)

COL Kenneth Kleine	Director Administration Services
COL Tarold Scott	Director Military Personnel
LTC Nelan	Director Aviation & Safety
COL Dan McCann	Director Organizational Training & Mobilization
SGM Mike Donahe	Directorate Sergeant Major Organizational Training & Mobilization
COL William Wade	Director Plans, Operations & Security
LTC Harrison Jack	Special Projects/Strategic Planner
LTC Carolynn Takami	Chief, Military Support Branch
MAJ Terry Edinboro	Emergency Plans Officer
CPT Rick Rabe	Assistant Military Support Officer
CPT Jon Siepmann	Plans Officer
COL Greg Peck	Director Facilities & Environment
LTC Balcao	Facilities & Environment
COL Joseph Luis	Director Surface Maintenance
LTC William Deason	Assistant Surface Maintenance Officer
COL Dennis Heintz	Director Logistics
CPT William Gotham	Surface Maintenance Officer

Table 2.2 - Names and Billets of all Staff Interviewed

What processes are you or your department responsible for maintaining?
Who is the customer?
What are the inputs to the process?
What are the outputs?
Where does the process begin?
Where does the process end?
What other organizations/entities do you interface with?
What problems or shortcomings are associated with the process?
What information systems or technology is used to support the process?
How well do they support the process? (strengths and weaknesses)
Are there future changes to the system being planned?

Table 2.3 - Process Questions

What is the purpose of the system? (Give a basic description of what it does, some representative fields/data inputs to the system, outputs and reports produced)
Who uses/has the ability to access the system? (In other words, who are its customers, and who actually inputs the data)
What are the hardware/software components of the system? (Standalone PC, PC/Server attached to the network, available/not available on the web, located on a mainframe)
How critical is the system to the function it supports? If it crashed, are there manual workarounds?
How often is it used? (Several times a day, weekly, etc.)
Any known Y2K issues?
Is it possible to make upgrades/modifications to the system? (At the CNG level)
How was the system obtained - pushed down from NGB/DA, RCAS II, homegrown, COTS?

Table 2.4 - Information Systems Questions

A literature search of course textbooks, Internet websites, professional magazines, books, and published thesis research was conducted in meeting this objective. See Appendix B for a list of the sources used.

The following extracurricular course was taken in order to develop and enhance understanding of business process reengineering/process innovation and other related concepts, including process measurement, benchmarking, and IT in process redesign.

Directed Study in Re-Engineering and Process Innovation.

Taught at the Naval Postgraduate School by Professor Mark Nissen, this course (IS 4800, 2-0) provided a very effective introduction to the concepts of process innovation and reengineering, as well as related subjects such as benchmarking. Process mapping, measurement and diagnostic techniques, redesign alternatives and methods, and the role of information technology as an enabler to these functions formed the core area of study. Capt McGuire, Capt Palan, and LT White attended the course. (Objectives 1, 2, and 4)

3. Results

After nine months of inquiry and exploration into the organizational characteristics, missions, and processes of the California Army National Guard, the pilot study proved itself to be a successful effort for the development of thesis research questions. It fulfilled the three primary objectives explained above, allowing the team to develop a specific area of study for thesis research. Given the amount of time and effort put into the study, it can be observed that not all avenues of exploration were, in the end, aligned with the final choice for the thesis topic. This is to be expected, and indeed a normal part of research. Beginning an investigation into an organization as large and complex as the Guard presents a very wide array of possibilities. What allowed the study to be effective was the willingness to explore, without knowing exactly what to look for or what would be found. The length of the pilot study (approximately nine months) also contributed to its success. It allowed exposure to many of the processes performed by the Guard, and provided a glimpse into the decisions made by the leadership and the corresponding results over time. We discuss the key results in three stages: 1) initial investigation, 2) problem discovery, and 3) BPR planning.

a. Stage 1 - Initial Investigation

As the context of the initial introduction to the Guard concerned intranet development, this remained at the forefront of exploration for the first several months of the study. Research into intranets was conducted concurrently with research into the organization, with guidance from the 40th ID sponsors on their areas of interest. The need for some sort of Guard-wide, easily accessible way to share information and workflow applications had been identified prior to the start of the pilot study in thesis research presented by Nelson and Heckroth [Ref. 5]. Much of the literature found on intranets focused on using them to conduct critical business applications, such as checking real-time customer order status, inventory levels/stocking status, shipping status, product information updates, as well as handling workflow applications like Lotus Notes, and a host of other uses. A basic scenario discovered through the research (suitable for a small enterprise) entailed utilizing relational databases (from products such as Access, SQL Server, or even Oracle databases) to store a wide variety of organizational data; readily available Microsoft Open Database Connectivity (ODBC) software to read the database files in response to user-generated queries; third-party middleware (such as Cold Fusion

Application Server) to process both the request for and receipt of this data, create dynamically-generated web pages to present it, and then pass them to a web server; and finally a World Wide Web (WWW) Server, to send the information to the requesting user's web browser. Other, similar schemes used various alternatives of this two-tiered theme, relative to which software component performed which task; most were very close in function to that described above. Silicon Graphics' corporate intranet, "Silicon Junction", had all of these capabilities and many more. The architecture it used, as well as several other arrangements, was evaluated as a potential solution for the enterprise-level intranet implementation desired by the Guard.

Initially, the sponsors' sole focus lay in implementing one of these technically-centered applications of intranet technology, without regard to analysis of their business processes. Their specific areas of interest for intranet development were:

- Intranet Development/RCAS Integration (adding to the functionality of the existing intranet shell developed by Nelson and Heckroth [Ref. 5], and then integrating it with the RCAS desktop software suite)
- Security Plan, Policies and Measures for Intranet Deployment (in garrison)
- Tactical Computing Security Plan (for intranet usage while operational/deployed – 'Warfighter' exercise)

The 40th ID sponsors were keenly interested in moving forward with these projects immediately. However, even at this early stage, process innovation and a systems analysis and design-oriented approach was deemed important by the thesis team. Before implementing strictly technical fixes to perceived shortcomings, some analysis of the underlying problems would be required to address the Guard's needs, and not just its symptoms. Information technology would be an enabler to process innovation techniques, allowing redesigned, and effective processes to be efficient as well. [Ref. 1] This business process reengineering focus was central to the way the thesis team approached the problem, and remained pivotal throughout the study and subsequent thesis.

Convincing 40th ID sponsors of the importance of examining processes first, however, was not accomplished quickly or easily. Numerous conferences and continual dialogue with key individuals were held throughout the study, and especially during the early months of the partnership. A few crucial readings were provided to Major Smith in an effort to acquaint him, and through him the 40th ID leadership, with the

primary principles espoused by the thesis team. The topics and corresponding sources are listed below:

- Business process innovation/reengineering [Ref. 1]
- Modern systems analysis and design approach to developing potential IT projects through use of a strategic information systems plan [See Appendix B]
- Government and business intranets [See Appendix B]

b. Stage 2 - Problem Discovery

Over a period of several months, as the Guard sponsors and the thesis team developed a good rapport, the ongoing dialogue and other efforts at educating the sponsors became more successful. Ultimately, the reengineering strategy endorsed by the thesis team was adopted – at least by the immediate sponsors within the Guard. As it would in any large organization, and especially within a strictly organized bureaucratic hierarchy such as a military unit, it required significant time and effort to communicate these ideas and strategic vision from the mid-level management (Major Smith, Lieutenant Colonel Barham) who first embraced it to the senior leadership of the 40th ID (Colonel Combs), who could make it reality. Concurrent with this effort was the pursuit of knowledge on the technologies identified in Objective Two, the principles and techniques of business process innovation/reengineering designated in Objective Three, and the organization itself, as laid out under Objective One. The continual dialogue and contact with Major Smith provided a great deal of information on the latter subject, as did meetings with Lieutenant Colonel Menter. As overall team knowledge of the organization, relevant technologies, and business process innovation/reengineering increased, several important points became clear.

First, the organization was ill prepared, in several critical areas, for deployment of an enterprise-wide intranet. The lack of an internal network infrastructure, combined with the high cost of remote access through long distance dial-in, made accessing any intranet difficult and expensive. Dial-in sessions by the majority of the Guard's armories were made to transmit and receive e-mail only, in an effort to minimize connection time and the subsequent charges (which were still over \$650,000 a year) they incurred. The availability of personal computers at most armories was extremely limited (one or two PCs each), further restraining units' ability to utilize a

potential intranet (of course, roughly 80% of a typical unit's personnel strength was comprised of Reserve Soldiers (M-dayers), who only worked at the unit once a month during drill weekends). A related consequence of the low density in IT resources was a correspondingly low level of average user training and familiarity with software available on Guard machines. Additionally, the existing intranet shell, developed by Nelson and Heckroth [Ref. 5], had not received enough organizational buy-in to make it a significant part of the IT infrastructure.

Second, and probably most important, it would be necessary to build a high-level process map of the Guard's business processes in order to develop a sufficient understanding of the Guard's many issues. This map would provide the team with a framework for dealing with these issues, and for deciding which were within the scope of the study and which were not. Continually throughout the pilot study, the thesis team wrestled with defining and then keeping within the scope of the project. As significant information was brought forth, the focus of effort shifted in a new direction based on the most recent findings. The overall trajectory of the pilot study changed every few months, as the team struggled to maintain its emphasis on exploration until sufficient data had been gathered to make an explicit determination of thesis topic. A process map of the organization would enable the team to define exactly where the Guard (and therefore the team) should concentrate its efforts, as it would ascertain the business processes critical to the Guard's missions. The extensive reading and research into business process reengineering which had been conducted in parallel highlighted the techniques needed to perform this analysis.

Third, it was clear from these conclusions that buy-in from higher levels of organizational leadership would be necessary for the high-level process mapping, and the subsequent proposed technology solutions if they were to be implemented throughout the CA-ARNG. Until this point, the focus of effort had been solely on the 40th ID. It was becoming clear that contacts within the higher headquarters needed to be established in order to conduct the project at the right level in the organizational hierarchy to see it achieve organization-wide acceptance. Establishing these contacts took a considerable amount of time, for various political and logistical reasons. Major Smith was instrumental in forging relationships with DOIM staff, especially Major Palumbo, the newly appointed Automation Officer (the billet formerly held by Chief Tollefson). The task of educating the new Guard sponsors on the need for a process innovation viewpoint began anew, assisted this time by Major Smith and other 40th ID sponsors. Although not

a 40th ID sponsor, Colonel Peck played a major role in helping the team acquire and synthesize information about the organization's processes.

As the team began to conduct research into the organizational characteristics present at the State Headquarters prior to beginning the mapping process, new issues, concerns and sponsor agendas came to the forefront. The DOIM presented a variety of ongoing or upcoming issues as potential project areas. For example, while the RCAS program was pushing thousands of new computers down to the Guard, with a complete desktop software suite for each one, how to deploy and manage these assets was left up to the California Guard. Besides desktop PCs, there were also workgroup servers, network equipment, and other IT assets. There were some very important questions raised by this program. For instance:

- How should the Windows NT Server domain architecture be structured?
- How should the new e-mail servers (MS Exchange) be deployed, and how should the old mail accounts be migrated?
- How could the network support staff of two manage the network operations center for the entire state?
- How should remote network equipment be monitored and managed, and by whom?
- What would be the most cost-effective way to provide connectivity between each and every armory and the State Headquarters?
- Could commercial Internet Service Providers provide the level of service, privacy and network access availability required by the Guard?
- Would a Virtual Private Network solution from an Internet Service Provider meet these requirements?
- How should the Guard's networks be structured – through the State as ".gov" addresses, or through the National Guard Bureau as ".mil" addresses? How could the two networks be tied together?
- How should the Guard's emergency response process tie in with the Office of Emergency Services? Should the Guard adopt the Lotus Notes workflow, notification, tracking, etc. management system RIMS used by OES in order to interface with them more tightly? Should they use it internally as well?

c. Stage 3 - BPR Planning

Although these issues were top priority in the information technology arena for the Guard, trying to solve them individually without relating them back to key business processes was obviously undesirable in the team's eyes. However, the team saw a way in which to tackle a few of these issues while still maintaining the process focus. By developing a Strategic Information Systems Plan aligned with the Guard's strategic business plan (if one existed), with both long-term strategic objectives as well as short-term tactical targets, both requirements could be met.

The plan of execution was straightforward. The team could examine the Guard's business processes, and then evaluate the degree to which their internal information systems supported them. Next, the team would research a desired future blueprint for the Guard's information systems based on research into available and forthcoming technologies, architectures, and methods of doing business with IT support, as well as the systems being deployed as part of RCAS. Then, a migration strategy to move the Guard from its current state towards the future blueprint would be developed. This migration strategy would be the Strategic Information Systems Plan.

As part of the plan, several of the short-term tactical projects identified as "low-hanging fruit" (specifically, some of the issues mentioned above, if they were still relevant) would be implemented in order to demonstrate the feasibility and validity of the Strategic ISP. For instance, the team could provide the Guard with an NT implementation strategy, or a recommendation on and working example of RIMS for internal use, or a remote management policy for the network operations center. This direction of research fit well into the areas already studied, and met the chief requirement to provide a useful product to the Guard as a result of the research. Also, it clearly addressed the three issues raised above, namely that 1) the Guard was not ready for full-scale intranet deployment, but needed help in IT-related areas; 2) the high level process mapping of the Guard would be conducted, and 3) any recommendations or proposals would be addressed to the top level in the Guard's management hierarchy in order to achieve organizational buy-in. This last point was satisfied by the close proximity to the top-level leadership of the Guard forces (for the entire state of California), as it resulted in an increased amount of official interaction and interest in the project.

During several extended visits to the State Headquarters in Sacramento, the team carried out the process and information systems mapping. The team also concentrated on learning the latest current events in the Guard, as significant developments occasionally arose which affected the course of the pilot study. One such instance was the previously mentioned ISP/VPN issue, which became moot after it was announced that the RCAS program had already addressed that issue. Other issues before the DOIM were already under discussion by appropriate committees within the Guard when the pilot study turned its focus on them. Several of these issues had been settled, and were no longer targets for possible thesis contributions.

Toward the latter months of the study, this circumstance occurred increasingly often. The fundamental reason for this, as it happened, was the previously sparse communications between the California National Guard DOIM and its counterpart at the National Guard Bureau, in Washington, D.C. Prior to a trip initiated by the Automation Chief, Major Palumbo, in April of 1998, the DOIM had had no contact with the NGB for the past three years. Consequently, a flood of information on many of the issues facing the DOIM (especially RCAS issues) was learned at the same time the thesis team was midway through the mapping operation at the State Headquarters. Of the remaining possibilities for actual implementation as part of the thesis, most were rendered infeasible simply because they required resolution too quickly.

Faced with this dilemma, the team had to decide whether to continue with a Strategic ISP in which the short-term, tactical objectives had all been overcome by events, and therefore focus solely on the long-term, strategic objectives; or, shift the thrust of the study and subsequent thesis to a topic which could still provide value to the Guard, and was aligned with the current direction of research. Based on the work which had already been performed in mapping the processes and information systems, and the strong business process reengineering orientation favored by the team, it was decided to shift the thesis toward more of a BPR focus by selecting one of the Guard's most basic processes for analysis and redesign.

Based on input from Colonel Peck and other sponsors at the State Headquarters such as Lieutenant Colonel Chapman, Major Palumbo, and Colonel Wade, and the results of the process mapping, the state emergency response (mobilization) process stood out as the most central process the Guard performs. Everything else the Guard does, in some way, supports this primary function. Upon making this decision, the pilot study effectively ended and the thesis proper began.

C. SUMMARY

The wealth of information gathered during the pilot study process was of tremendous value to thesis research efforts, and indeed much of this information is used directly in the thesis. The information pertaining to background and organization of the CA-ARNG, presented earlier in this chapter, were direct benefits of the pilot study, following along with the outline for Objective One - Learning About the Organization. Although significant research was performed during the study on the topics described by Objective Two, Investigating the Technologies, most of this material is not presented in the body of the thesis. The process innovation focus adopted at the conclusion of the pilot study concentrates instead on businesses processes. Although the use of information technology as a primary enabler for process innovation techniques is addressed heavily in the following chapter, recommendations for specific technological implementations remain a subject for future research with the CA-ARNG. Process innovation, addressed by Objective Three in the pilot study, remains the chief focus of the thesis and is the subject of the following chapter.

Three central lessons are learned from this pilot study. First, research represents an uncertain and unpredictable endeavor, which is best approached as an exploration, as opposed to a journey toward a specific destination. Second, process analysis must necessarily precede IT analysis, as IT represents one enabler of innovation and must be implemented within the context of (possibly redesigned) processes and strategies. Finally, in-depth, field research takes a lot of time, particularly when the focus of study is an organization of such size, complexity, and tradition as the Guard. For a thesis project such as this, a pilot study may represent an indispensable requirement.

III. PROCESS INNOVATION

An historical perspective of industrial age organizational development is required to understand the imperative of change today. Smith and Sloan style organizations, the organizational structure found in the majority of U.S. corporations and governmental organizations, are struggling to meet the challenges presented by the rate of change, global competition, and ever-increasing customer expectations to include their ability to select numerous similar products and services. Organizations must have an understanding of how work is performed and how they developed into their current state in order to analyze and eventually improve collective performance.

Organizational survival will literally be determined by how well organizations know themselves and how well they understand the environment in which they operate. In other words, only through a thorough analysis of work structure, performance, objectives, strategy, and a manner in which to transform these core principles, will organizations be capable of sustained success in what has been called the age of the information organization. [Ref. 1, p. 1] Therefore, an organization's survival is based upon its ability to comprehend modern notions of customer, competition, change, and a methodology to develop an enterprise based on information age organizational principles (e.g., processes aligned to strategy, information technology, worker empowerment, knowledge, and a mutually supportive culture that encourages innovation). Knowledge of the industrial age roots of an organization and the challenges presented by the information age will provide a solid theoretical foundation needed for charting the organizations' course into the new millennium.

Process Innovation (PI) is a revolutionary technique developed by Thomas H. Davenport that "fuses information technology and human resource management to dramatically improve business performance." [Ref. 1, p. 2] Davenport outlines a methodology that allows companies to make the monumental change from an industrial age to information-based organization. In his book, *Process Innovation: Reengineering Work through Information Technology*, Davenport describes the need for a new framework for understanding business: a process orientation framework that acknowledges the significance of technology and human factors in the information age organization.

The needed revolutionary approach to business performance improvement must encompass both how a business is viewed and structured, and how it is improved. Business must be viewed not in terms of functions, divisions, or products, but of key processes. Achievement of order-of-magnitude levels of improvement in these processes means redesigning them from beginning to end, employing whatever innovative technologies and organizational resources are available. [Ref. 1, p. 1]

Similarities exist between the Hammer and Champy definition of reengineering and Davenport's interpretation of process innovation. Both are tools used to achieve "radical" process change. However, process innovation focuses not only on reengineering but on other factors critical to a successful process redesign. Davenport defines the term *process innovation* as "encompassing the envisioning of new work strategies, the actual process design activity, and the implementation of the change in all its complex technological, human, and organizational dimensions." [Ref. 1, p. 2]

The business drivers of process innovation are the same factors described by Hammer and Champy's "3C's" (Competition, Customer, Change). However, Davenport's methodology describes a detailed, logical approach to undertaking and successfully completing a process innovation initiative based on commonly recognized business drivers of the "3C's". We have identified three key tenets of process innovation. Each is described in turn in the first section that follows. We then discuss what process innovation is not and describe change enablers in considerable detail. An overview of Davenport's process innovation methodology is presented subsequently, after which we summarize the key points of this chapter and transition to the discussion of benchmarking that follows.

A. TENETS OF PROCESS INNOVATION

1. Process Before Technology

A process view of business is concerned with how work is accomplished as opposed to what work is done. [Ref. 1, p. 5] Davenport defines a process orientation to business as "involving elements of structure, focus, measurement, ownership and customers." [Ref. 1, p. 5] Central to the understanding of a process orientation is defining a process itself. A process is defined as a structured, measured set of activities designed to produce a specified output... [Ref. 1, p. 6] Figure 3.1 illustrates the core

elements of a process through which various influences on the process activity actually shape how work is accomplished. Each process has unique constraints (controls) and enablers that shape it.

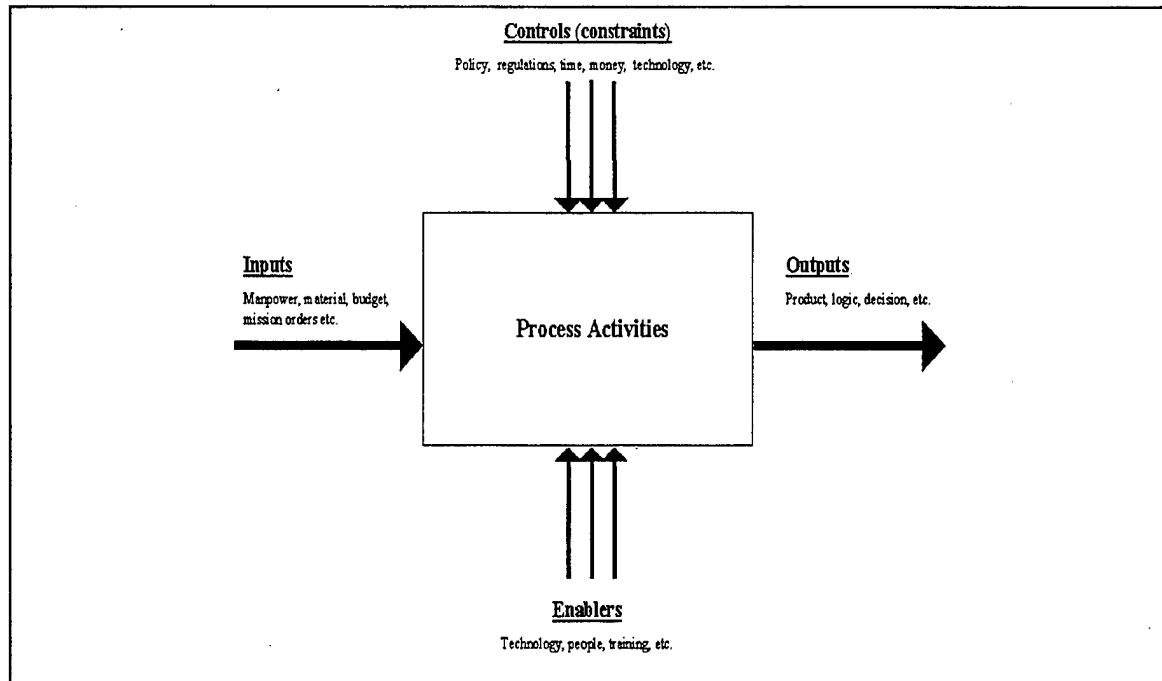


Figure 3.1 - Process Components with Examples [Ref. 28]

As Davenport explains, a process is simply a “structure for action.” [Ref. 1, p. 5]. The structural elements of the process (specific work activities, controls, enablers, inputs and outputs) are what inevitably allows the process to be reshaped. Structures can also be measured to produce quantitative and qualitative information on the health of a process. Processes lend themselves well to being measured, unlike a hierarchical map, the latter of which only shows functional areas of responsibility and reporting relationships.

Structure in the performance of work is desirable. Without structure, work activity becomes uncoordinated and unpredictable. Therefore, the notion of viewing work activity as a process is not a constraint on “getting work done.” By viewing the work activity as a process, workers and executives alike can develop a common understanding of how work is being performed, thereby making decisions on how to improve or redesign it. Ultimately, processes define how the organization delivers value to the customer. Each process of the organization is examined to determine its relative value to the end result: product delivery and customer satisfaction.

It can be said that the *process perspective* used to view the Smith model was entirely too narrow. [Ref. 1, p. 7] Process perspective can be defined as the breadth and depth at which a process is viewed. Narrowing the process perspective causes reduced visibility of process from input to output. The converse is true if the process perspective is too broad and not in sufficient depth. This can lead to an inability to understand the relevance of internal processes and their key factors. Knowledge of breadth and depth is critical to understanding the spectrum of activities that occur across the organization. Although one need not have extensive experience with the process, a basic understanding of activities (depth) and scope of activities (breadth) is desirable. A balanced process perspective will allow people at various levels of responsibility to share a common understanding of how the process delivers or fails to deliver value to the customer. The process perspective will allow people responsible for various aspects of the process to focus on how they can add value to the overall process.

A process perspective is inherently horizontal, or cross-functional. Information age organizations deliver value to their customers through processes that often cut across an organization's business unit and departmental boundaries. Usually, the order of work from input to output in most organizations is sequential. Do this first, then take the next step. Examining the input, its flow across the organization, and the output will often reveal the sequential nature in which work is structured. Work in sequential steps is time consuming, inefficient and creates considerable overhead and friction. Handoffs among functional departments are often unstructured and in need of coordination. By understanding the cross-functional nature of processes, we can begin to see how sequential steps can be redesigned to work in parallel, thereby reducing handoffs and accomplishing work more quickly. A cross-functional emphasis therefore de-emphasizes the traditional structure of the organization, making departments and business units less important, while emphasizing the relevance of an organizational structure that better enables the flow of work from input to output.

Successful processes have clearly defined process owners. The process owners have a balanced process perspective and are responsible for all activities across a process. An owner will ensure that each and every individual sub-process that encompasses the overall process delivers value to the customer. The difficulty with implementing this concept is that individual processes often cut across organizational boundaries, into someone else's traditional power domain. Process ownership must not be viewed as an encroachment upon traditional departmental ownership. Davenport believes that process

ownership must be viewed as an “alternative dimension of the formal organization” where delivering value to the customer is the target objective. [Ref. 1, p. 7] As businesses begin to see how processes are cross-functional, new relationships among process owners and business unit (functional) executives develop, which become mutually supportive. The ultimate result of the new understanding of cross-functional process owners and functional unit executives might lead to organizational restructuring or at the very least, a process owner/functional executive relationship where each can support the other.

Central to innovation is the notion of dramatically improving business performance. Process innovation, as defined by Davenport, “...combines a structure for doing work with an orientation to visible and dramatic results.” [Ref. 1, p. 10]. In process innovation, the spirit of creativity prevails over traditional thinking. Innovation implies a fundamental rethinking of basic assumptions of how an organization does business. Organizational cultures that value creativity are prone to discontinuous thinking which often leads to innovative results. Therefore, innovation demands the flexibility to question ideas and assumptions to develop and grow into mature frameworks for thinking about process structure and performance.

In his seminal Harvard Business Review article, “Reengineering Work: Don’t Automate, Obliterate,” Michael Hammer admonishes executives of the fallacy of placing technology before process. Often referred to as the Productivity Paradox, corporations, despite heavy investment in technology, have not achieved the level of productivity that technology promised to deliver. Hammer describes the disappointment and offers insight.

...heavy investments in information technology have delivered disappointing results – largely because companies tend to use technology to mechanize old ways of doing business. They leave existing processes intact and use computers to simply speed them up... It is time to stop paving the cowpaths. Instead of embedding outdated processes in silicon and software, we should obliterate them and start over. [Ref. 3, p. 104]

Simply stated, Hammer started a corporate revolution. He called for companies to harness the power of information technology to “radically redesign (their) business processes in order to achieve dramatic improvement in their performance.” [Ref. 3, p. 104] Companies that desire to see significant productivity improvements and break the

productivity paradox need to first examine how work is performed. Utilizing technology for existing processes is equivalent to “paving the cowpaths” (i.e., investing in outdated business processes that have no more been examined than the routes of weathered cow paths).

Davenport echoes these sentiments as a common thread prevalent throughout his book. “We have found in many companies that key processes were last designed (to the degree that they were designed at all) well before the rise of information technology.” [Ref. 1, p. 40] Organizations that develop or purchase software and systems with the goal of improving productivity of existing processes are creating systems that are functionally based and do not reflect a cross-functional view of business. According to Davenport, “such stovepipe systems cannot support a business view of the organization; they imprison data with functional barriers.” [Ref. 1, p. 41] The tenet of process before technology cannot be overstated. Technology, without the close examination of how work adds or does not add value to the intended output, will assuredly lead to an investment with minimal impact.

2. Strategic Alignment

Strategy is the high-level description of an organization’s roadmap for success. Strategy provides the necessary business focus on what is most important to the organization. The intent of the strategy is to align the collective momentum of an organization in a direction that propels it towards meeting its long-term goals. Organizational momentum can be described as the technology, information, human and organizational structure that collectively define the organizational capabilities needed to meet its goals. Strategy forms the common language that binds these elements. Work, from a different perspective, is the combined interaction of human, technology and structure. Therefore, of critical importance to process innovation, is the strong linkage between strategy (roadmap) and process (work). Business processes define how work is done. Davenport articulates this relationship and the importance of process alignment to strategy:

Process innovation is meaningful only if it improves a business in ways that are consistent with its strategy. In fact, process innovation is impossible -- or at least only accidental -- unless the lens of process analysis is focused on a particularly strategic part of the business, with particular strategic objectives in mind. [Ref. 1, p. 117]

Therefore, processes must have specific goals based on corporate strategy. Processes are not self-serving. They exist solely to channel the momentum of the organization into value-added work activities that serve to close the gap between where the organization is now and where it needs to be. Alignment of process goals and objectives to the strategy serves as the primary means by which an organization accomplishes its goals. Furthermore, the analysis techniques described in process innovation ask process owners to examine how their process goals and objectives align with the strategy. This exercise provides much needed insight into the incongruities between work performance and strategic objectives. Kaplan and Norton believe that "when everyone understands the (organization's) long term goals, as well as the strategy for achieving these goals, all organizational efforts and initiatives can become aligned to the needed transformation processes." [Ref. 2, p. 200] Simply stated, creating a strong linkage between process and strategy and identifying where and how they are misaligned, triggers innovation in the form of a new perspective. This perspective is focused on how well the process is contributing to the "gap closure" between process performance of today and the business goals of the future.

3. Change Levers

Change levers refer to the techniques through which processes are transformed. Also known as enablers, change levers are the "means" through which process innovation is accomplished. They are the very tools of process innovation. Davenport points to three change levers (information technology, information, and organizational/human factors) that when utilized in varying degrees, together and separately, have the power to significantly redesign a process.

The power of information technology is perhaps the most influential change lever available to the process innovator. However, IT alone cannot produce the change required for bold process redesign objectives. Human and organizational factors are often overlooked, yet their importance is as critical as IT in processes innovation. Information, more specifically the type of information we need to make decisions, is a topic whose relevance to process performance is not clearly understood by many executives. However, information management is taking on new importance, as more and more data is generated, when what is actually needed is specific information tailored for decision making.

Combined, the human/organization, information, and technology change levers can transform a process based on the degree to which they are applied. As a general rule, the greater the combination of change levers, the more significant the change. The change lever effect for process transformation is illustrated in Figure 3.2.

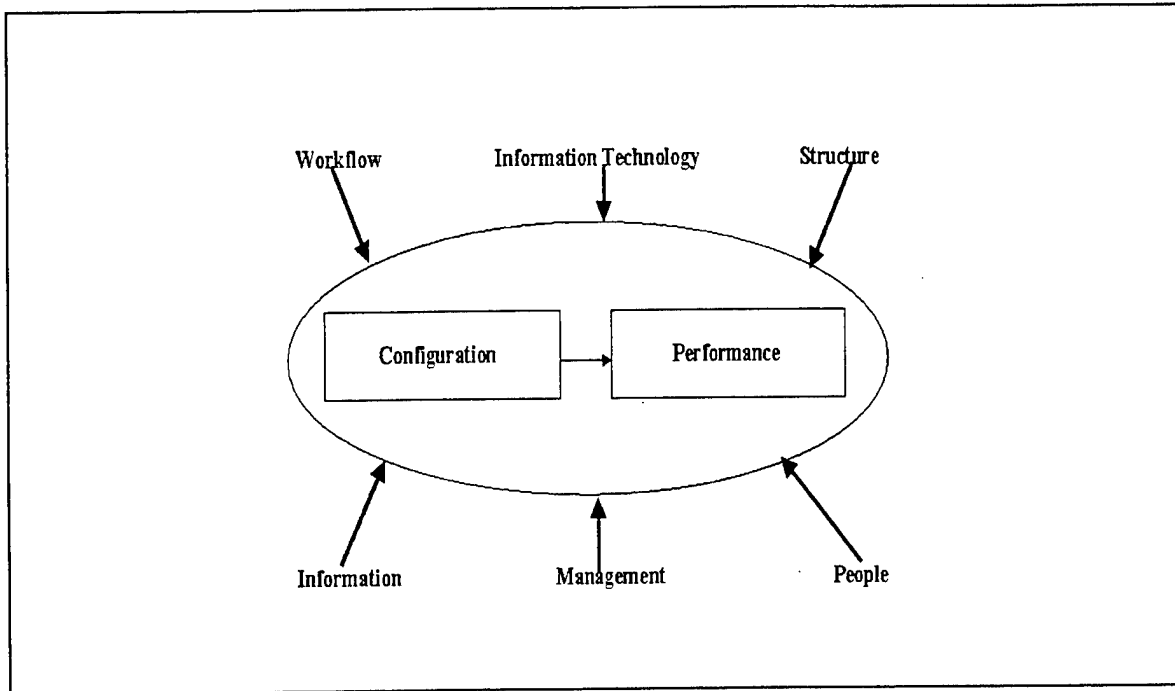


Figure 3.2 - Change Levers [Ref. 28]

In this figure, configuration refers to the structure of the target process, while performance refers to how well the process actually works. By applying various combinations of the technology, information, and human/organization factors, new process redesign alternatives will begin to form. Davenport observes that,

The architect brings to the design of a building the knowledge of the technologies needed to operate it (e.g., elevators, air conditioning, plumbing and so forth) and the types of people who will work in it. A process designer must be cognizant of the technologies and people involved in making a process work. [Ref. 1, p. 18]

Process innovators understand the transformational capabilities of the three primary change enablers and their ability to realize bold performance objectives. Successful innovators will use current and future techniques/tools associated with

information, technology and human/organization to think about how the techniques can be applied to solve problems that might not currently be apparent or manifest. Additionally, process redesign should never be undertaken as a means to test new organizational or human relations theory, and especially not for technology sake alone.

B. WHAT PROCESS INNOVATION IS NOT

Process innovation should not be confused with continuous process improvement or any other, incremental performance improvement or quality management program. Fundamentally, process innovation seeks order-of-magnitude changes in the way organizations are performing, whereas continuous process improvement and quality management imply performing the same activities with slightly increased efficiency and effectiveness. [Ref. 1, p. 10] Process innovation has a broad focus and seeks significant performance objectives while improvement and quality management have a more narrow scope for performance gains. Quality programs such as Total Quality Management (TQM), as described by Hammer and Champy:

... work within the framework of a company's existing processes and seek to enhance them by means of continuous incremental improvement. The aim is to do what we already do, only do it better. [Ref. 3, p. 49]

Process Innovation, continuous improvement, and quality management techniques do share many common themes, nevertheless. Among them are a recognition of the importance of the process in achieving performance results, and a customer focus as a critical force that shapes the process. They are also similar in the recognition of the cultural change required to increase performance. However, they are completely different in the level of performance goals they seek to achieve and in the direction from which change is driven -- that is, top down (process innovation) vs. bottom up (quality/improvement). Figure 3.3 shows the various categories in which they differ.

	<u>Improvement</u>	<u>Innovation</u>
Level of Change	Incremental	Radical
Starting Point	Existing Process	Clean Slate
Frequency of Change	One-time/Continuous	One-time
Time Required	Short	Long
Participation	Bottom-up	Top-down
Typical Scope	Narrow, within functions	Broad, cross-functional
Risk	Moderate	High
Primary Enabler	Statistical Control	Information Technology
Type of Change	Cultural	Cultural/structural

Figure 3.3 - Continuous Process Improvement versus Process Innovation [Ref. 1, p. 11]

The direction from which change is driven deserves further clarification. Quality and process improvement programs have a bottom-up focus where employees are encouraged to define how the processes in which they participate can be changed. Essentially, process improvement and quality programs are driven from the employee level. Employees participate in programs that encourage them to focus on the quality of work and voice their opinions on how to improve the process and its quality. Alternatively, process innovation is a top-down change technique, with an emphasis on strong executive and senior management participation. [Ref. 1, p. 12] Davenport cites the following for the top-down nature of process innovation:

Because large firms' structure do not reflect their cross-functional processes, only those in positions overlooking multiple functions may be able to see opportunities for innovation. [Ref. 1, p. 12]

A production line assembler is unlikely to have the organizational perspective required to view the cross-functional activities of a process in its entirety. This does not mean that employee input is not essential to process innovation. In fact, all levels of the organization must have "buy in" to the process innovation initiative. Their full support and participation is a critical success factor. However, in top-down driven change (i.e.,

process innovation), those ultimately responsible for the success of the organization have the responsibility to define the objectives. Indeed, an outcome of process innovation may be to empower the worker with the authority, process perspective and means to make decisions about the activities in the process. Bottom-up techniques normally imply narrow improvement objectives that lack broad perspective and the necessary emphasis on technology, information and human/organizational tools to realize order-of-magnitude change.

C. CHANGE ENABLERS

Each of the primary change enablers from above is discussed in detail.

1. Information Technology

The importance of information technology in process innovation cannot be understated. As previously discussed, the productivity paradox developed due to inaccurate assumptions that technology alone would dramatically improve business performance. Without changing the process structure, the use of technology will likely produce disappointing results. However, information technology can indeed produce dramatic results when used to enable a redesigned process. Innovators must have an understanding of the possibilities that technology presents to them. Describing technology in solely technological terms will be a sure way to alienate process owners and others participating in the innovation initiative. When technology can be presented by describing how it can add value to or spark innovative thoughts about process redesign, those participating in the innovation effort will be far more receptive. In Figure 3.4, Davenport describes several basic categories where IT presents process innovation opportunities.

<u>Impact</u>	<u>Explanation</u>
Automational	Eliminating human labor from a process
Informational	Capturing process information for purposes of understanding
Sequential	Changing process sequence, or enabling parallelism
Tracking	Closely monitoring process status and objects
Analytical	Improving analysis of information and decision making
Geographical	Coordinating processes across distances
Integrative	Coordination between tasks and processes
Intellectual	Capturing and distributing intellectual assets
Disintermediating	Eliminating intermediaries from a process

Figure 3.4 - Impact of Information Technology on Process Innovation [Ref. 1, p. 51]

Each impact briefly describes a possible outcome of technology in process innovation. Almost instantly, we can see many possibilities. For example, a tracking system would provide military commanders with the ability to pinpoint the location of their units.

In fact, the true power of technology in process innovation is how it can be used to spark inductive thinking -- the ability to first recognize a powerful solution (technology) and then seek the problems it might solve. [Ref. 3, p. 84] However, this can present a challenge to organizational leaders and managers who have primarily been taught deductive reasoning techniques. Experienced decision makers are very skilled at defining problems, then seeking potential solutions. According to Hammer and Champy this leads to a commonly occurring error in the way corporate leaders think about technology. Most leaders deductively reason how technology can be used to improve existing processes. [Ref. 3, p. 85] Inductive thinking challenges leaders to consider how technology can allow the organization to do things it's not already doing. Simply stated, "It's about exploiting the latest capabilities of technology to achieve entirely new goals...recognizing the new, unfamiliar capabilities of technology instead of familiar ones." [Ref. 3, p. 85]

History illustrates many examples of overlooking the latent possibilities resident in technology. Hammer and Champy describe how a small company in the late 1950's was performing work on its first commercially available copier. As cash became scarce for the fledgling company it turned to IBM for investment in the idea. Based on economic analysis, IBM concluded that although it replaced all known methods of copying, it would not repay the investment required to fund the company. IBM decided to not get into the copier business, so the company, Xerox, continued to work on the idea in the hopes that it would one day find a market. The Xerox copier was technology seeking a solution. At the time, the need for a technology that could create multiple copies was deemed a business need. However, once it became available, companies began to see a value in replicating documents in large quantities as a means to share information across the organization. The rest is history.

Often, it is the hidden or latent power of technology that, when thought about inductively, produces the most significant results. The opportunity resident in video teleconferencing (VTC), for example, is not a massive reduction in travel costs as once envisioned. It is in the manner in which teleconferencing improves communication among geographically dispersed people. [Ref. 3, p. 89] Most organizations have not realized serious reductions in travel costs since deploying VTC in their organizations. This can be attributed to the realization that there can be no replacement for face-to-face interaction among people. [Ref. 3, p. 89] Non-verbal communication and personal interaction can not be replicated via video. However, progressive organizations have demonstrated that utilizing VTC provides a medium for more frequent communication, not a replacement of face to face meetings. The latent opportunity in VTC is that of improving the lines of communication among geographically separated entities; an invaluable means of increasing the quality of communication, and ultimately, the quality of work produced by more frequent interactions. [Ref. 3, p. 90]

Technology can also be a process innovation constraint. Although process innovation often focuses on a "clean slate" approach to process redesign (i.e., not being constrained by existing processes), it is important to consider the constraints that existing technology (e.g., "legacy" systems) places on the possibilities of potential redesigns. Existing systems and lack of technical infrastructure should not be ignored when designing new processes. The investment in the existing systems and infrastructure is too expensive. Instead, process innovators must recognize the natural constraints IT places on potential redesigns, so that informed decisions can be made about the feasibility of

redesign. According to Davenport, "rather than assuming a clean slate at the beginning of a process and then later getting bogged down in existing systems, the analysis of constraints tailors the process to a systems environment from the beginning." [Ref. 1, p. 65]

Technology represents the most powerful tool in the innovator's toolkit. Hammer and Champy refer to the "disruptive power of technology" as a critical success factor in breaking traditional notions of work and organization. [Ref. 3, p. 91] Organizations that strive to make technology exploitation a core competency demonstrate an understanding of the importance of technology and a willingness to commit resources to capitalizing on new solutions to yet unknown problems -- indeed, "discontinuous thinking" at its finest.

2. Information

Of critical importance to process innovation is the manner in which information supports business processes. Information can be described as data made meaningful. Although overshadowed by its more flamboyant brother, technology, it is information that workers, managers and executives require to make everyday decisions. Therefore, management of information -- the management of an organization's information environment -- is a key process enabler capable of dramatic process performance improvement.

The management of information is not an easily understood concept nor is it widely practiced. This might be attributed to affinity for technology as the "holy grail" that somehow permits organizations to structure their information and make it useful. However, by some estimates, 85% of corporate information is not manipulated by information technology due to a lack of understanding of the information required by decision makers and often by the unstructured nature in which some information is communicated. [Ref. 1, p. 71] More often than not, organizations have a very vague understanding of information requirements that are needed to make accurate and timely decisions. Without a full understanding of information requirements, according to Davenport, "vast amounts of information enters and leaves the organization without anyone being fully aware of its impact, value or cost." [Ref. 1, p. 72] Process innovation requires a full awareness of information requirements as a precursor to success. As such, three issues (roles of information in processes, types of information oriented processes,

and process information management) are addressed to provide background into the relationship between process and information.

a. Primary Roles of Information

The three primary roles of information in processes are performance, integration, and customization. [Ref. 1, p. 73] Critical information regarding the performance of processes can be gathered throughout a process to provide the status of its health. This is particularly true when the processes are aided by technology. Information management expert Shoshana Zuboff explains, "The devices that automate by translating information into action also register data about those automated activities, thus generating new streams of information." [Ref. 10, p. 9] The new streams of information such as cost, cycle time, responsiveness and quality can be used by all who support the process. Real time process reporting systems that capture important process performance information are invaluable tools providing employees with immediate feedback and management through accurate information. Davenport cites the General Electric manufacturing plant of Salisbury, Maryland as an example of how employees use real-time heads-up-displays to provide them with a variety of process performance information.

Often, information gathered on a customer or generated internally by a department has relevance in other departments across the organization. Information can be thought of as the thread that weaves various activities and business units into an organization. Information itself is a powerful means to integrate processes. Therefore, sharing of information across the organization is critical to its success. Through a study of organizational information requirements, process innovators can be provided with an important tool that illustrates how information can best be captured and disseminated to all who require it, regardless of its origin. Many companies are using technology to aid in information acquisition. Davenport describes how companies use toll-free 800 customer service numbers to acquire information reported by customers. [Ref. 1, p. 75] The information is made available to all who require it providing a valuable tool to learn about customer preferences, complaints and compliments. Other companies are using "information specialists" to acquire unstructured information on customers and internal corporate activities, as a means to provide the whole organization important information regarding on-going projects, their status and other relevant activities. Information

specialists acquire and synthesize all forms of information based on the information requirements of the organization.

Davenport states that "Information can be utilized to better integrate process activities both within a process and across multiple processes." [Ref. 1, p. 75] By understanding information requirements, processes can use common information acquired once, anywhere in the organization, stored in an information system, and reused by all who require it.

One of the new assumptions of the information age, as defined by Norton and Kaplan, is "customer segmentation" or the ability to customize the delivery of output to each customer. [Ref. 2, p. 4] More commonly known as "mass customization", this notion refers to the ability of an organization to acquire information regarding each customer and their needs, and to tailor the product specifically for them without increasing the cost of production. Technology makes the acquiring, storing, indexing and retrieving of this information a reality. In fact, mass customization is now viewed as a critical success factor by most information age organizations in order to compete for business in mature market segments. The importance of delivering tailored solutions is self-evident. Each customer and each situation, such as a military operation, has its own set of unique requirements. A process that delivers a "one size fits all" product can no longer succeed in the information age where customer expectations are on a continuously increasing slope. According to Davenport's research,

Firms that have succeeded have mastered the basics of information management. They are able to categorize, store, retrieve, and maintain customer records with relative ease. These firms determined early what information they needed to offer tailored products or services and gathered that information. Because they recognized the value of process customization, they recognized the importance of their information assets and were willing to invest in them. [Ref. 1, p. 77]

Today's customers are demanding. Tomorrow's demands will be more taxing. Organizations that wish to meet today's requirements and anticipate tomorrow's must understand the importance of tailored solutions based on a complete understanding of information requirements.

b. Information Oriented Processes

The information oriented process produces information as its output. Whereas a manufacturing process produces a physical product, the product in an information-oriented process is information itself. Davenport describes two types of information-oriented processes: those designed to aid management decisions and activities and those with operational objectives. [Ref. 1, p. 77] The following paragraphs describe the nature of these processes.

Management oriented information processes are designed to aid in decision making. In most corporations, managers and executives focus on financials as the primary source of information used for decision analysis. However, information age wisdom dictates that non-financial information based on customer, cycle time, competition and market knowledge play an increasingly critical role in the management of successful modern organizations. Simply stated, few inroads have been forged in the way of providing information needed for executive and management decision making. [Ref. 1, p. 79]

Several reasons may account for the knowledge gap. Most organizations have not yet undertaken initiatives to identify the kind of information required for managerial decisions. Missing are process oriented measurements that give managers meaningful information on nearly all the non-financials. Information, for example, such as the average time it takes to fill a customer's order or resolve disputes. Clearly, the value of the information is in its timeliness and accuracy. In relation to a performance measurement system, this become critical. According to authors Sharon McKinnon and William Bruns, a study of executive information use found that top management does not use computer stored information because it is generally obsolete. [Ref. 11, p. 12] Taken another way, executives and managers require timely information delivered in any form as opposed to obsolete, system delivered information.

Furthermore, executive information is often unstructured and difficult to capture. [Ref. 1, p. 79] A great deal of organizational communication is interpersonal in nature. High level executive briefs, discussions in the cafeteria and other locations make the capturing of rich information communicated in such encounters difficult at best. Typically, senior managers and executives are "briefed" by their staffs as means to fill the information-oriented management process gaps. Face-to-face meetings are indeed important to a healthy communication climate. However, briefings of the future, where

executives have access to real-time performance measurements, might become more action-oriented rather than informational in nature. Unstructured executive information remains a perplexing area in information management research.

Strategic measurement and control is another type of information-focused management process which could play a significant role in the performance of an organization. Executives require the capability to examine how performance levels measure against strategic goals and objectives. Davenport illustrates Imperial Chemical Industries, one of Europe's largest firms, and how it focuses on a small number of strategic milestones (financial and non-financial) to successfully hone the management focus on critical information. [Ref. 1, p. 81] Information specialists might be used to track performance information from across the organization relative to the few strategic milestones. Hypothetically, once processes in the organization have identified their information requirements, established performance measurements, and created systems to monitor performance, information regarding the few strategic milestones could be delivered to executives in the form of a strategic control system.

Many of today's processes produce information as their output. Examples of such processes might produce customer service, a consulting report or a formal briefing. Davenport points out that unless these information-oriented processes are transactional in nature (repetitive, frequently occurring), they are unlikely to be viewed as a true process. [Ref. 1, p. 82] However, this does not diminish the importance of information production processes. It does serve as an important indicator as to the maturity of the organization's information management understanding.

Information processes that more resemble transaction processing similar to a production line, like pay processing, supply requests and insurance policy processing, are likely to be more clearly recognizable. However, with both the less clearly defined information processes like expert knowledge acquisition and distribution, and the more clearly defined bank check processing, companies are placing a higher premium and importance on them while attempting to build processes for management. For example, Davenport describes IBM's "market information management" capture process which encompasses the management of all information which might lead to a successful sale of products and services. Many large companies have similar information acquisition processes as their importance in information age success becomes more pronounced.

c. Designing an Information Management Process

Designing an information management process is a difficult undertaking that has a great deal of potential for meaningful returns. Firms that are attempting to design an information processes should not initially be concerned with order of magnitude of change. They should first “establish an information management processes to provide a baseline upon which subsequent efforts can try to improve.” [Ref. 1, p. 83]

Another key element in information process management is that the processes can only be properly managed if the actual information requirements for a process are clearly defined. Unfortunately, very few organizations understand the importance of defining process information requirements. A process’s information requirement is defined as that information from both internal and external sources that is needed for the process to work. According to Davenport:

Information management processes should include the entire information “value chain”, that is, the process should start with the definition of information requirements, and move through collection, storage, distribution, receipt, and use of the information.

With the proper process perspective, process owners can begin to define their information needs and how that information impacts decision making. In essence, an examination of information requirements amounts to the analysis of the relationship between “information provided and decisions taken.” [Ref. 1, p. 154] Information must not be separated from the process. Executives, managers and workers perform process activities (work) based on information. Can a process really be complete if it has vague knowledge of the information required to make it run? Figure 3.5 depicts a process for information management.

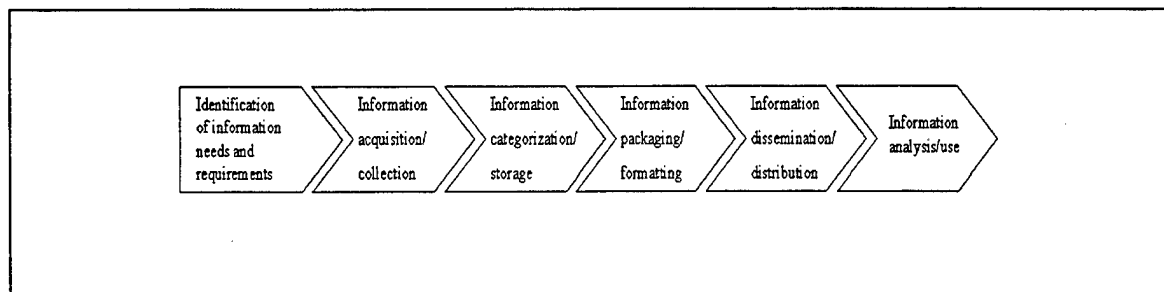


Figure 3.5 - A Process for Information Management [Ref. 1, p. 84]

The information management process in Figure 3.5 provides a generic example of how an organization might construct its own management process. Organizations embarking on an information-management process-building initiative should consider the nature of how information is received, categorized and stored. Once that is determined, the lens should be focused on a single process whereby information requirements can be analyzed. By referring to Figure 3.5 and asking "how" before each of the processes beyond Requirements Determination, process owners can begin to develop an understanding of how information impacts their processes.

Information technology can obviously play a critical role in enabling the information management process. However, as previously discussed, a great deal of information communicated to and within the organization is unstructured and interpersonal in nature. The impact of current technology on collecting this information is minimal. Therefore, the role of humans in acquiring and synthesizing unstructured information in its various formats remains critical to a successful process. Technology, such as knowledge based systems, are used to capture organizational process knowledge. Human involvement in acquiring information for the knowledge based system is essential. However, once it is acquired, cataloged and formatted, it could then be made available to the organization through the use of computers.

Most organizations view information and technology together. As we have discussed, a focus on information alone can provide enormous insight into processes' information requirements. Many companies are organizing people to begin capturing and cataloging information. According to Davenport, a number of Japanese firms have organized "competitive information departments" that compile a wide variety of information such as memos, trip reports, and briefings. They refine and distribute such information to those who require it. [Ref. 1, p. 43] Closer to home, American Express and AT&T are also taking information management seriously. Recognizing the need to place an emphasis on information management, both companies have created senior executive positions to plot and manage information and policy. For example, the vice president for information services stands side by side with the vice president for information technology. Davenport believes that companies should consider a "hybrid" chief information officer (CIO) who has not only business and technology skills, but also information management skills.

3. Human Resources and Organizational Structure

The third key change lever applied in process innovation is human resource and organizational structure. Senior managers and executives have an awareness of the importance of human resources and the influence of organizational structure and culture on the people who work there. Human resource and organization are well known factors that contribute to the success of the enterprise. Policies that impact the organizational structure and human resources are commonly applied tools utilized to produce corporate-wide change. Process innovation also utilizes these powerful tools to enable redesigned processes. It becomes critical to understand the relationship between structural change and the impact that change has upon humans. Davenport explains:

If process innovation is to succeed, the human side of change cannot be left to manage itself. Organization and human resource issues are more central than technology issues to the behavioral changes that must occur within a process. [Ref. 1, p. 96]

Too often the impact of structural change upon human resources is not fully explored. The consequences of not properly managing people throughout the organizational change process can be devastating. Successfully navigating people through change is the subject more thoroughly examined in Chapter VI. However, one issue remains clear: process innovation can only be successful if all aspects of change are in balance with another. [Ref. 1, p. 96]

a. Organizational Enablers

According to Davenport, "organizational enablers of process innovation fall into two categories: structure and culture." [Ref. 1, p. 96] Team organization stands out as the most powerful means of facilitating new process oriented behaviors. This can primarily be attributed to the ability of a team structure to combine multiple skills and knowledge into a coherent unit. Davenport believes that team organization allows for a more rapid adaptation to changing environments. [Ref. 1, p. 97]

Organizations seeking a team structure do so based on the benefits of cross-functionalism and improved quality of life. [Ref. 1, p. 98] Cross-functional teams are designed to combine the diverse skills of many into a cohesive, self-directing unit. Because the teams combine many skills and are comprised of workers from different

functional units, they naturally lend themselves well to enabling cross-functional work. Team structure has also been shown to increase the quality of work life. [Ref. 1, p. 97] Most people prefer to interact with others while they work -- to talk, share ideas and solve problems. Team interaction has been shown to increase understanding among team members having diverse functional backgrounds. This can be a particularly important benefit for organizations seeking to diminish long-standing functional boundaries and foster a more appreciative cultural environment based upon positive reinforcement, co-inquiry (listening to one another) and better understanding of each team member's functional background. [Ref. 10] However, team membership does not always foster understanding and appreciation. Sometimes team members simply do not "get along." Therefore, selection of team members, and their cultural compatibility, is critical to building a successful team.

Davenport distinguishes between two types of teams: process design and long-term teams that execute work. [Ref. 1, p. 99] Process design team composition will be covered in Chapter VI. Long-term teams, such as the kind that might be established to perform an entire process, face particular challenges that might not be associated with short term team. In particular, "difficult issues that face long-term teams revolve around the relationship between team members and the functional structure of the organization." [Ref. 1, p. 99] To whom team members report and are evaluated is of critical importance if the team is to operate in a cross-functional manner. If a team member is evaluated by his functional manager, he or she is likely to have strong allegiance to that manager and favor decisions that positively impact the team members functional connection, perhaps to the detriment of process performance as a whole.

In cross-functional team building, managers and executives are forced to divorce themselves of their functional association and select team members best suited for the job. Davenport states that:

To function effectively as a cross-functional team, a senior management group must be willing and able to look beyond functional allegiances, and even beyond what may benefit their careers. [Ref. 1, p. 100]

This might prove to be particularly difficult. Many executives who have been promoted to such positions arrived there by political and self-preservation motives are often counter-productive. However, team selection and an understanding of the

factors impacting selection remain critical issues that senior management groups must overcome.

Team success is based on the following factors: [Ref. 1, p. 100]

- Composition of the team
- Clear relationship to functional structure (reporting relationships, process vs. functional activities)
- Logistical issues (team location and work space)
- Degree of “self-management” (amount of team control in making management/resource decisions)
- Boundary management (inter-group responsibilities and team/organization relationship)
- Clarity (mission, process boundaries, decision making authority, internal and external group roles).

Prevalent among many successful process team stories is their ability to be self-directing. “Self-managing” teams direct their own work and have no formal leader. [Ref. 11] Often referred to as self-empowered, these teams have the ability to make decisions, acquire resources, maintain operational budgets and a host of other activities, even hiring additional employees in some cases. Teams, particularly empowered ones, offer process innovators a powerful enabler, which through the clarity of its charter, an appreciative intra-team culture, proper tools (skills, hardware, financials) and organizational support, can produce dramatic performance results along with a positive impact on the structure and culture.

Information technology is a powerful enabler of team communication. Many products are now available that support group-oriented activities such as group document preparation, communication, brainstorming and analysis. Collectively, these tools are called *groupware* and can have a significant impact on productivity by reducing the need for face-to-face meetings and document revision, to name a couple. Groupware applications traditionally come packaged with scheduling programs that automatically de-conflicts overlapping meetings in real-time and can also access databases where information the group needs can be easily retrieved.

Telecommunication tools such as *automatic call distributors* (ACDs) route incoming calls from both internal and external customers to those best able to answer questions. Another generic tool, *workflow software*, enables teams to edit, route, store and retrieve documents. Workflow software can create digital versions of common organization paper forms whereby documents can be revised by computer. Team enabling technology tools should not be arbitrarily applied. Only when processes have been optimized or redesigned should technology be applied, however. This includes internal group processes that establish how information is utilized.

The trend in modern team development and deployment is to empower teams with broad decision making powers inside less-hierarchical, initiative-fostering organizations. If teams are to succeed, the culture must come to value more participation and a flatter structure that complements the self-empowered team model. In general, a process innovation culture produces an environment that rewards initiative and encourages employees to provide input, without the fear of management reprisal. Through proper guidance, culture can be redefined to reflect the more nimble approach of the team-based empowered process workers. As Davenport explains:

Although process innovation is not normally a bottom-up activity, a culture that is receptive to innovation at all levels is likely to both identify and implement process innovation at relatively high frequencies. Furthermore, even after broad process designs have been implemented, an innovative culture can inspire minor improvement that benefit day-to-day process performance. [Ref. 1, p. 105]

Even before a formal process innovation effort is undertaken, cultural changes can be set in motion that prepare the organization for future changes that accompany process innovation. People generally want to work in a place where their opinions can be heard and valued. However, an organizational structure and culture that value empowerment may not always be appropriate. Organizations that experience high employee turnover and/or involve repetitive basic tasks may wish to maintain tight control of their processes. [Ref. 1, p. 105] Fast food restaurant chains undoubtedly have control cultures that are viewed as necessary to ensure quality in a business with high employee turnover.

Often, an organization's structure and culture do not adequately support executive initiatives that encourage participation and empowerment. This "reality gap"

can be a source of significant irritation among employees and managers alike who recognize the incongruity. Cynicism can quickly develop among employees which can take significant resources (time, effort) to rectify. Executives must closely examine how their vision of culture reflects reality. Cultural change issues are more closely examined in Chapter VI.

b. Human Resource Enablers

Organizational and human resource enablers are closely linked change levers for process innovation. Here we focus on how human resource enablers directly impact the way workers are “trained, motivated, paid and evaluated.” [Ref. 1, p. 107]

New processes involve education and training in required skills. Education implies a broad-based approach to learning that helps develop a more thorough understanding of theories and cause and effect relationships. Training has an inherently more narrow focus -- usually concentrating on a particular type of technical or physical skill development. If workers are expected to take on more responsibility or work in teams, they will require education and training in both increasing the breadth of their knowledge as well as the depth of specific skills.

A worker expected to be a generalist and participate on an autonomous team, for example, must learn about the jobs of the other team members (cross training) and, if new technologies are to be employed in the process, must acquire skills in applying and using those technologies. [Ref. 1, p. 107]

New skills will be required across a wide range of topics. Chief among those topics is specific business process training. Workers must possess the appropriate skills to be effective process workers. Organizations must identify the particular skills that are required and the most effective ways to educate employees. However, organizational education requires significant planning to be of benefit. Not only does education take more time than anticipated, but usually there are very few employees who have the requisite knowledge to train others or perform process oriented work. Davenport believes that “if the process is truly innovative, no one will be qualified to train anyone else.” [Ref. 1, p. 107] Executives and process workers alike will undergo various forms of process education and training, utilizing different subject matter more appropriate for their roles in the process. This can serve as a powerful signal that all are

“sacrificing” with the goal of producing a better organization and, inevitably, a better place to work.

Forward thinking companies considering organizational change will begin educating executives, managers and workers on fundamental change related issues before the change initiative begins. Educating and training in advance of change can help counter organizational resistance and develop a more informed and better trained worker, thereby increasing the chance of a successful implementation.

Motivation, and the relationship to performance, is a well known cause and effect relationship. However, identifying what motivates people is a perennial challenge for managers and executives. Work design experts Richard Hackman and Greg Oldham offer five key aspects of job or process motivation: [Ref. 13]

- Skill Variety (the variety of skills necessary to complete the job)
- Task Identity (the degree to which a job involves completion of an entire activity)
- Task Significance (the perceived importance and impact of the job)
- Autonomy (the freedom and discretion with which the job is performed)
- Feedback (the extent to which information about the performance of the job is provided to the worker)

These factors are commonly accepted drivers of job motivation and should be built into new job descriptions of the information age worker.

Behavior is strongly influenced by how people are compensated. The modern approach for compensation, known as “gainsharing”, describes that worker compensation based on quantifiable performance has shown to increase productivity. [Ref. 1, p. 111] Process work is well suited to measuring performance and lends itself extremely well to the gainsharing model. Workers, managers and executives would be compensated for different levels of performance based on their roles and responsibilities. In a team concept, for example, workers could be rewarded for team productivity while individual compensation might be tied how well they share knowledge with other group members.

Process oriented career paths are likely to be structured in a non-traditional manner. According to Davenport, "career movement is likely to be more lateral than upward; titles may no longer reflect the importance of the role." [Ref. 1, p. 111] This viewpoint represents a dramatic departure from normal organizational career paths. Companies that can take advantage of this new structure "will have a long-term advantage in process innovation over those that do not." [Ref. 1, p. 111]

Versatility in work roles and responsibility is of great importance to organizations that wish to increase their overall understanding of process activities. This could be done in a variety of ways, namely establishing work rotation schedules among process workers. Scheduling allows workers to begin learning about their next role well in advance of the actual rotation. Work rotation is a key aspect of job motivation known to produce a more enthusiastic and knowledgeable process worker.

Although a totally foreign concept to U.S. companies, lifetime employment is widely practiced in Japan and has produced positive results. The thought behind lifetime employment is that it allows workers to worry less about short term performance and more about making a long term difference. Workers in the model might also feel more valued and be less susceptible to "please the boss" actions not necessarily aligned to overall process objectives. Perhaps U.S. companies can develop another form of employment status that reduces the loss-of-job anxiety and replaces it with more permanent feelings of belonging.

Training, compensation and other policies are important enablers of human resources. However, they should be considered in a broader context as supporting policies that accelerate depth and breadth of change. According to Davenport, "only the most dramatic change in human resource policies could itself be viewed as a lever for new process design." [Ref. 1, p. 112] If change is to be successful, both the human (social) and technical dimensions must be given equal appreciation and equal consideration. Management of human and organization change is addressed in Chapter VI.

D. THE PROCESS INNOVATION METHODOLOGY

The process innovation methodology is divided into 5 step process known as "The High-Level Approach to Process Innovation." [Ref. 1, p. 25] In the following paragraphs, this intuitive and highly effective, step-by-step approach to process

innovation is outlined and discussed. Herein referred to as the “methodology”, Davenport’s high level approach translates the principles of the theory into a logical order for action. Figure 3.6 shows the 5 steps of the methodology.

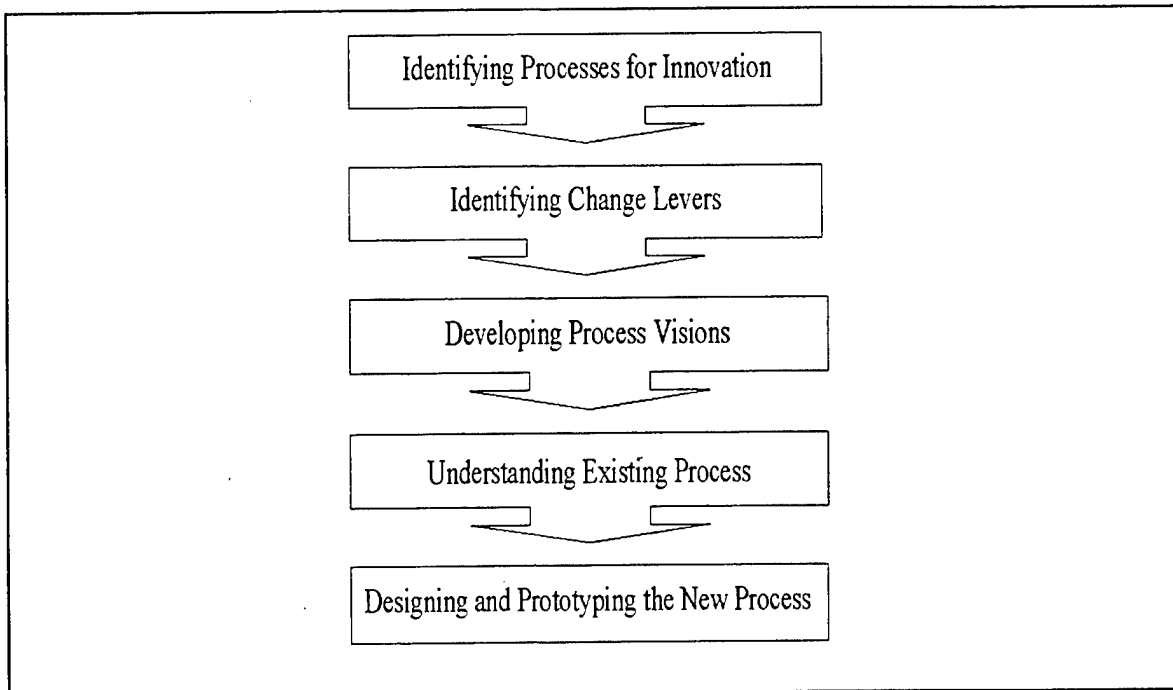


Figure 3.6 - A High Level Approach to Process Innovation [Ref. 1, p. 25]

1. Identifying Processes for Innovation

The process innovation journey begins with a “survey of the process landscape to identify the processes that are candidates for innovation.” [Ref. 1, p. 27] Determining the processes that will be candidates for innovation is essential to a successful initiative. By establishing boundaries, planners are able to concentrate the organization’s resources on the processes that meet the appropriate criteria for selection. Davenport describes five key activities in identifying processes for innovation:

- Enumerate major processes
- Determine process boundaries
- Assess strategic relevance of each process
- Render high-level judgments of the “health” of each process

- Qualify the culture and politics of each process.

The objective of surveying the process landscape is to complete a broad, high-level examination of the key business processes of the organization. To achieve order-of-magnitude performance improvements, the processes must be viewed from a high-level process perspective. A perspective that is too narrow will fail to capture enterprise-wide processes -- the processes with the greatest potential impact the organization as a whole. According to Davenport, "when the objective is radical process change, a process must be defined as broadly as possible." [Ref. 1, p. 28]

Key processes identified by IBM, Xerox and British Telecom have enumerated between 10 to 20 key processes. [Ref. 1, p.28] Accordingly, Davenport's rule of thumb sets the appropriate number of high level processes at between 10 to 20.

Within this range -- which leaves us with some cross-process activity, but renders each process small enough to be understood -- change management is then only very difficult, rather than impossible. Constricting the range also permits us to identify both operational and management processes and to find different approaches to redesigning each type. This does not mean that all of the identified processes will be of the same importance, or even that innovation will be identified for all of them. [Ref. 1, p. 29]

International quality advisor H. J. Harrington describes a promising method to assist process innovators in identifying key high level processes. [Ref. 15] In this method, top executives describe the processes for which they are responsible and refine their lists to arrive at a high-level description of the company's top-level processes. Defining process boundaries is another important activity that will help flush-out high-level processes. Davenport encourages managers to ask the following questions to determine boundaries: [Ref. 1, p. 31]

- When should the process owner's concern with the process begin and end?
- When should the process customers' involvement begin and end?
- Where do sub-processes begin and end?
- Is the process fully embedded within another process?

- Are performance benefits likely to result from combining the process with other processes or sub-processes?

Answers to these questions can provide a clarity in process enumeration activities.

Once the top-level processes are identified, assessing the strategic relevance of each process will narrow the choices for innovation. Davenport has developed four criteria that guide process selection: (1) the processes' centrality to the execution of the firm's business strategy, (2) process health (i.e., how well is it performing), (3) process qualification (i.e., cultural and political climate of the process), and (4) manageable project scope. [Ref. 1, p. 32] All four criteria combined might point to particular process innovation targets. However, innovators will likely select two or three key criteria as the basis for selection.

Clearly, process innovation requires a significant amount of a company's resources to effectively perform. Organizations must understand the level of significant change that accompanies process innovation and the several years that it could endure. The number of processes selected must be balanced with the organization's resources before deciding how many, and which ones, will be transformed through innovation. That number might be just one or it may encompass an organization's entire process map.

2. Identify Change Levers

Change levers are synonymous with the enablers of process innovation. As noted above, Davenport identifies three classes of change enablers: human and organization, technology, and information. Other researchers have since added to this list. For example, Nissen [Ref. 28] also discusses workflow rearrangement (e.g., conducting sequential activities in parallel, eliminating non-value-added activities, introducing a process triage step), technologies beyond information technology (e.g., manufacturing, transportation, construction), inter-organizational alliances (e.g., supply-chain networks, vertical enterprises, platform organizations) and cultural change (e.g., employee stock options, participative management, support for risk-taking). Here, we focus on the Davenport set which identifies four key activities in identifying change enablers: [Ref. 1, p. 48]

- Identify potential technological and human opportunities for process change

- Identify potentially constraining technological and human factors
- Research opportunities in terms of application to specific processes
- Determine which constraints will be accepted

Also, we noted above that thinking inductively can assist with identifying innovative applications of existing IT enablers (i.e., change levers). Current research has employed artificial intelligence methods to match enabling technologies to process pathologies. [Ref. 27] This offers potential to assist process innovators with their inductive thinking.

Innovators should identify how the enablers could be applied to specific processes. How can technology, for example, work in concert to bring about change in process innovation? Asking questions will lend itself well to beginning the creative thinking cycle required to identify potential opportunities.

Constraining enablers must also be considered in the initial stages of process innovation to identify the feasibility of utilizing various alternative technologies or other change levers based upon organizational limitations. Critical among such constraints for information age organizations are the ubiquitous legacy information systems. Such legacy systems often represent a huge investment in a rapidly-aging technology and severely limit our ability to implement enterprise-wide IT enablers. We noted one example of this in our pilot study discussed above, for example, as the CA-ARNG IT infrastructure and technology decision limited the potential of its desired Intranet "solution."

3. Developing Process Visions

Once the opportunities and constraints have been identified, they must be applied to the processes under consideration. In other words, how might the opportunities and constraints be employed in the process? [Ref. 1, p. 48] The research at this stage in the methodology is high level and rough. However, it serves to set-up a better understanding of the processes, their potential enablers, and the impact of the enablers on the processes themselves.

Business processes describe how work is done. The goal of work in general is to accomplish some type of objective. Successful organizations derive these objectives

based on strategy. Therefore, creating a link between how work is done (process) and the long term strategy is perhaps the most critical factor in the success of any organization. This represents the alignment factor discussed above. Strategy and process must reinforce one another if process innovation is to be effective. Developing a process vision refers to creating an idealized image (vision) of the state of future processes based on the organization's strategy. There are five key activities in developing process visions: [Ref. 1, p. 120]

- Assess existing business strategy for process directions
- Consult with process customers for performance objectives
- Benchmark for process performance targets and examples
- Formulate process performance objectives
- Develop specific process attributes

Process innovation is “concerned with the implementation of a strategy as a means to guide and inspire process innovation.” [Ref. 1, p. 121] In essence, vision, in the process innovation context, involves a detailed description of how the process will work and how it will be measured. Process innovation assumes that an organization has already formulated a clear strategy. A clearly articulated strategy will allow innovators to examine it and derive high-level direction needed to guide its key processes.

The customer's perspective is critical in developing process vision. Since the customers ultimately judge the quality of the “product”, their input is essential. Processes have both internal and external customers. Most companies concern themselves more with external customers, often missing key insight. It is recommended that both sets of customers provide input in developing process visions.

Customer input provides many advantages. It provides process innovators with insight into different ideas and performance objectives based on what the customer wants from the process output. By inviting customer participation, innovators send a clear message that the process is designed with them in mind; this serves to build internal and external commitment to the innovation program. Process innovators should seek customer input that is “broad -- encompassing desired process outputs, performance,

flow, enablers, and other relevant factors.” [Ref. 1, p. 124] Utilizing interview teams is an effective way to structure the inquiry processes of gathering customer information.

Process benchmarking refers to a methodology used to collect “best practices” of other organizations. Generally, the “best in class” organizations or key competitors are selected for benchmarking. Information derived from “best practices” could be in the form of performance objectives, measures of effectiveness, technological enablers, workflow arrangements, and other important process attributes which could be incorporated in new process designs. Results from benchmarking have been used by organizations seeking to “not reinvent the wheel” thereby utilizing “best practices” of other organizations as means to see how other successful organizations are doing business. Benchmarking is discussed in greater detail in Chapter IV.

The relationship between strategy and process cannot be overstated. Davenport states that, “process visions link strategy and action; they translate high-level strategies into measurable targets for process performance and understandable characteristics of process operations.” [Ref. 1, p. 127] Figure 3.7 illustrates the relationship between strategy, process vision, and the objectives and attributes that characterize the redesigned process.

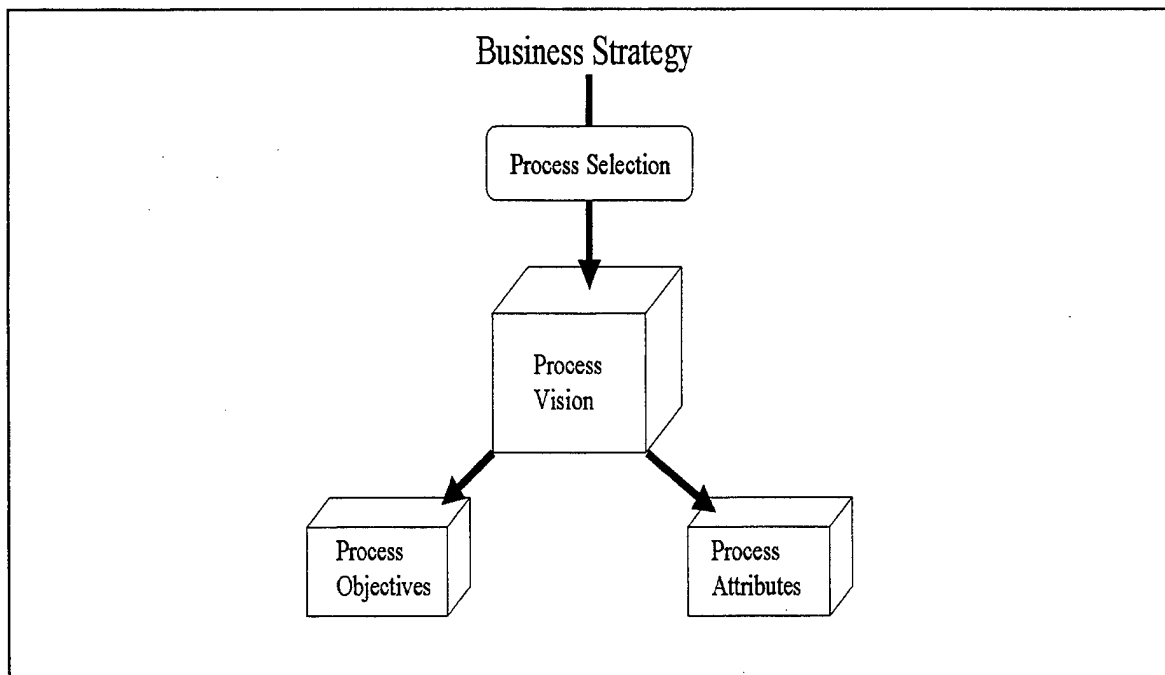


Figure 3.7 - Strategies, Visions, Objectives, and Attributes [Ref. 1, p. 127]

Objectives include the overall process goals, specific types of desired improvements, numeric targets for innovation and time frames for objective accomplishment. [Ref. 1, p. 127] These objectives are created when innovators ask, “What business objective is this process supposed to accomplish?” [Ref. 1, p. 127] Analysis in this phase should be broad in nature and encompass the aspects deemed most important by customers and executives. Objectives defined by the innovation team should be stretch targets. As innovation strives to produce order-of-magnitude results, attaining those results requires objectives that challenge the organization. Stretch objectives must also be realistic and quantifiable, however. Examples of process objectives might include the following:

- Reduce cycle time plastic manufacturing process by 50% in 3 years
- Reduce processing cost of internal administrative requests by 75% in 1.5 years.

Attributes, on the other hand, are the “descriptive, non-quantitative adjunct to process objectives and constitute a vision of process operation in a future state.” [Ref. 1, p. 129] They might also be thought of as basic principles or characteristics of process operations, succinctly describing the future process in action. Examples of process attributes might include:

- Link customer orders to an order tracking system available to customer via the Internet
- Develop empowered process teams that oversee key administrative functions

As discussed, process attributes and objectives are derived from multiple sources such as corporate strategy, high-level overviews of the roles of technology and people, customer interviews and benchmarking. [Ref. 1, p. 131] These activities are performed and collected during multiple visioning sessions. Figure 3.8 depicts a logical framework for conducting visioning sessions.

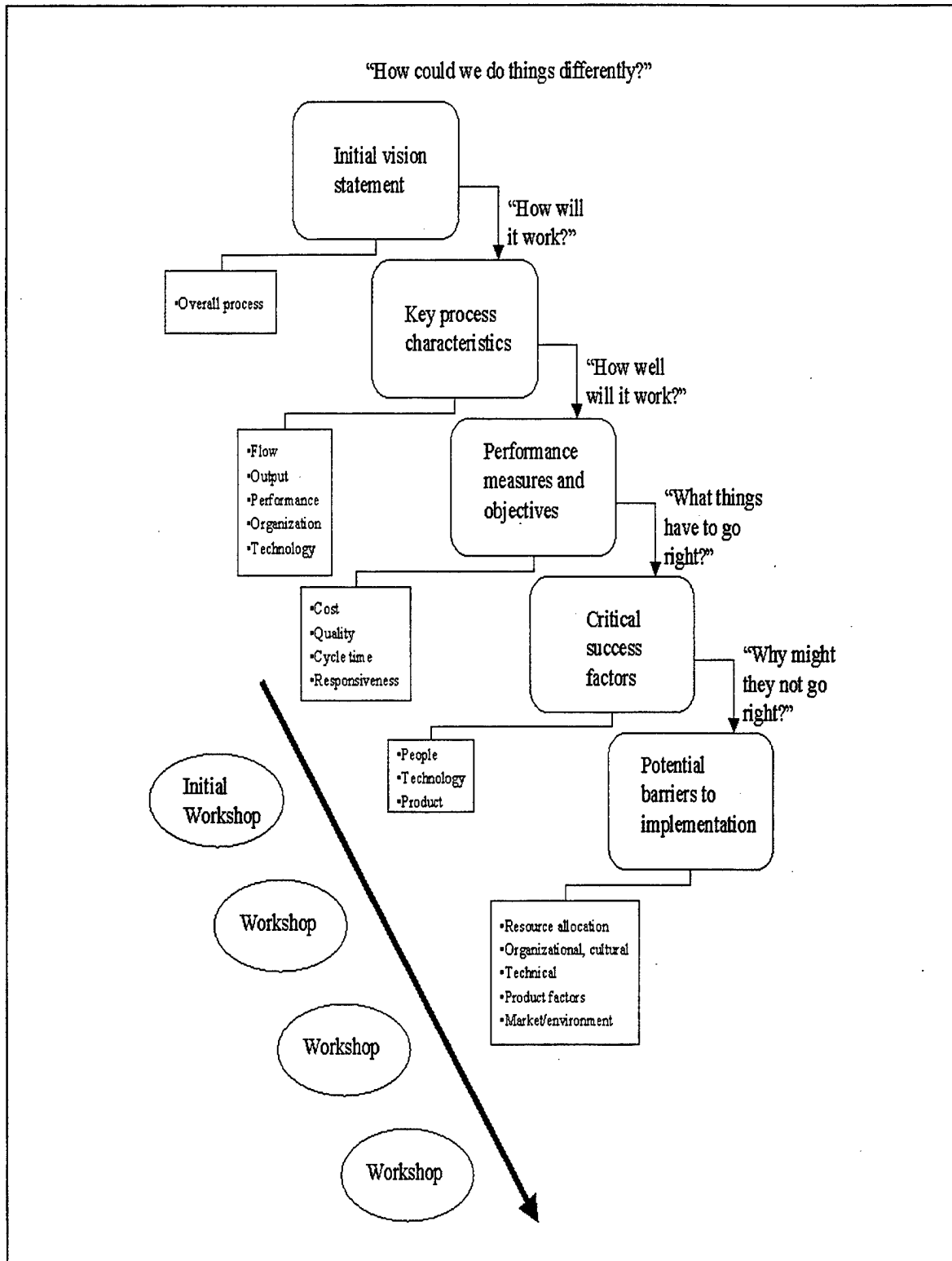


Figure 3.8 - The Visioning Process [Ref. 1, p. 132]

Vision sessions progressively develop more refined answers to the questions posed in the Figure 3.8. The sessions are also critical to building a common understanding of the issues from a multidimensional perspective. Wide participation of key stakeholders (executives, customers) should be viewed as essential. Defining the high-level vision, objectives, and attributes is the first step in the actual vision process (Figure 3.7). This will provide enough substance to allow the workshops to address the questions posed in Figure 3.8.

4. Understanding Existing Processes

The fourth phase of the process innovation methodology is to understand existing processes. There are six key activities in this phase: [Ref. 1, p. 139]

- Describe the current process flow
- Measure the process in terms of the new process objectives
- Assess the process in terms of the new process attributes
- Identify problems with or shortcomings of the process
- Identify short-term improvements in the process
- Assess current information technology and organization

Although this phase conflicts with the notion of the “clean sheet of paper” reengineering approach advocated by some (e.g., Hammer and Champy [Ref. 3]), developing an understanding of current, or baseline, processes is necessary for the following reasons: [Ref. 1, p. 139]

- Understanding existing processes facilitates communication among participants in the innovation initiative.
- There is no way to migrate to a new process without understanding the old
- Recognizing problems in an existing process can help ensure that they are not repeated in the new process.

- Understanding the current process provides a measure of the value of the proposed innovation.

Understanding baseline processes is an important phase within a broader process innovation context. Baseline process mapping is an exercise that produces a high-level snapshot of how processes in the organization currently operate. Davenport recognizes the value of describing and measuring existing processes as means to gauge the degree of innovation new process designs achieve based upon a baseline analysis. A measurement technique is described in Chapter V.

During this phase, process problems and accomplishments are identified. The purpose of this exercise is to target areas for elimination, transformation or emulation. When comparing the faults/accomplishments to new process attributes (determined through the previous step), ideas are generated that help guide innovators in more specific directions. Technology and the human/organizational factors should also be examined in this phase to determine how such change levers can impact the current process. This will ensure that the future process is designed with the full knowledge of how the baseline is shaped by these factors. Fashioning the baseline is critical in deciding what new process designs are innovative as opposed to improved.

Identifying short term improvements will allow innovators to establish milestones along the journey to the new process end-state. Although process innovation is a long-term endeavor, it will often be politically critical to demonstrate tangible improvements in order to maintain commitment to the initiative. Short term improvements will greatly assist in demonstrating that the process innovation initiative is “working” and can serve as a morale booster during a time of significant change. This implies a practical sequence to effecting multiple redesign transformations and projects.

5. Designing and Prototyping the New Process

The five key activities in designing and prototyping a new process are: [Ref. 1, p. 154]

- Brainstorm design alternatives
- Assess feasibility, risk, and benefit of design alternatives and select the preferred process design
- Prototype the new process design

- Develop a migration strategy
- Implement new organizational structures and systems

The design activity is largely based on the spirit of innovation and “out of the box” thinking. The group culture must be one that is accepting of any and all ideas as a means to brainstorm the best design. Any group facilitation technique that encourages members to voice their ideas and allow the ideas to grow is acceptable. Brainstorming, in general, is highly iterative. The goal of brainstorming sessions is to develop a creative, but realistic, description of the new process utilizing input from the new process vision, change enablers, and baseline knowledge gathered earlier in the innovation methodology. [Ref. 1, p. 155]

Graphically depicting the design alternative by drawing process flows will greatly aid in the communication of the ideas. High level process flows should be described first. As the process takes shape, sub-processes should be identified and described. Finally, the low-level activities of the process should be articulated. Figure 3.9 illustrates the levels of process design.

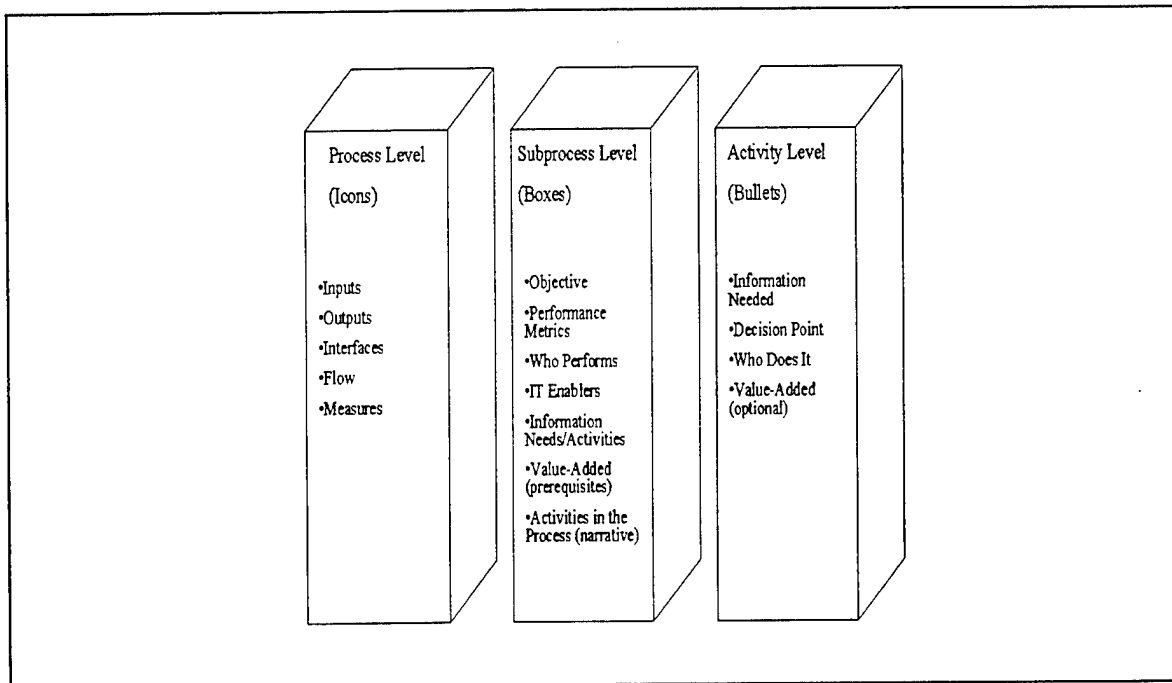


Figure 3.9 - Levels of Process Design [Ref. 1, p. 155]

Brainstorming sessions will produce process designs that must be assessed for feasibility. Factors such as cost, time, and benefits must be compared to the ability of the organization to undertake the redesign. To make these determinations, members must be versed in the high-level vision for the process, including performance objectives and attributes, yet have an awareness of organizational, technological and process constraints. [Ref. 1, p. 156]

Prototyping the new process refers the need to test the new designs in a benign manner to determine whether the redesigned process is viable. One way is to test and simulate the operation of the new process. Davenport envisions this phase as a small scale laboratory-like experiment,

Prototyping can itself be viewed as a series of phases that yield increasing degrees of tangibility. Computer simulation is a kind of limited process prototyping, beyond which it may be reasonable to create a paper-based information test of the process. In subsequent phases, the prototype might be taken to a stand-alone process test, using personal computers for information support, and interfaces to other processes where existing information systems might then be added to it. The ultimate prototype would include all enabling technologies, skills, and organizational structures. Each phase helps refine the process design and the information required to support it; taken together, these phases help reduce implementation risk. [Ref. 1, p. 157]

The findings reported in prototyping activities would be used to modify elements of the process to hone its potential for success. Although there can be no guarantees that the process will perform as tested, it will serve as important step in gaining the support of all effected by the process implementation and prototyping can provide initial insight into bottlenecks, constraints and problems that are not visible during brainstorming sessions and earlier stages. Changing a new process while still in the prototype phase is an order-of-magnitude less expensive than after organization-wide implementation.

A migration strategy will need to be formulated to implement the new process. As with prototyping, it is recommended that a limited pilot implementation be undertaken before full process roll-out. This will serve to limit the impact of the process until all the potential "hidden aspects" are flushed out and addressed. Issues such as time, funding and other constraints must be thoroughly researched prior to developing a migration plan.

A phased implementation based on realistic assessment of the risk factors, including the organization's ability to absorb the new process, remains a critical success factor.

The implementation of new organizational structure is the final step in this phase. According to Davenport, "although the problem of rigid functional organizations is widely recognized, the proposed solution – to abandon any form of structure beyond the self-managing team – is frequently worse than the problem... [Ref. 1, p. 158] It is not recommended that a process structure be the only structure of the organization. In fact, hierarchies define reporting relationships and provide order in large organizations. Davenport believes that, [Ref. 1, p. 160]

An organization that wishes to benefit from a process perspective must be prepared to tolerate the well-known problems with matrix structures, including diffusion of responsibility, unclear reporting relationships, and excessive time spent in coordination activities and meetings.

A combined orientation toward a process structure together with the traditional functional perspective can help prevent key activities from falling in-between the cracks. The new organization structure must take into account, and indeed integrate, the often overlapping responsibilities between processes owner and workers, and between functional department owners and workers.

E. SUMMARY

Process innovation is a methodology that permits industrial age organizations to successfully complete the monumental leap into the information age. New information age assumption (e.g., cross functions, links to customers and suppliers, market-of-one, global market, innovation, knowledge workers) are based on the new realities of old business drivers (change, competition and customer). Function-based organizations are now faced with a new set of challenges that only 10 years ago were beyond our comprehension. Today, survival is a function of understanding information age realities and developing an organization that can flourish in the era of permanent and accelerated change.

Successful information age organizations recognize the need to systematically examine their business practices and address the realities of how (and how well) they actually perform work. As a result, many businesses are undertaking process innovation initiatives in top-down effort to transform their existing work structures into high

performance processes. Process innovation is designed to achieve order-of-magnitude performance improvements through identifying key business processes and applying the process innovation methodology. In contrast, quality management and continuous process improvement programs are focused on narrow processes and set moderate performance improvement objectives. Their "bottom-up" nature inherently constrains the ability of the organization to focus on high-level processes which ultimately can produce the most significant performance improvement.

Information age organizations are inherently process focused. Functional business unit and departmental structures used to manage the organization are losing relevance, supplanted by a structure that reflects the true nature of cross-functional work. Output is focused on meeting individual customer needs. Processes have ownership whereby work can be measured and optimized based on feedback from internal and external customers. In essence, the hierarchical structure of industrial age organizations is giving way to cross-functional process orientation where process owners are responsible for the entirety of work performance, including the product.

The application of powerful change levers is being applied to both enable and implement process innovation. Information technology is a change lever that allows organizations to realize order-of-magnitude performance improvement. According to Davenport,

The relationship between IT and process-based structures is reciprocal; processes require information technology to achieve radical change, and to harness the capabilities of information technology in a cross-functional, performance-driven manner requires a process view. [Ref. 1, p. 301]

Information technology presents both opportunities and constraints. Opportunities take a variety of forms including automational (eliminating human labor from a process), sequential (changing the sequence of a process or performing the task in parallel), geographical (enabling a process to operate effectively over great distances), and disintermediational (eliminating process intermediaries). [Ref. 1, p. 302] The primary constraints to IT are those imposed by the existing technical infrastructure, namely the existence of legacy systems. These constraints are commonplace and a careful examination must be undertaken to assess the feasibility of implementing IT enablers within the existing infrastructure.

The application of various human resource and organizational structure enablers also allows organizations to achieve radical change. Worker and team empowerment provides process workers the means to meet organizational objectives by providing them with autonomy and the necessary resources to execute cross-functional work. Progressive companies are examining their culture and organization to determine how to support process innovation initiatives.

Assessing information requirements and developing a management structure to deliver that information to the people who need it represents another innovative change lever. Many companies are undertaking initiatives to identify, acquire, synthesize, and present information in a manner easily rendered useful by process workers (information consumers). New skills and positions are being created such as information specialists (people who acquire and synthesize structured and unstructured information) and executive information “czars” (executives responsible for information acquisition, synthesis, and quality) who focus on bringing order to this critically important yet misunderstood element of process success.

Processes are only meaningful if they are aligned with organizational strategy. Process innovation focuses on distilling organizational strategy into specific process objectives. The alignment of work activities (process) to process objectives that are directly linked to the organizational strategy forms a powerful check and balance that ensures work is structured in a meaningful manner. The output of an aligned process is designed to close the gap between today and the organizations vision of the future.

An organized approach to process innovation is required to achieve desired results. Our discussion above has outlined a high-level approach to process innovation:

- Identifying Processes for Innovation- Enumerating top-level processes and assessing them for their ability to be innovated. [Ref. 1, p. 25]
- Identifying Change Levers- Examining the technical, informational, human, and organizational enablers of process innovation and their applicability to processes under consideration for innovation.
- Developing Process Visions- Developing process objectives and attributes of the to-be process.
- Understanding Existing Processes- Analyzing the existing (baseline) processes and diagnosis their pathologies and faults.

- Designing and Prototyping the New Process- Based on the current process and the new process vision, design the new process and test it.

Although a variation of these principle can be applied to achieve desired results, a successful process innovation initiative will include the aforementioned activities in some form. An organization must be committed at all levels to undertake a process innovation initiative. Chief among the key ingredients for success is education on process innovation and cooperation among all key stakeholders. The long-term nature of process innovation demands a strong understanding of the concepts, a shared vision of the desired future state, a viable strategy and a culture that identifies with the need to change and a willingness make it happen.

The California Army National Guard is an organization that shares many of the same issues confronting nearly all governmental organizations and large corporations. Fundamentally, it is an industrial age organization facing the demanding issues of rapid change, rising customer expectations, and competition to justify its existence and acquire funding to support its initiatives. It has an executive-level awareness of these issues and has undertaken quality programs and strategic planning initiatives in an effort to chart its course in the information age.

Beginning with the identification of processes for innovation and concluding the design of a new process, the Davenport Process Innovation methodology will be applied to a specific Guard process as a means to demonstrate the methodology itself and to generate process redesign alternatives of a specific process. The approach and finding are discussed in detail in Chapter V. We first outline the key aspects of benchmarking in the next chapter. Benchmarking represents a powerful approach to performance improvement that is complementary to process innovation.

IV. BUSINESS PROCESS BENCHMARKING

Benchmarking is an effective, forward-looking process that can help an organization make decisions and prioritize the use of resources. Most companies have formal measures to gauge performance, and often the operating staff members have informal measures to monitor productivity. The benchmarking process integrates company improvement activities in a process that allows an enterprise to better organize and match the effort (people, time, and funds) to achieve key measures and strategic goals.

Woodrow Wilson once said “We should not only use all the brains we have, but all we can borrow.” Nothing could be closer to the truth concerning benchmarking. Benchmarking is a conscious effort to gain insight into the knowledge pool of another organization. It provides an outside point of reference that informs improvement efforts, and is usually gained from another’s experience [Ref. 16]. It gathers the tacit knowledge—the know-how, judgments, and enablers—that explicit knowledge often misses [Ref. 17].

A. BENCHMARKING OVERVIEW

The previous chapter discussed Process Innovation and a deductive approach to achieving results. This chapter explores business process benchmarking, a topic that is closely related to process innovation, which uses an inductive approach to process redesign. This chapter begins with an overview of Business Process Benchmarking, explains the relationship between benchmarks, performance measures, and benchmarking, and provides several definitions of benchmarking. The types of benchmarking, the processes of the benchmarking model, and the “Camp” approach that was initially developed and used at Xerox are also discussed. Additionally, a case study of the SEMP process performed by a world-class civilian enterprise is presented.

1. The History of Benchmarking

Although only popularly used in the past twelve years, the concept of benchmarking is not new. Corporations discovered that they could improve both qualitatively and quantitatively by establishing “internal” best practice benchmarks.

Soon, this extended to inter-company benchmarking. Today, benchmarking has become a sophisticated, readily available guide that crosses all industries and lines of business.

Benchmarking became "revolutionized" with the introduction of two major events. These events changed the way people perceived benchmarking and allowed them to open their minds and companies to this new subject. One of these significant events was the introduction of the Malcolm Baldrige National Quality Award. This award was signed into law by an Act of the same name by President Ronald Reagan on August 20, 1987 and later established an annual U.S. National Quality Award [Ref. 4, p. 5]. The other significant event was the benchmarking of the Xerox Corporation by Robert Camp, a logistics expert and engineer at Xerox. Camp spent approximately seven years benchmarking the processes at Xerox. Although this event had happened two years prior to the initiation of the Baldrige award, both peaked their interest in the opportunities derived from a benchmarking study [Ref. 4, p. 5].

Benchmarking complements Total Quality Management (TQM) and reengineering alike. Both the concepts of TQM and reengineering have excited many business and military leaders, as they are considered effective approaches to enhancing the quality of an organization's response to its customers' needs while strengthening the character of its internal culture. Benchmarking is seen as a major component of the "improvement initiatives," [Ref. 20] as it enables an organization to identify its strengths and weaknesses in comparison to other organizations, particularly those deemed "best in class." When combined with benchmarking, TQM and reengineering can provide a methodology for organizational excellence both internally (staff and operational efficiencies) and externally (by providing goods and services that anticipate a customer's expectations).

2. Benchmarking Definition, Purpose, and Best Practices

a. Definitions

Benchmarking has come to signify numerous definitions. Among the more widely accepted are:

"The continuous process of measuring products, services and practices against the toughest competitors or those companies recognized as industry leaders"

David T. Kearns, CEO Xerox

“A systematic process to search for and introduce best practice into an organization”

Sylvie Trosa

“The search for and implementation of best practices”

Robert Camp

Notice that these definitions contain the words continuous, systematic, and search, respectively. These words imply that benchmarking is going to be a long term process, and not something that can be completed immediately. Spendolini has provided us with a more vibrant and energizing definition than those mentioned above—“a continuous, systematic, process for evaluating the products, services, and work processes of organizations that are recognized as representing best practices for the purpose of organizational improvement” [Ref. 4, p. 9]. He maintains that there is not an exact definition and organizations should tailor their own definition using a benchmarking menu (See Figure 4.1). The only requirement to using the benchmarking menu is that at least one word from each box must be present in the definition. Flow is from top left to bottom right.

Box 1 suggests that benchmarking is something that takes place over an extended period of time [Ref. 4, p. 11], as opposed to a short-term or singular activity. In order for benchmarking information to be meaningful, it must often be considered in a context that acknowledges organizational activity over time. To benchmark the present state of an organization on a one-time basis denies the basic assumption that organizations will change over time.

Box 2 suggests that there is indeed a method to benchmarking [Ref. 4, p. 12]. This is usually demonstrated in most companies by the existence of a flowchart that recommends a certain set of actions in a particular order. These models represent a consistent and expected sequence that can be repeated by any member of the organization.

Box 3 clearly defines the idea that benchmarking is itself a process [Ref. 4, p. 13]. Virtually every definition of benchmarking involves a series of actions that define issues, problems or opportunities, measure performance, draws conclusions, and finally

stimulates an organization's change and improvement. Regardless of which method is invoked, a fundamental precept is that the focus is on the process of benchmarking.

Box 4 suggests that benchmarking is an investigative process [Ref. 4, p. 13], denoting an active versus a passive approach. Benchmarking does not provide answers. Instead, it provides us with information to make informed decisions and helps us to better learn about other organizations and ourselves.

Box 5 suggests that benchmarking is not limited to any one particular facet of an organization [Ref. 4, p. 13]. Several definitions focus on benchmarking as providing the ability to understand work processes as well as the finished products or services these processes produce. The idea of considering business practices or processes that focus on how work is performed, rather than on what is produced, represents a difficult transition for many.

Box 6 suggests that the focus of benchmarking is not limited to competitive products, services, or practices [Ref. 4, pp. 13-14]. In using the generic definition of benchmarking, one can see how this concept can be applied to any organization that produces similar output or engages in similar business practices.

Box 7 suggests benchmarking involves an initial investigation to discover the names of companies that are known to excel in the area of interest [Ref. 4, p. 14]. This is usually facilitated through contact with other benchmarking professionals, industry analysts, or consultants. Printed materials such as periodicals, newspapers, and magazines can also provide guidance and information. The key is to expand the list of potential benchmark partners from those known solely through personal experience.

Box 8 suggests that organizations chosen for investigation and analysis should represent as close to the state of the art as possible in the area being benchmarked [Ref. 4, p. 14]. Why benchmark another company or organization with mediocre performance?

Box 9 suggests that the purpose of benchmarking usually includes some reference to comparisons and change [Ref. 4, p. 15]. Once a benchmarking activity is concluded, there may be a call to action with the purpose of turning benchmarking recommendations into action. The goal is to develop a direction in which to proceed.

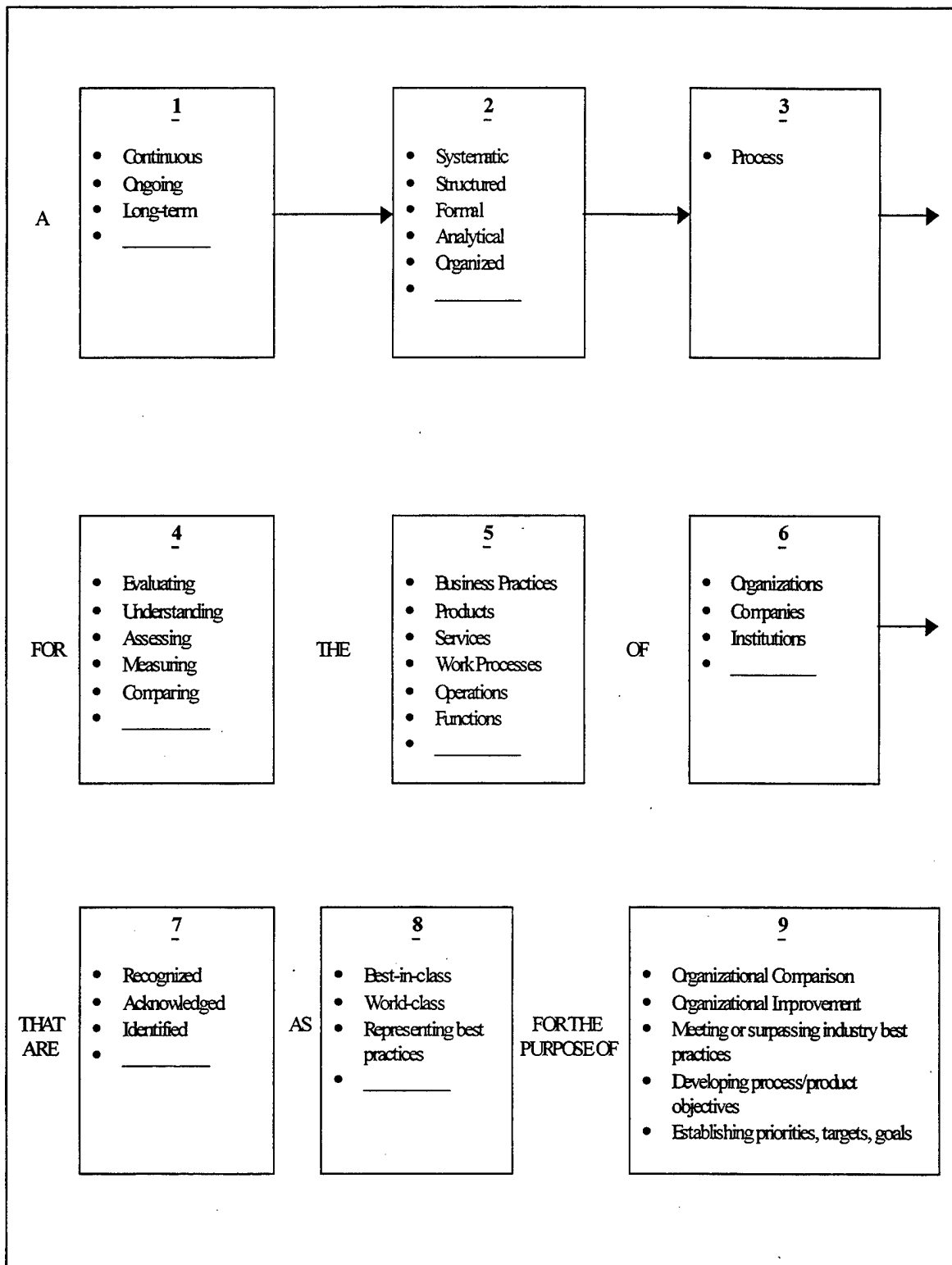


Figure 4.1 - Spendolini's Benchmarking Menu [Ref. 4, p.10]

b. Purpose

Simply put, the purpose of benchmarking is to break the paradigm preventing people from being able to learn from one another [Ref. 21, p. 14]. Its primary objective is to understand those practices that will provide competitive advantages to business. Benchmarking is an integral part of the planning and ongoing review process designed to ensure a focus on the external environment and to strengthen the use of factual information in developing plans.

In the private sector, the primary rationale for benchmarking is the requirement to maintain or regain a competitive market position. While many public departments and agencies do not actively compete in economic markets, other reasons to consider benchmarking as a management improvement technique [Ref. 22] include aids in strategic planning and forecasting, stimulation and performance improvements, and improving information and goal setting.

First, benchmarking can help aid companies in the design and implementation of their strategic plan. Thorough knowledge of the marketplace including trends, competitor information, the customer base, and financial requirements are all key in the quest to develop a sound and robust strategic plan [Ref. 4, p. 26]. Benchmarking is a useful tool for gathering such information during the inception of a strategic plan. The practice of benchmarking can help make management aware of the potential pitfalls associated with pursuing various courses of action and can literally help shape the strategic planning process. Recall the importance of strategy from our discussion of process innovation above.

With regards to forecasting, benchmarking takes the same information gathered above and helps managers extrapolate it to determine possible future outcomes. By observing the business direction and trends of some of the larger corporations, such as IBM and McDonald's, managers can project how these same trends have a direct impact on their company [Ref. 4, p. 26].

Second, benchmarking is about comparison, which can be a driving force that ignites organizational or individual performance [Ref. 22]. Benchmarking activities or functions can help senior managers and staffs ascertain how their organization and its programs are performing in relation to other leading corporations. The technique can bring to the foreground new and creative ideas, which can be used to improve performance. Comparisons, whether they are between different parts of an organization

or with practices in different business units or regions, may generate a rich source of innovative ideas. While assessing variations in performance between different parts of the same organization may lead to incremental changes in efficiency or effectiveness, some suggest that the greatest performance gains from benchmarking are likely to be realized from external comparisons [Ref. 22]. Benchmarking performance information often adds an important comparative perspective to organizational outputs. Specifically, some data may only be valuable when compared over time or with other organizations.

Benchmarking also helps to elicit new ideas. One of the formal precepts of benchmarking is that of establishing external contacts [Ref. 4, p. 26]. Many of these meetings take place within the host organizations. The very nature of this encounter predisposes managers to look and see how this other enterprise is performing a similar process. It causes them to raise questions and think about their own processes. This represents the inductive approach to process innovation noted above in learning to improve performance through examination of internal process activities. However, not all of the ideas and processes uncovered during benchmarking are instantly useful to an organization. Benchmarking causes people to think about new ways to do business and encourages employees to think "out of the box," to consider alternative paradigms and to engage in "what if" thinking [Ref. 4, p. 27]. This approach is oriented towards long-term payoffs.

Third, all levels of government need reliable ways of assessing the relative performance of public programs in order to be able to set overall priorities and strategies [Ref. 22]. Benchmarking can assist managers in improving the quality of their performance information. Such improvements can, in turn, help organizations better meet both external and internal accountability requirements.

c. Best Practices

Benchmarking is used as a means to identify best practices. Although many smaller companies cannot compete with the "best practice" companies on the basis of economies of scale, benchmarking allows these companies to make a significant contribution to their own company based on the best practice, independent of organizational resources [Ref. 4, p. 28].

Many people equate benchmarking with benchmarks. However, a clear distinction exists between the two. Benchmarks are performance measures dealing with

the questions such as how much? how quickly? how high? Or how low? Benchmarking is action—discovering the specific practices responsible for high performance, understanding how these practices work, and adapting and applying them to your organization [Ref. 17]. Benchmarks are facts; benchmarking is a process.

Richard Quinn may have known what he was talking about when in 1996 he stated, “You simply can’t manage anything you can’t measure.” However, today it takes both qualitative and quantitative measures to determine the performance of your company. Organizations are easily seduced by the “myth of objectivity,” [Ref. 18] deluding themselves into believing that only readily quantifiable information is legitimate for performance measurement. “If it can’t be counted, it doesn’t exist” is often the prevailing frame of mind. This mindset leads managers to measure only what is visible and tangible. For an organization to be capable of reflecting its collective contributions, a healthy blend of both qualitative and quantitative factors throughout the scope and scale of the enterprise must be achieved.

Danny Lyonais contends that performance measurement is the backbone of any organization [Ref. 19]. Using his analogy, it is easy to illustrate the importance of performance measurement and its role in benchmarking.

Performance measurement can be compared to the spinal column of organizations. As in the body, a performance measurement system carries information to and from the decision-actioning center or "brain" of the organization. Therefore, it is a critical component of any organization.

Carrying the analogy a bit farther, a properly functioning spine allows the brain to be in touch with all the sensory inputs that are at its disposal. The same with an organization.

However, judging from research and experience, most organizations do not yet have fully developed spines. While the "brain" - the decision-making center of the organization, functions and does its job, the changing environment is forcing it to look for better and more complete sensory input. Growing these extensions is an evolutionary process. And like any change experience, there are growing pains.

There is much pondering about what is best to measure, whether measures are adequate, are the right thing to do. Some go so far as to say that there are too many things that are non-measurable and that measuring is a waste of time. All these are part of this growth process. As with evolution, there is no right answer or magic bullet. The answers will evolve from organizations' ability to develop the performance measures that they know will relay reliable decision-making information. Also, as with evolution, those who fail to adapt will not survive long.

Some organizations are starting to see and feel that performance measurement is more than quarterly or annual number crunching. They are beginning to understand that performance standards are not about past performance but about tomorrow's survival; that measuring performance is actually organizational development with technical and human dimensions.

Their success in finding ways to develop "the spine" will be founded on a structured, inclusive approach anchored in an attitude of continuous learning . Performance measurement, not unlike physiotherapy in this analogy, may hurt, but the results are quick, positive and long lasting.

Working with people to extend their own and their organization's brain power is what it's all about: investment in human capital and in human collaborative processes. It's time to let the performance measurement skeletons out of the closet once and for all! [Ref. 19]

Best practices are defined as "superior performance within a function independent of industry, leadership, management, or operational methods or approaches that lead to exceptional performance" [Ref. 17]. It should be stipulated that there is no one "best practice." What is good for one company is not necessarily good for another. Every organization is different in some way. What is meant by "best" are those practices that have been shown to produce superior results; selected by a systematic process; and judged as exemplary, good, or successfully demonstrated [Ref. 17]. Best practices are adapted to fit into a particular organization.

Camp contends that searching for a source (of best practices) of similar processes in the same function, but outside the industry, is probably the most intense of all searches [Ref. 21, p. 83]. However, this is where the most innovative practices are likely to be found. A classic example of this is the comparison of Xerox's practices to

those of L. L. Bean, which is still an enduring representation of the potential for uncovering best practices [Ref. 21, p. 83].

Xerox initially sought companies providing like services and goods. They were looking at the functionality of the companies and not the process. When Xerox began to look at the process of fulfilling customer requests, it became clear that L. L. Bean was a prime candidate to benchmark. Bean's process for placing customer orders was three times faster than that of Xerox. Both companies fulfilled customer requests based on size, shape, and handling characteristics and both realized that this was being done manually [Ref. 21, p. 84].

A characteristic of all Best Practice companies observed, large or small, is an emphasis on Competitive Benchmarking: comparing performance of their products and services with those of world leaders in order to achieve improvement and measurement progress. Show me yours and I'll show you mine.

Author Unknown

3. Benchmarking Types and the Process

a. Types

According to Camp, there are four types of benchmarking: Internal, Competitive, Functional, and Generic [Ref. 21, p. 16]. Each of the four types is based upon the products and services, business processes, and performance measures that it supports.

Internal Benchmarking is defined as the comparison among similar operations within one's own organization [Ref. 21, p. 16]. The old adage that learning begins at home certainly applies. Most organizations will begin within the confines of their own companies in hopes that they will be able to identify internal best practices before proceeding outward. Additionally, internal benchmarking assumes that there are differences in work processes based on geographical location, organizational history, and the nature of managers and workers in that location. If a best practice can be found internally, the company can often apply these same techniques to other similar processes within the company to realize a productivity gain. This internal knowledge becomes the

new baseline for all subsequent investigations and measurements external to the company [Ref. 4, pp. 16, 18].

Competitive Benchmarking is defined as the comparison to the best of the direct competitors [Ref. 21, p. 16]. It involves identification of the products, services, and work processes of the organization's direct competitors. The objective is to identify specific information about a competitor's products, processes, and businesses results and then make comparisons to one's own organization. Competitive benchmarking is useful in positioning one's organization through its product services, and processes relative to the marketplace [Ref. 4, p. 18].

Another advantage that competitive benchmarking provides is that lessons learned from other companies can be applied to your own with little or no "translation" [Ref. 4, p. 19]. In some cases, competitors may have already benchmarked their process and would be willing to trade information. Competitors may have also joined forces to participate in joint benchmarking projects in non-proprietary areas. An example of such a consortium is SEMATECH. This group consists of fourteen American semiconductor manufacturers including such companies as IBM, DEC, Motorola, Hewlett-Packard, Texas Instruments, and Intel [Ref. 4, p. 19].

This can be one of the most difficult types of benchmarking to implement, however. Companies have to distance themselves from the belief that all competitors are their enemies, and refrain from viewing the effort only as an information security risk. Companies and their employees must realize the fundamental difference between benchmarking and a traditional competitive analysis [Ref. 4, p. 20]. By approaching your competitor with an honest, open approach, you significantly increase the likelihood that you will illicit the same response from him.

Functional Benchmarking is defined as the comparison of methods to companies with similar processes in the same function outside one's industry [Ref. 21, p. 16]. It involves the identification of products, services and work processes of an organization's direct competitors. The objective of functional benchmarking is to identify best practices in any type of organization that has established a reputation for excellence in the specific area being benchmarked [Ref. 4, p. 21].

The word *functional* is used here because at this level most benchmarking involves specific business activities such as finance, marketing, sales, or engineering. Hence, most functional experts limit their benchmarking investigation to areas of functional expertise.

Generic Process Benchmarking is defined as the comparison of work processes to other organizations that have innovative, exemplary work processes [Ref. 21, p. 16]. The word *generic* is used here to suggest “without a brand.” This is consistent with the idea that this type of benchmarking focuses on excellent work processes rather than on the business practices of a particular organization or industry [Ref. 4, p. 21].

b. Process

Robert Camp has meticulously incorporated his knowledge of benchmarking at Xerox into the ten-step process listed in Figure 4.2. This diagram illustrates how these steps of the benchmarking process fit into distinctive phases. It should be noted that there are actually five phases of benchmarking in this model. The last phase, Maturity, is a systematic endeavor where the aforementioned steps will have to be continually achieved and reworked. Once this has been done, only then can the company realize maturity.

The first of the benchmarking phases declare that a decision on what to benchmark must be made. Careful consideration should yield the largest opportunity to improve the performance of the organization. This requires identifying the key work processes, prioritizing and selecting the vital few, and then flowcharting them for analysis and comparison of practice [Ref. 21, p. 19]. The decision on what to benchmark may also mean evaluating products and services, support functions, organizational performance, or strategy. Whatever the case, people are often surprised at the quality and quantity of information that is available to those who make a serious effort to find it [Ref. 4, p. 28].

Second, the benchmarking target must be chosen. This is accomplished by determining which other companies employ superior work practices that can be adapted or adopted [Ref. 21, p. 19]. However, this does not necessarily mean looking within your own industry. It has been said that Remington Firearms benchmarked a popular cosmetics company to discover their process for manufacturing lipstick applicators. Remington later applied the newly acquired information to their process for manufacturing shell casings resulting in more accurate bullets when fired.

Third, plan and conduct the investigation. Determine what data is needed and how to conduct the benchmarking investigation. Observe the superior practices firsthand and document the best practices found [Ref. 21, p. 19]. Investigation can be

conducted in many different fashions with interviews being one of the more useful methods. Probably the best utilization of time and effort would be a telephone interview. Spendolini asserts that the telephone is the benchmarker's most valuable tool [Ref. 4, p. 153]. This is due largely in part of the economics of the situation. It is far less expensive to conduct a telephone interview than it is to conduct on-site visits and is particularly useful when a large number of contacts must be made to collect information. Another advantage to conducting telephone interviews is the fact that they can increase your workday by a few hours. This due largely to different time zones. By conducting a benchmarking interview from the East Coast to benchmark a company on the West Coast, you have effectively gained a three hour window in the afternoon in which to conduct interviews at the end of your work day. Lastly, telephone benchmarking also provides flexibility regarding place and attire [Ref. 4, p. 154]. One can make a benchmarking interview from just about anywhere in any attire to the person of company they wish to contact.

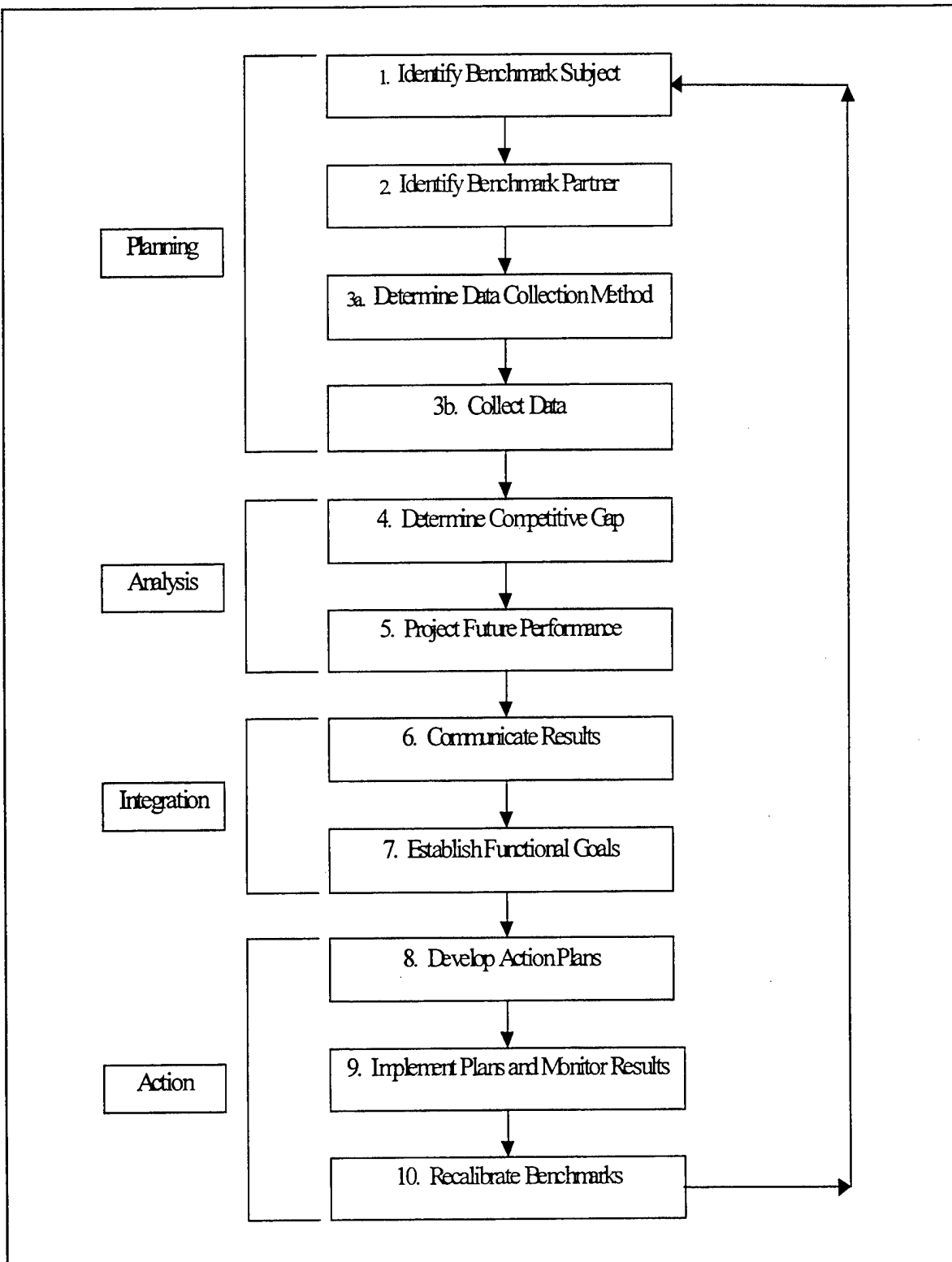


Figure 4.2 - The Formal, 10-Step Benchmarking Process [Ref. 21, p. 20]

- **Planning:** identify what to benchmark, identify whom to benchmark, and gather data.
- **Analysis:** Examine the performance gap and project future performance.
- **Integration:** Communicate the findings and develop new goals.
- **Action:** Take actions, monitor progress, and recalibrate measures as needed.
- **Maturity:** Achieve the desired state.

Phase 1: Planning

A plan for benchmarking is prepared.

- **Decide:** What to benchmark
- **Identify:** Whom to benchmark
- **Plan:** The investigation and conduct it
 - Gather necessary information and data
 - Observe best practices

Phase 2: Analysis

The gap is examined and the performance assessed against best practices.

- **Determine:** the current performance gap
- **Project:** Future performance levels

Phase 3: Integration

The goals are redefined and incorporated into the planning process.

- **Communicate:** Benchmarking findings and gain acceptance
- **Revise:** performance goals

Phase 4: Action

Best practices are implemented and periodically recalibrated as needed.

- **Develop:** Action plans
- **Implement:** Actions and monitor progress
- **Recalibrate:** The benchmarks

Phase 5: Maturity

Leadership may be achieved

- **Determine:** When benchmarking position is attained
- **Assess:** benchmarking is an ongoing process

Figure 4.3 - The Five Phases of the Benchmarking Process [Ref. 21, p. 21]

Difficulties can often arise from conducting telephone interviews. The most notable of these are when the interviewee does not return a call or when the caller is unprepared. Either of these situations make it difficult to collect the proper information, if any at all. In the case of the later, Spendolini makes the following recommendations regarding telephone interviews. [Ref. 4, pp. 153-157]

- Prepare ahead of time. Have a list of questions and put them in a logical sequence. This helps keep the conversation on relevant subjects. In this thesis research, we put together a list of about ten to fifteen questions to ask the customer. These were based mostly on our understanding of the SEMP process, which gave us further insight into the emergency response process of the civilian agencies we studied.
- Develop a list of preferred contacts. Organizing a list of preferred contacts reduces the time spent in navigating through the organization.
- Coordinate your calling with other team members. Ensuring that only one benchmarking team member calls a particular source (person) help to alleviate repeatedly polling the same person for answers to similar questions.
- Contact a specific individual. Knowing the names and titles of knowledgeable sources helps to avoid wasting time by talking with people who don't necessarily understand what information you are looking for. When in doubt, ask for the public relations department; they usually have organizational charts and information handy to aid in benchmarking.
- Explain who you are and why you are calling. This step helps to establish credibility and puts the contact at ease. Explain the purpose of the benchmarking activity, your background or the teams, and a brief outline of the subjects you wish to cover.
- Feed information. To help orient the person you are contacting toward the information you desire, it often helps to feed information to them. For example, a brief description of the information previously gathered on the company can be used to introduce areas where more data is needed.
- Mention the source of your referral. This technique is a door opener, especially if the source of the referral is a close, personal friend of the contact. Make sure that you make exact reference to the person and companies that have previously assisted you in your benchmarking effort if they are available.

- Exchange information. Offer to exchange information or send a brief summary of the results. This is an especially effective technique when soliciting information from management consultants who make their living dispensing advice. Many organizations will not give you information unless you can provide them something in return.
- Give the other party a realistic estimate of the amount of time you require. Avoid underestimating the time needed for the interview. Acknowledge the time requirement and suggest multiple interviews as a way of coping with the time constraints.
- Follow up. Make sure to follow up with a thank you letter or email to those individuals that made the benchmarking possible with their time and interviews. Include a brief summary of your progress to date and offer to send them the results of the finished product. Mention that you will be conducting benchmarking projects in the future. This is one way to begin to develop your own information network.

Fourth, an analysis of the performance gap must be performed. After completing the benchmarking investigation and observation, develop a comparison between the best practices and current work methods [Ref. 21, p. 19]. While the tendency in developing the comparison is to focus on the negative gap (where performance, products, or services are operating at a level below that of the organization being benchmarked), Spendolini postulates that companies should focus on the positive gaps (areas where your company has an advantage or is clearly superior to that being benchmarked) as well [Ref. 4, p. 176]. Companies performing this analysis need to consider factors influencing the comparison results before attempting to draw a conclusion [Ref. 4, p. 178].

Fifth, project future performance levels. Decide how much the performance gap will narrow or widen in the near future, and list possible repercussions for the organization [Ref. 21, p. 19]. The gap analysis is the ultimate benefit statement for the benchmarking effort, and, as such, will provide a source of energy and insight into the potential for continuous improvement [Ref. 21, p. 136].

Sixth, communicate benchmarking findings and gain acceptance. Communicate the findings to all those who have a need to know in order to gain acceptance and commitment [Ref. 21, p. 19]. The final phase of the gap analysis is to prepare a report on the best practice process and recommendations for its implementation. The purpose of this report is to share the findings with the process owners and operators, upstream customers, downstream suppliers and the benchmarking project's customer [Ref. 21,

p.158]. This report not only details the best practice process but also discusses the new goals and objectives that would be set by adopting the new process.

Seventh, revise performance goals. Convert findings into operational statements describing areas for improvement based on implementation of best practices in the business process [Ref. 21, p. 22]. Thus, key business processes must be prioritized to the most critical few, and the remaining processes scheduled for benchmarking and improvement over an extended horizon [Ref. 21, p. 47].

Eighth, develop action plans. Create specific implementation plans, measurements, assignments, and timetables for taking action on the best practices [Ref. 21, p. 22]. Ask if the action plan clearly shows the performance gap or if the action plan was implemented. Ask on what basis the best practices to benchmark were prioritized.

Ninth, implement specific actions and monitor progress. Implement the plan and report progress to key process owners and management [Ref. 21, p. 22]. Sustaining a benchmarking process over an extended period of time includes securing external assistance, developing a handbook for managers, showcasing success, and role modeling. Additionally, benchmarking excellence should be recognized and rewarded [Ref. 21, p. 182].

Tenth, recalibrate the benchmarks. Continue to benchmark and update work practices to stay current with ongoing industry changes. Determine where the organization's status in its pursuit of quality and the implications for benchmarking [Ref. 21, p. 22].

4. Benchmarking Summary

Benchmarking is an ongoing systematic process to search for and introduce best practices into an organization [Ref. 4, p. 9]. While the concept originated in the private sector as a means to enhance or regain market share, the technique also has notable benefits for government organizations.

One of the main benefits of benchmarking is that it allows organizations to develop a better understanding of their key processes. Benchmarking highlights the link between these processes and the outcomes they are designed to achieve. It allows organizations to recognize the potential sources for performance improvement ideas, including organizations that appear to be very different.

Benchmarking has traditionally been used by managers to compare organizational or program performance with market or field leaders. This comparative element of the technique has been found to act as a driver for better performance, encouraging experimentation and innovation in work practices. Benchmarking has also contributed to improving departmental or agency performance information as well.

Additional incentives for government/military organizations is a strategic issue presently being investigated by a number of governmental agencies [Ref. 22]. One of the most powerful incentives may be introducing greater competition into the workplace. Competition could be a strong incentive for managers to compare organizational or program performance against other service providers. Financial incentives may also prove useful in encouraging managers to further consider the technique.

Whether in the public or private sectors, benchmarking requires a culture that is comfortable with the notion of comparison and creativity. Benchmarking calls for a culture where managers are at ease with the notion that their organization may not be the sole source of good ideas or so unique that they can not be compared with others [Ref. 22]. Ultimately, however, benchmarking is useless unless management can use it to improve performance of its own processes.

B. BENCHMARKING CASE STUDY

In the previous section, we learn about the theoretical aspects of business process benchmarking, its history, and how it is related to an organization's strategic objectives. The following case study helps illustrate these concepts through an examination of the SEMP as performed by a world-class civilian agency emergency mobilization process.

The CA-ARNG is, inherently, a very heterogeneous organization with a hierarchically and geographically distributed process structure. The relatively large number of processes being executed simultaneously make it necessary to categorize these processes into one much larger process. We decided, with the help of the Guard's senior leadership, that this all-encompassing process was to be that of emergency response mobilization.

This process can be broken down into both state and federal mobilization. Occasionally, the state and federal functions may be in support of the same mission. This study focuses on the state side of the mobilization process, and in particular, the State Emergency Mobilization Process of the Crisis Action Center (CAC). Specifically, this

process has been compared to those of other "rapid response" centers in the civilian private sector.

The following material details the process of benchmarking the organization, using the model developed by Camp (see Figures 4.2 and 4.3). Only the first two phases of the model, Planning and Analysis, will be presented here. The results of this benchmarking will be combined with analysis and redesign of the CA-ARNG SEMP in the next chapter.

1. Phase One: Planning

From the Camp model above, first, a decision must be made on what to benchmark. With the help of the senior Guard leadership, it became clear that the one process that would have the most impact would be the SEMP. All other processes within the confines of the Office of the Adjutant General (OTAG) headquarters command support this one process in some way. Considering that this process has already generated a very positive reaction from similar organizations throughout the country and the world, the team felt compelled to gain senior leadership buy-in and support. This was deemed crucial prior to any diagramming, benchmarking, or redesign.

The search for an appropriate organization to benchmark was more difficult. National guard units from other states were suggested, but none had the reputation for being able to mobilize for an emergency as quickly as the CA-ARNG. Following some preliminary research, it was decided that a civilian rapid response company would be chosen solely on the basis of how it performed the mission. This was done with the full understanding that this company would most probably be orders of magnitude smaller than the Guard. However, research has shown that a benchmarking target is not necessarily a larger organization. Smaller companies may be benchmarked to learn process methods, a technique which often helps larger companies consolidate processes and become more efficient. The company selected for benchmarking is the world-renowned Red Adair Enterprise based in Houston, Texas, which operates in a broad class of emergency response service providers. During the Persian Gulf War, his team of rapid response firefighters was instrumental in extinguishing out-of-control fires in the oil fields of Kuwait. Adair received high accolades from both the Royal Kuwaiti Family and President Bush for a job well done.

When the decision had been made on which company to contact, a preliminary list of questions was developed to help chart the course of the interview. This list of questions proved useful in facilitating the interview and helped to keep both the interviewer and interviewee on track. The list of questions is as follows:

- Have you benchmarked your organization against peer groups or against organizations from institutions competing in your market?
- What has been your experience in finding comparable organizations to benchmark with?
- What or who has been your most successful source of benchmarking information?
- What has worked well (or not well) in terms of benchmarking changes in your organization's performance?
- What is one example where you were particularly effective in dramatically improving performance?
- In what area(s) would you like to see your organization benchmark itself in the future?
- If you agreed that your main process was mobilization, what would your sub-processes be?
- Do you have a current diagram of functional flows and/or processes?
- What are your performance measurements?
- What is your use of information technology as an enabler?
- Could you take me through your process flow?
- May we call on you again?

Although Adair Enterprises has since disbanded, one of its most successful spin-off businesses, Boots & Coots International Well Control Inc. (B&C/IWC), home-based in Houston, Texas, met the criteria for a benchmarking target. We also contacted a like company called Wild Well Control to obtain multiple sources of benchmarking information [Ref. 25]. Wild Well Control performs a service similar to that of Boots and Coots.

a. Boots and Coots International Well Control Inc.

The point of contact with Boots and Coots is Mr. Larry Flack [Ref. 24]. We were given this name by Mr. Dor'e [Ref. 23] of the former Red Adair Enterprises, now called Global Industries. The initial topic of discussion was an exchange of backgrounds. Mr. Flack stated that "Global emergency response companies specialize, through their respective well control units, in responding to and controlling oil and gas well emergencies, including oil and gas well blowouts, well fires, and marine oil spills, as well as providing a complete menu of non-critical well control services." Without further hesitation, the highpoints of benchmarking were discussed. Furthermore, we explained that while the California Army National Guard does not entertain oil fires as one of its state-related tasks, there is a strong correlation to methods used in fighting a forest fire. Both require preliminary information, immediate mobilization of assets, and rapid feedback as to the status of the emergency. The authors hope to show how the business process of mobilization of these civilian companies can be applied to the Guard to reduce cycle time.

The interview continued with a description of the B&C/IWC mobilization process. Referring to the process diagram (see Figure 4.4), the first process activity node in the B&C/IWC mobilization process is customer validation. This activity is primarily responsible for acknowledging the request for assistance/service and gathering the preliminary data from the customer. Mission tasking is received from the customer via phone or fax and the necessary prerequisite information is gathered and recorded on a standard questionnaire. Information needs essential to successful mission tasking are mission related information consisting of location and nature of event, time and type of emergency, and a point of contact with phone number. Other essential details concerning the situation may be prompted for after the initial viewing of the information. Customer validation is important because it is the essential "go/no-go" step in the process for commercial companies in the emergency response industry. Considering that the primary motivator for these companies is financial gain, a quick determination of the customer's ability to pay for services rendered must be made. The speed of this step depends on the customer and his credit rating. If the customer happens to be one of the huge oil conglomerates, like Exxon or Shell, then the process of customer validation and verification becomes rather transparent. Under agreement, when these customers call, no expense is spared to arrive on-scene in the most expeditious manner. If the customer

happens to be less affluent, then a background credit check is done to ensure that the customer possesses sufficient funds or assets to pay B&C/IWC. In atypical cases, letters of credit can be drafted; in others where the customer cannot be expected to pay, service is refused.

Organization and deployment is the second process activity. It consists of alerting the members of the situation and orchestrating their efforts to arrive on-scene in the most expeditious manner possible with the correct equipment at hand. Again, the critical mission data that was received in the first process activity step is used again here. Members of the team are informed via cellular phone or pager, as these are the most direct means available and are recalled to the headquarters. Once there, a preliminary plan of action is formulated and the team is then dispatched to the airport to charter an aircraft that will be able to get them and their equipment to the emergency. At the airport, specialized equipment is loaded onto the aircraft. Meanwhile, back at the headquarters, the administrative staff is preparing visas to allow the team to enter a foreign country should the need result and contacts the customer to dictate what equipment will be needed upon arrival of the team. The organization process is two-part, happening in two locations simultaneously: the team brings the specialized equipment to the incident and the customer is expected to provide equipment that cannot possibly be transported aboard helicopter, truck, or aircraft such as cranes or Caterpillar earthmovers. The deployment component of this process activity takes less than 12 hours to arrive on-station after notification of the emergency. Oftentimes, the emergencies take place on off-shore oilrigs. Organization such as these have a letter of agreement with the Houston airport to obtain aircraft in the performance of their duties.

Mission execution, the third and most important process activity, is facilitated through the experience possessed by seasoned veterans that comprise the team and the use of tested procedures that are constantly honed. It is the most critical step and brings about the fruition of all the experience and training that these professionals have. It is here where the initial assessment of the situation onsite will dictate a course of action. Information needs in this step compare what was initially presented by the customer, to what the emergency is now. By doing this preliminary investigation and hedging their performance with the use of technology, more input can be provided to the on-scene commander to make a decision. The team will send pictures back to the headquarters, facilitated through the use of laptop computers and digital cameras.

Mission completion, the last step of the process activity nodes, is the culmination of three sub-processes consisting of demobilization, feedback, and plan revision. The most important piece of information that the team depends on is the final word from the customer. The mission is complete only when the customer says it is. This is facilitated via phone or personal visit. Upon word that the job is completed and satisfactory to the customer, mission completion becomes three sub-process. The first of these is the demobilization process and deals with cleaning and maintaining the equipment so that it may be used for the next emergency. Although this is done as a preparatory practice onsite, most of the work happens when the team returns home where the equipment is actually cleaned and prepared for the next use. Feedback is the second sub-process and consists of gaining customer comments on the service performed. These are usually done by phone call, letter, or may be done onsite. Plan revision is the third sub-process and is similar to the military's after action reports. It analyzes what went well, what did not, and incorporates new, innovative procedures to use on the next similar emergency so that the same mistakes are not made again.

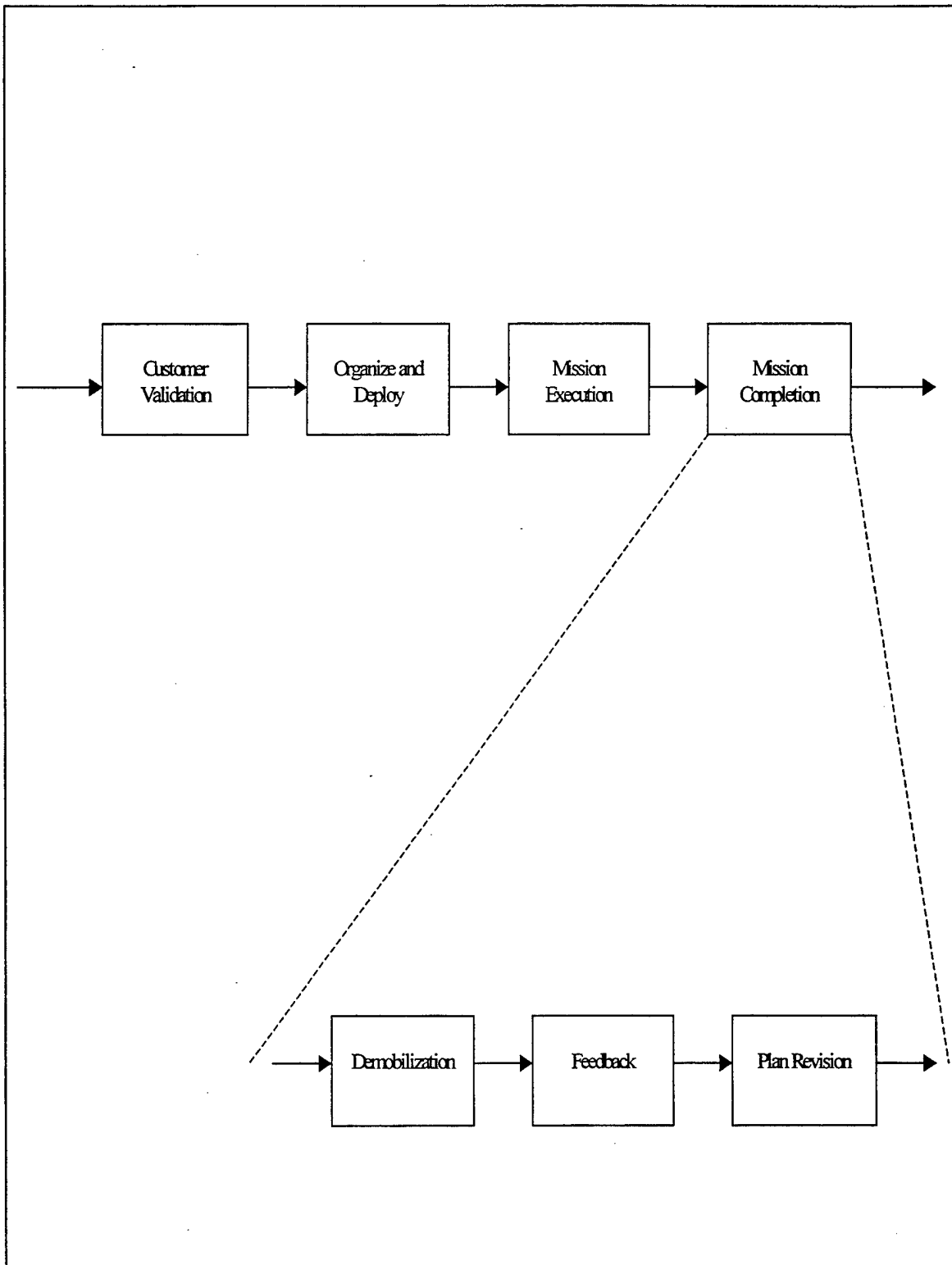


Figure 4.4 - Mobilization Process for Boots and Coats [Ref. 24]

b. Wild Well Control Inc.

Pat Campbell of Wild Well Control [Ref. 25] was interviewed as an additional source of comparative information. This interview was structurally identical to the previous one, and was used to validate the procedures stated by Mr. Flack. Mr. Campbell seemed very apprehensive about the whole interview process and chose not to answer certain questions. This is indicative of the stigma that is often associated with benchmarking. There can be considerable resistance to benchmarking as many people see it as a ploy to gain proprietary information or corporate secrets [Ref. 4, p. 20]. As a result, we are unable to describe the emergency process employed by Wild Well Control. Results such as these are to be expected in any benchmarking study.

2. Phase Two: Analysis

In the analysis phase, a determination of the current performance gap must be assessed. This involves a comparison between the organization's products, services, work processes, or results and those of the competitors or best-practice organizations [Ref. 4, p. 176]. The objective of this analysis is to identify any type of performance gap that exists. Most often, the focus is on the negative (i.e., where the internal process is inferior in some respects to the external process being benchmarked). This is especially true where performance, products, or services operate at less than the level achieved by other organizations that have been benchmarked [Ref. 4, p.176].

Special attention should be given when analyzing and evaluating benchmarking data. Many factors have to be considered including trends, the efficiency of the process when compared to competitors, the relative size of organizations and their revenue, and how these statistics correlate with other bottom-line measures such as market share, profitability and growth [Ref. 4, p. 178]. Spendolini states that the message here is simple: "Before attempting to draw conclusions from the results of benchmarking data, consider the various factors that might affect the interpretation of the numbers [Ref. 4, p. 178].

Gap analysis, as Camp labels it, is missing what could be termed as a follow up activity [Ref. 21, p. 134]. He asserts that this "activity" is what really yields results and includes tracing the gap back to the business processes. However, this usually involves mapping the processes and making the comparison on a process-to-process basis. As such, this is where the Boots and Coots case analysis continues.

Boots and Coots continues to be recognized as one of the front-runners in the rapid response emergency mobilization process. Throughout the years, the skills they possess, their method for arriving on-scene, and techniques that have been tested under fire have proven the worth of this company. The success of this company can be attributed to several traits.

First, this size of this company. B&C/IWC consists of about 20 members. Their company is smaller than most others in the same industry. Being smaller allows this company several advantages such as rapid dissemination of information, the ability to mobilize quickly, and the ability to act more like a cohesive unit. With regards to rapid dissemination of information, it has always been easier to pass information to a few people than it has been to a much larger group. This is mainly due to how the company expects communications to be carried out. B&C/IWC greatly endorses the use of cellular phones and pagers for their employees, so that they may be contacted or apprised of a situation on a moment's notice. Therefore, all members of the organization have the same information at roughly the same time, thus reducing the time for "trickle-down" dissemination of information that is inherent in hierarchical structures. Doing the same with a large group would be expensive and extremely time consuming. Smaller organizations also enjoy the benefits of being able to mobilize more quickly than larger ones. Again, it is much easier to organize and deploy small units than large ones based simply on the group dynamics present. Regarding cohesiveness, we feel that the word *team* does this organization an injustice. They do not act like a team, but more like a "collective entity." What transpires when an emergency is initiated is a swift and seamless chain of events to get the team to where the emergency is.

Second, empowerment is used. B&C/IWC empowers its front-line employees to a much greater extent than most organizations that have traditionally used a hierarchical structure to dictate policy and performance. B&C/IWC relies instead on the cumulative years of experience that the company possesses and empowers its employees to think for themselves, take charge, and quell the emergency. Empowerment allows the front-line employees to provide the company with positive performance effects in terms of cost and cycle time. Since cycle time is a big performance measure for rapid response emergency companies, it makes good sense to allow the employees to be empowered. By allowing the employees to make decisions autonomously, cycle time can generally be reduced due to the lack of handoffs inherently included with a hierarchical structure.

Third, the process of mobilization is short. By having several letters of agreement with various oil refinery companies, B&C/IWC can shave time off to responding to an emergency. When these customers call, the team departs. Additionally, by being a relatively "flat" organization (i.e., everyone is an equal), time is not lost in tasking subordinates. Everyone knows their job, and when called, they are up to the task.

Fourth, is the use of technology. B&C/IWC may not be fully automated, but for a small company, they leverage their use of technology well. For instance, this company uses digital cameras to provide the customer and headquarters with a real-time assessment of the condition of the emergency. Team members back at the headquarters may also make suggestions if warranted. Portable laptop computers facilitate the transfer of data via the internet by satellite or cellular phone when out in the field.

Fifth, B&C/IWC de-emphasizes their traditionally reactive mode of operation. They offer their customers an increased level of service that reinforces and enhances their attention to safety while ultimately saving time, money, and most importantly, lives. At the core of this approach is a harsh regimen of training. Their engineers work with customers to identify potentially volatile situations and efficiently conduct pre-event troubleshooting.

Lastly, the core competency of B&C/IWC is service. It remains the central focus of what they do, why they do it, and who it is provided to. The diverse experiences and depth of resources that this company possesses allows them to expand the business to utilize the lessons they have learned from the many thousands of fires they have extinguished.

C. SUMMARY

The search for proven strategies and practices that will result in quality improvement, cost efficiencies, and customer satisfaction has never been more critical in today's world of shrinking budgets. Benchmarking can provide the key to balancing quality, performance, and cost. It is a powerful measurement process for examining current operational functions and targeting these processes for performance improvements.

Using benchmarking in planning allows your organization to make adjustments and respond more quickly to change. Benchmarking of your organization and studying the data can help you determine where performance deficiencies exist and help you find

innovative and cost-effective approaches to making breakthrough improvements. Once done, the organization may realize a new understanding of how benchmarking can help to refocus resources for better results. As such, this overview of Benchmarking has been provided to prime the members of the Guard to examine their own processes, canvass other organizations for like processes, and apply that which has been learned as a possible best practice. By benchmarking a world-class organization such as Boots and Coots, we have seen how effectively a small company can respond to emergencies that would tax organizations many times larger. Many of the innovative techniques and gains identified by examining the B&C/IWC emergency mobilization process will be reintroduced in Chapter V, as the authors attempt to integrate the best practices learned in this case study into the California Army National Guard's State Emergency Mobilization Process.

V. REDESIGN ALTERNATIVES

The impetus for redesign is to align business processes with the overall strategic plan of an enterprise. The previous two chapters provide the reader with the requisite knowledge and tools needed to facilitate this change. While process innovation encompasses envisioning new work strategies, designing process activities and implementing change [Ref. 1, p. 2], benchmarking is used to help an organization understand their own processes, so that members of the organization will be able to canvass other organizations for like processes and apply best practices into their own enterprise. Both process innovation and benchmarking are powerful performance improvement techniques used in this chapter to propose redesign alternatives that offer good potential to improve business processes of the organization.

Business Process Reengineering has become a crucial strategy for success in today's increasingly competitive and changing environment. As reengineering has evolved alongside the Information Age, *the utility of information maxim* [Ref. 26] has driven industries to better exploit the growing amount of, and need for universal access to, critical corporate information and data. As a result, information technology is shown to be a key driver to reengineering success. Given the diverse set of information systems present in the workplace today, distributed computing is noted to be the strategic tool for supporting reengineering efforts.

The key to achieving reengineering success is making the firm's technology, business, and organization components congruent with each other [Ref. 26]. With the given set of business and organizational challenges, leveraging information technology to transform today's heterogeneous, proprietary systems into an enterprise-wide, standards-based open network is a critical initiative: the open information technology initiative. Based on popular reengineering models, this initiative can be considered to be an imperative.

This chapter integrates redesign tools developed by Davenport--Process Innovation Methodology--as discussed above and Nissen--Knowledge-Based Organizational Process Redesign (KOPeR) [Ref. 27]. A baseline process flow diagram of the SEMP is presented and process measurements are defined for use with KOPeR. Several redesign alternatives are developed through this analysis that offer good potential to effect order of magnitude improvement in process performance.

A. REDESIGN METHODS AND TOOLS

1. Hybrid Davenport - Nissen Methodology

The integration of Davenport's process innovation methodology with reengineering methods, tools, and techniques developed by Nissen [Ref. 28] represents a hybrid methodology that we employ to analyze and redesign the California Army National Guard SEMP. The methodology utilized is as follows:

- Conduct high-level process analysis
- Select high-level process for redesign
- Describe current process flow
- Measure baseline process
- Diagnose process pathologies and faults
- Identify enablers and transformations
- Generate redesign alternatives
- Prototype and test redesigns

Our principal objectives for this chapter are to: 1) provide a theoretical background that highlights the need for process thinking, 2) describe a methodology to transform functional organizations to information age organizations, 3) provide the CA-ARNG redesign alternatives for its key, high-level process (i.e., the SEMP), and 4) demonstrate how process innovation principles can be applied to other processes beyond the SEMP. Our intent is to educate key stakeholders of the importance of process thinking, the need to redesign key processes, and the many elements of organization's structure and culture to prepare it for the challenges it faces in the 21st century.

2. Koper

KOPeR (pronounced "cope-er") is a proof of concept system for Knowledge-Based Organizational Process Redesign. It captures process redesign knowledge from the reengineering literature and practice through the use of twin taxonomies and production

rules, and it supports a measurement-driven redesign method by employing measurement to drive the diagnosis of process pathologies. The high-level redesign method is diagrammed in the figure below.

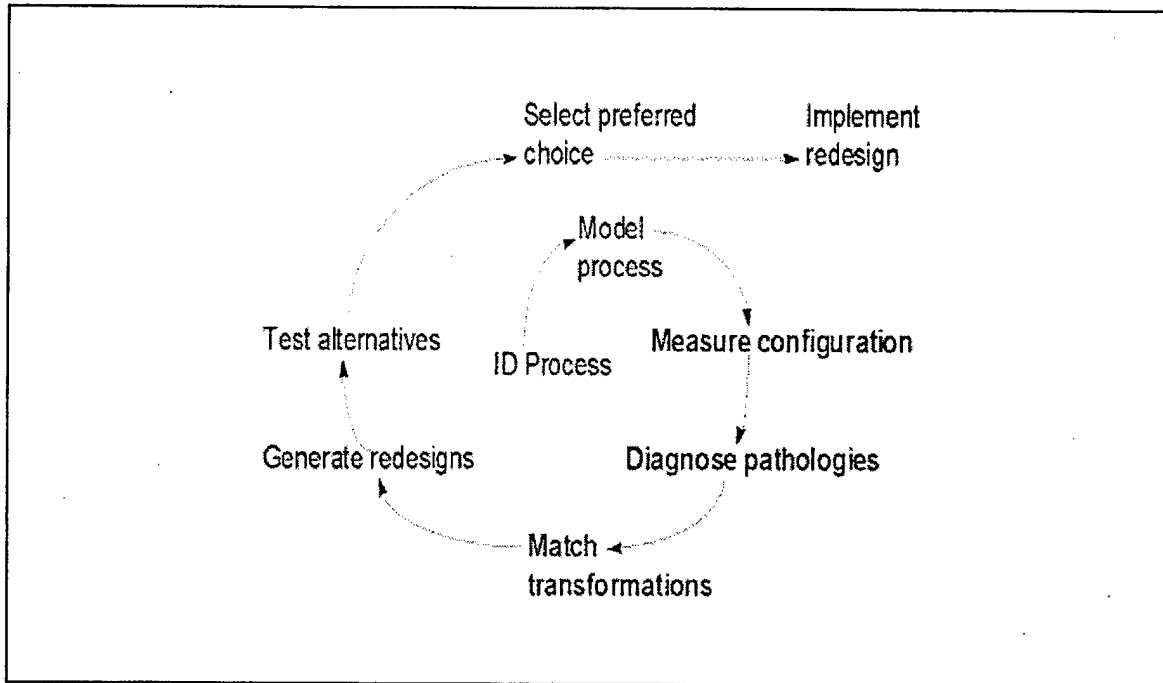


Figure 5.1 - KOPER Approach

KOPeR's graph-based measurement scheme utilizes attributed digraph information from a represented process to drive its diagnostic inference. The steps highlighted in bold text--measure configuration, diagnose pathologies and match transformations--are accomplished automatically by the system. This graph-based, measurement-driven method is unique among contemporary redesign approaches. Indeed, the intelligent automation of key redesign activities such as process diagnosis and transformation represents a unique capability of KOPeR. [Ref. 27]

A representative sample of heuristically useful measures and their graph-based definitions are summarized below.

- Process size: number of process activities (count task nodes)
- Process length: length of longest path (count task nodes in longest path)
- Process depth: number of hierarchical levels (count process levels)

- Handoffs: number of inter-agent transfers of work (count number of traverses of process work across different agent roles, departments and organizations)
- Feedback: number of quality/feedback loops (count number of cycles in process graph)
- IT-Support: number of process tasks supported by information technology (count task nodes with IT-S attributes)
- IT-Communication: number of process communications supported by information technology (count task nodes with IT-C attributes)
- IT-Automated: number of process tasks automated by information technology (count task nodes with IT-A attributes) [Ref. 27]

As noted above, KOPeR builds on the Davenport framework and is employed to support process analysis and redesign of the CA-ARNG SEMP. Each principle step of the hybrid Davenport-Nissen methodology is discussed in the following section. For more information on KOPeR, see Nissen's dissertation [Ref. 29].

B. SEMP ANALYSIS AND REDESIGN

The following paragraphs describe our high-level approach to SEMP analysis and redesign. Through a series of meetings at the 40th Infantry Division (ID) Headquarters in Los Alamitos, CA and the California Army National Guard Headquarters in Sacramento, CA, the team conducted interviews with senior officers and staff non-commissioned officers of the California Army National Guard. As described in Chapter II, the early meetings provided the thesis team with insight into the direction that the thesis would eventually follow: this study of the high-level SEMP process with analysis and development of redesign alternatives. Once the reengineering direction is determined and validated by key CA-ARNG stakeholders, a more focused approach is applied to gather information. The following techniques are utilized: 1) focused interviews designed to learn and understand the processes and how they relate to the organizational structure, culture and other existing processes, 2) recovery of organizational documentation relating to the Guard's strategy, current quality initiatives, process improvement activities and technical infrastructure, and 3) first-hand observation of the organization at work during both normal and crisis conditions.

In general, all efforts are made to examine the CA-ARNG from a top-level process perspective. First-hand observation, historical research, and current doctrine and policy research have provided this team with a unique, outsider's perspective of the California Army National Guard in operation. Specifically, the hybrid approach described above is followed to obtain process-based information that forms the backbone of this research. The principle analysis and redesign steps are described in turn.

1. Conduct High-Level Process Analysis

We begin by determining the key top-level processes of the CA-ARNG. This is accomplished through a series of interviews with the leaders (or process owners) of each top-level department of the CA-ARNG. Leaders are asked a series of questions (Table 2.3) designed to extract information relating to key activities that each of their respective departments performs. In essence, we apply a "discussion facilitated" approach to Harrington's method of having top executives identify the activities for which they are responsible. [Ref. 1, p. 30] Table 2.2 describes the departments and key stakeholders interviewed. The outcome of this first phase is an understanding of the top-level activities of the CA-ARNG, who is responsible, and which activities provide the best opportunities for dramatic performance improvement through process innovation.

2. Select High-Level Process for Redesign

The study of the high-level process analysis concludes with selection of the California State Emergency Mobilization Process (SEMP) as the target process for redesign. SEMP is chosen primarily due to its central importance to the Guard, its mission, and how this process interfaces with the State and citizens of California. This process alone, defines the one of the primary missions of the CA-ARNG:

Protect the public safety of the citizens of California by providing military support to civil authority during natural disasters and other emergencies.
[Ref. 37]

Our intent is to select a process of great interest to the Guard and central to the services they provide to the citizens of California. SEMP activities cut across nearly all functional departments of the CA-ARNG Headquarters and the 40th Infantry Division. The generic product of this process, disaster relief, is perhaps the most publicly well-

known function of the Guard. The California SEMP is a well organized, highly effective process that attracts the attention not only of citizens who benefit from its services, but also other countries who study the process and people with the intent of emulating its success in their own countries.

Based on interviews with key personnel responsible for the SEMP, we are encouraged to conduct a study on exactly how they perform business and to recommend how the process could deliver more value to its internal and external customers. Although the current process can be considered “healthy,” it is clear that through the use of enablers, process performance could be significantly improved. We reason that even if the results of the study produce no more than incremental improvements, its value-added contribution to the Guard will be a more clearly understood process and an outsider’s perspective of the internal workings of the process.

3. Describe Current Process Flow

The baseline transformation approach described by Davenport requires us to define the current configuration of the process. The details of these findings are discussed in Section C of this chapter. In general, this process information is obtained through focused interviews, group workshops, briefings and first-hand observations of key SEMP personnel, primarily those in the Plans and Operations Section. During the research, findings are documented continuously and fed-back to key stakeholders for validation. The continuous feedback from stakeholders on our assumptions and findings proves to be an invaluable source of guidance and education.

4. Measure Baseline Process

Measurement is of critical importance to understanding the baseline process configuration. Once the baseline process is described and graphically depicted, we apply KOPeR to measure the process. These measurements provide us with facts that allow comparing baseline measurements to those of future redesign alternatives. Such baseline versus redesign comparison is an invaluable tool that determines whether or not the redesigned process provides improvement above the baseline process’ performance, or, merely a “warmed-over” version of the original.

5. Diagnose Process Pathologies and Faults

This phase involves more detailed examination of the baseline process. Process pathologies are diagnosed through the study of process flows, the information currently used to make them work, and the technological enablers currently employed in the process. Research pertinent to this phase is conducted using the information gathered in the previous steps. The research team conducts a series of workshops to examine the process work. Findings such as specific information utilized, technology employed, and perceived pathology faults (issues that negatively impact the process' performance) are listed by each process activity of the SEMP and are detailed in Appendix C. General findings of the SEMP baseline process are described in Section C of this chapter.

6. Identify Enablers and Transformations

New technology, human resources and organizational structures are discussed above as potential tools to aid in the redesign of SEMP. The team also studies successful process-oriented organizations such as IBM, American Express, PeopleSoft, and Levi-Strauss to gain insight into enabling technologies and organizational structures that these organizations use. Leading edge research on various technologies such as intelligent agents, decision support systems, expert systems, and Intranets are also considered for their potential to dramatically improve performance of the SEMP baseline process. We endeavor to think inductively about the potential of these technologies to aid the SEMP in solving problems not yet identified, or at the very least to effect dramatic performance gains.

Leading organizational culture/structural theories are also explored to develop insight into process pathologies and possible innovations, particularly socio-technical research (discussed in Chapter VI). The format of these theory-exploration sessions is that of semi-guided brainstorming sessions conducted by members of the research team, professors, and fellow students whose creativity and subject matter expertise in organizational structure and technology provide enormous insight.

The outcome of this phase produces a set of enabling technologies and structures that appear to offer good potential for performance enhancement while maintaining acceptable levels of risk and ease of implementation. The spectrum of technologies and organizational structures explored, which range from leading-edge to mainstream, are used to generate three promising redesign alternatives in the subsequent step. Designs

range from easily implemented (mainstream yet capable of potentially producing results) to most difficult to implement (i.e., leading edge technology and infrastructure).

7. Generate Redesign Alternatives

To generate and articulate these redesign alternatives the research team utilizes the visioning processes described by Davenport (Figure 3.7) to identify “new process objective and attributes.” Transformation enablers from above are identified and “plugged-into” the process visioning methodology. Members of the research team accomplish this generation of redesign alternatives through several intense workshops over a period of three weeks. Multiple versions and iterations of the same process are generated and reworked several times before deciding as a group on the three redesign alternatives presented in this chapter. Details of these three process redesigns are described in Section D. Additionally, best practices from the Boots and Coats case study are incorporated as a “seed kernel” for the visioning process to aid in the development of the redesign alternatives.

8. Prototype and Test Redesigns

The final phase of the hybrid methodology, prototyping and testing, is not within the scope of this research due to time and resource constraints. Nonetheless, this remains an important step in determining the feasibility of implementing redesign alternatives and represents a logical next step for future research along these lines. Chapter III discusses a basic prototyping methodology that can be utilized for this step. This phase also serves to identify the risks involved with each redesign. By pinpointing hidden issues that might not be discovered during the planning phases described above, innovation implementers can more reliably anticipate and rectify potential problems with redesigns and their implementation prior to the actual rollout of the new process.

C. BASELINE PROCESS

1. Baseline Process Description

The baseline SEMP process is delineated in Figure 5.2. In this schema, the level-1 process activities are listed as a sequence of boxes at the top of the figure. Lower level

sub-process flows are shown below the level-1 process activities they support. For instance, the SRCOM Mission Tasking activity, which is shown at level-1, has two level-2 sub-processes: 1) Aviation Mission Tasking, and 2) Ground Mission Tasking. The level-1 Mission Completion activity is similarly comprised of three, lower level sub-process steps: Demobilization, Feedback, and Plan Revision. We use this same convention for diagramming all process flows in this section.

The SEMP process begins with mission validation. This activity is initiated when the CAC receives a mission tasking number from OES via one of two methods. The first is through the use of the RIMS. As previously mentioned in Chapter II, RIMS is the statewide workflow, messaging, emergency response tracking and reporting database system. The RIMS tasking order arrives over the Internet to the CAC where it is tracked, and based on the experience of the watch officer, it is assigned to the appropriate units. The second method works in conjunction with RIMS and has been known to provide advance warning of an impending emergency to the CAC before the RIMS tasking number arrives in some cases. This simple, but effective method is the use of a phone call. Based on the severity of the season (flood or fire), the Guard may have Liaison Officers (LNOs) stationed at the OES to provide advance warning to the CAC of an impending emergency before the tasking number arrives. Although these phone calls precede the tasking number by only a few minutes on average, this is valuable time that the watch officer can use to validate whether the mission is legal, ethical, and if other agencies have been contacted prior to the Guard. These decisions are based on the watch officer's experience and upon procedure manuals that delineate guidance for providing military support to civilian authorities (MSCA). MSCA is used only as a last resort, or if the emergency is too great for existing assets to handle. If the mission meets the legal requirements, the watch officer can utilize this added time in formulating a preliminary plan of action, verifying the location and condition of assets, or validating his plan with other personnel in the vicinity of the CAC and gain mutual consensus.

Information needs of the Guard for this activity are similar to those described in conjunction with Chapter IV. They consist of location and nature of event, time and type of emergency, and a point of contact with phone number. Guard-specific information includes the legality of the mission, the mission parameters, the incident commander, OES mission tasking number, and whether or not other state or federal agencies have been contacted. This is a "Guard particular" activity which represents the critical "go/no-go" step (i.e., it must be done). Recall the process examined in the B&C/IWC

benchmarking study does not have a specific activity for this. RIMS facilitates information technology communication and support in this step. Office tools are also employed for information technology support. This process step concludes with a handoff of information for the customer validation step.

The second activity in the SEMP baseline process is customer validation. Unlike the B&C/IWC process activity by the same name, this is a process where the initial information received by OES is validated by the customer. The Guard performs this process because they are mandated to do so by their standard operating procedures (SOP). This process is accomplished by a watch officer contacting the Incident Commander (IC) to verify the request. This is usually done by phone or radio. The same information collected in the mission validation step is used here. The CAC watch officer verifies this information with the incident commander. Verification serves several purposes such as to 1) ensure the information is correct, 2) receive updates by someone who is onsite, and 3) establish positive contact with an official at the emergency scene. However, this activity appears to be a redundant step in obtaining and using information, and it is not without faults, such as the lack of rich and timely information received through RIMS. The Guard understands that more information, provided in a more timely fashion, could reduce response time and possibly eliminate the customer validation step.

Additionally, having fewer points of contact with the customer could reduce the chance of receiving conflicting information. Such information can cause confusion, and thereby increase cycle time while the watch officer is sorting out conflicts. Cycle time is a process measurement designed to identify how long it takes from input to output. Alternatives such as these are examined in greater detail below. Customer validation is also information-technology supported through the use of office tools such as word processing programs to maintain a log. This process concludes with a handoff of the information to the SRCOM step.

Senior Command Mission Tasking (SRCOM) is next in the line of process activities and consists of using the established military hierarchy and protocols to task units -- senior to subordinate. The CAC watch officer calls and tasks the senior command to perform a certain task. The mission related information is once again passed here, resulting in one or more handoffs. Once this has been done, what happens next is transparent to the CAC. The senior command now begins the process of determining where and what assets are needed, and how to effectively mobilize them for this

particular emergency. The emergency can now effectively go two different routes: aviation tasking and ground tasking.

The first of the sub-processes residing within the SRCOM Mission Tasking process is Aviation Mission Tasking. Once the emergency is determined to be a search and rescue (SAR) or some other emergency where air assets are needed (e.g., such as the decision to move people across impassable terrain), aviation assets are tasked. For emergencies where fewer than five aviation assets are needed, State Aviation is the primary agency tasked. If more than five aviation assets are needed for an emergency, then the 40th Aviation Brigade is called upon.

If the mission is not aviation related, or if the use of aviation assets is not required, the 40th ID is called upon. This is basically the default tasking for a majority of the state-related emergencies. In a few cases, the use of both aviation and ground assets is required. In this scenario, both would be tasked according to mission requirements as described above.

Organization and deployment is the fifth process activity in the Guard's SEMP. Although this process is similar to the one used by B&C/IWC, the CAC is not really the director for tasking the individual units. Instead, as mentioned above, the CAC tasks the senior command, which subsequently tasks its subordinate units. Thus, this is another transparent process to the CAC. For example, if the 149th Armor Battalion is needed, the CAC would not directly task this unit. Instead, the tasking would come through the third battalion, via the 40th ID. As a result, instead of having one handoff, there are now three, resulting in increased cycle time.

In the case of the Operational Area Team (OAT) concept, which was recently introduced this past winter season, the CAC tasks the OAT commander, who is provided with the same mission critical information as above. Subsequently, the OAT commander takes this information and prepares for the mission. The assets he uses to mitigate the emergency are left to his discretion and are custom tailored to each emergency. OAT units are designed for meeting current crisis needs, yet are inherently scaleable to meet expanding mission requirements.

OATs consist of a Guard commander with enough assets and authority to provide civilian officials with a solution to their mission-based needs. Assets are staged by location and are ready to respond to missions when needed. Should these assets be needed, they are able to respond more quickly than those that have not been pre-assigned and that might otherwise need to be tasked through conventional military channels.

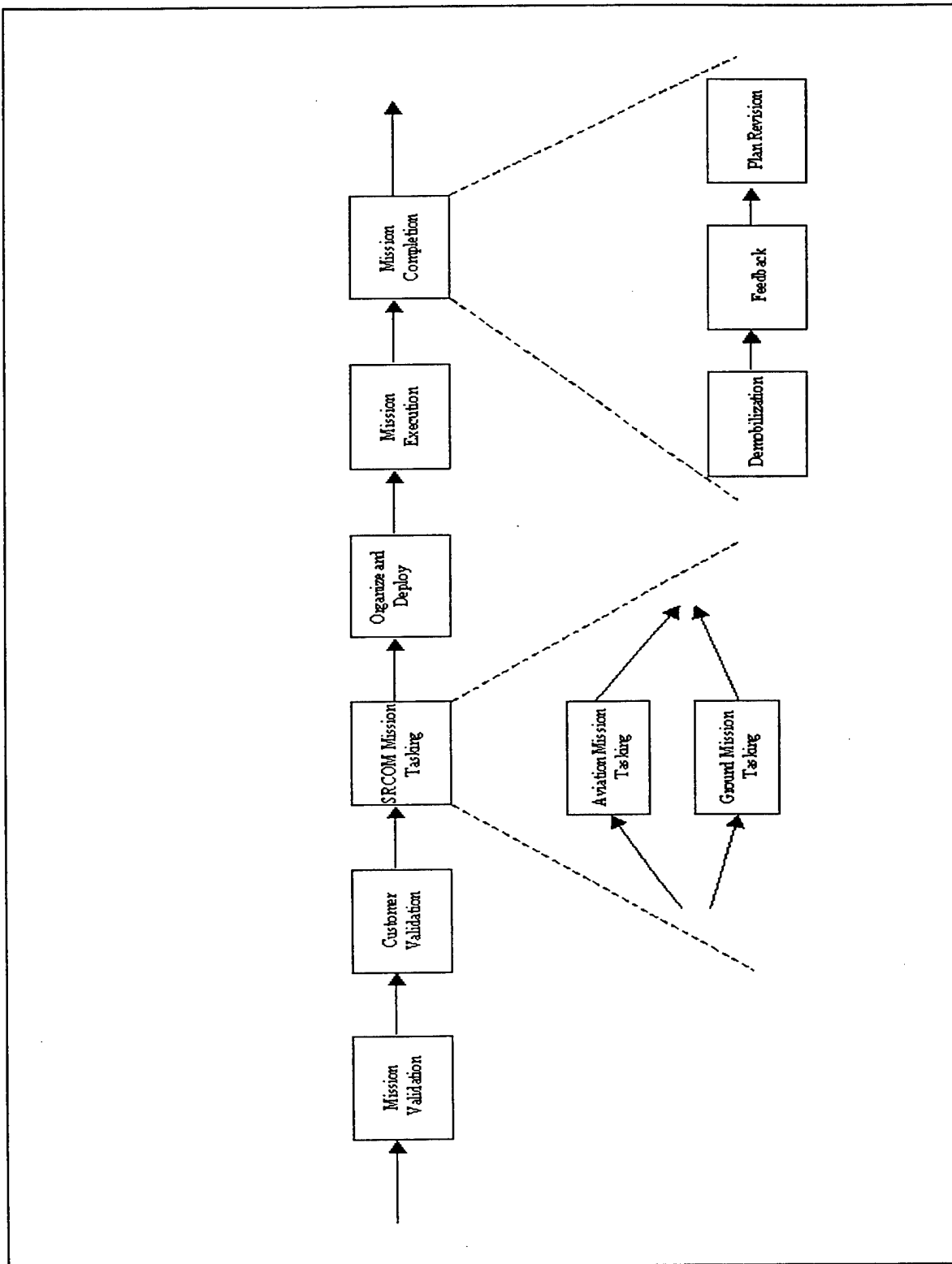


Figure 5.2 - CA-ARNG SEMP Baseline Process

In either variation of the tasking by the CAC, direct (OAT) or indirect (hierarchical), the mission critical information is passed via telephone which consumes precious time. The Guard is mandated to respond to emergencies in less than 24 hours, and usually is able to respond in much less time. Due to the sheer size of this organization and the dynamics of mobilizing such a large group, they are unable to respond as fast as, for example, the Boots and Coots team (discussed in Chapter IV) to a local emergency.

Mission execution, the most important step, is yet another transparent process to the CAC. Once the individual units have been assigned by their respective SRCOMs, they execute the mission according to the SOP relating to the particular type of mission. At this stage, the soldiers have their "marching orders" and do not have to be told how to accomplish their mission, only what that mission entails. Executing units report to the SRCOM who relays the information to the CAC. The reporting relationship during the mission execution was not entirely clear during the course of our research. For example, we observed reports being filtered up through the chain of command from the executing unit, to SRCOM, and then to CAC. This represents additional information handoffs that might be eliminated through the use of technology (discussed in the Redesign Alternative section below).

Mission completion, the last in the process, is very similar to the process used by Boots and Coots which utilizes information technology support and communication through word processing, spreadsheets, and email. It also consists of three sub-processes: demobilization, feedback, and plan revision. Once a mission has been completed by the units on scene, contact is made with the CAC who then signs-off the mission tasking number as complete. The completion sign-off is sent via RIMS to the OES. If the unit is no longer required for an emergency, demobilization takes place immediately following task completion. It consists of cleaning and repairing assets and taking care of administrative issues such as pay. Feedback is the second of the sub-processes. This is basically a lessons learned session attended by officers involved in the operation being examined. After action reports (AARs) are derived from an operation and designed to highlight successes and problems. Feedback reports (AARs) are created by the use of word processor programs and e-mail for submission from subordinate commands to their seniors. Procedures identified as "working well" are then incorporated into the plan revision sub-process. Plan revision, using office tools, is the culmination of the AARs

and lessons learned, which is incorporated into existing operational plans to be used for similar emergencies in the future.

Feedback and plan revision sub-processes are areas that require a closer examination. Although the three sub-process sequence has been described by soldiers at the Headquarters as very sequential, this team believes that many opportunities to obtain feedback are missed. Demobilization is a matter of SOP and occurs after every operation. However, it is unclear how feedback is received from the demobilization phase on an ongoing basis. Furthermore, the feedback sub-process appears to be very limited in scope, with an after action report (AAR) as its output. It is also unclear how plan revision actually incorporates the output of feedback to develop an updated plan. Feedback and plan revision will be discussed further in the Redesign Analysis section of this chapter.

2. Baseline Measurements and Analysis

Measurements of the CA-ARNG SEMP configuration are summarized in Table 5.1. Also noted in the table are the corresponding process pathologies. Using the above mentioned KOPeR tool and the process diagram in Figure 5.2, the measurements suggest that the CA-ARNG SEMP Baseline process suffers from four serious pathologies: 1) sequential process flow, 2) excessive process friction, 3) inadequate IT communication usage, and 4) absence of IT automation.

<u>Measure</u>	<u>Value</u>	<u>Pathology</u>
Parallelism	1.1	Sequential Process
Handoffs Fraction	0.455	Process Friction
Feedback Fraction	0.0	Satisfactory
IT Support Fraction	0.545	Satisfactory
IT Communication Fraction	0.273	Inadequate
IT Automation Fraction	0.0	Requires IT-S, IT-C first

Table 5.1 - Baseline KOPeR Analysis

Each of these measurements and pathologies suggests serious performance implications. First, KOPeR has evaluated the SEMP baseline process as a sequential or linear process. Sequential processes, by nature, take more time to complete than parallel ones because each step is dependent on the one preceding it. A redesign transformation

called de-linearization involves rearranging a sequence of process activities to be performed in a more parallel or concurrent manner. Process parallelism or concurrency has positive performance effects in terms of cycle time and costs, when performed in parallel as opposed to sequentially. This de-linearization redesign transformation affects the sequence and flow of process activities, but not how or by whom they are performed. De-linearization can significantly reduce process cycle time, particularly when high-level process activities are delinearized. However, if two process activities are sequentially-dependent, they cannot be performed concurrently. Instead, they must continue to be performed in series. One test for sequential-independence is to analyze the inputs and outputs from each process activity. Where the inputs to an activity are *not* produced by the preceding activity, the two activities offer good opportunity to be performed in parallel. [Ref. 27]

Process friction is deemed excessive because of the number of frequent handoffs associated with this process. Reducing the number of handoffs would make this a smoother, more fluid process, thus reducing the cycle time and friction. Alternatively, KOPeR deems the baseline process "satisfactory" with regard to the number of feedback loops and information technology support. Feedback loops are notorious for increasing the number of handoffs because the process activity node initiating each feedback loop must be revisited. Thus, by having a low number of feedback loops, unnecessary information transfer is reduced, curtailing having to validate the information before it can be passed through the process.

Information technology support involves the application of information technology to support process activities. This powerful redesign transformation (i.e., enabler or change lever) can have positive performance effects in terms of cost and cycle time, as computer-based tools can augment human performance in terms of memory, speed, thoroughness and other attributes. For example, in the baseline process, the RIMS program and use of desktop office tools such as word processing programs are used in conjunction with human labor.

Information technology communication utilizes RIMS and is judged inadequate by KOPeR due to shortcomings in distributing information. This is due to the infrequent use of email or other means of electronic communication vice paper or voice communication. By encouraging more communications through information technology, it would help to transform the baseline process to one where cycle time and cost could be reduced.

The lack of information technology to automate this process is also a shortcoming in the Guard. Automation saves time and money by replacing human labor, but it requires substantial IT infrastructure. This powerful redesign transformation can have positive performance effects in terms of cost and cycle time. Many of these benefits are discussed in connection with the process redesign alternatives presented later in this chapter.

3. Recommendations for Redesign Analysis

Based on the KOPeR redesign analysis, we recommend that the following be considered: 1) De-linearize process activities to increase parallelism, 2) Look to information technology to increase support to process communications, and 3) Look to information technology to automate process activities.

As mentioned above, such process inputs must be sequentially independent before de-linearizing them. Case managers or empowered case teams (discussed in the Redesign Alternatives section of this chapter) could decrease friction and otherwise help to speed up the process by decreasing the number of handoffs. The Guard could use these teams as a source of expertise to task assets instead of having one person handle the situation.

Alternatively, and more importantly, the Guard needs to use information technology to a greater extent. A partial infrastructure is already in place, but before expanding this to a wider audience, the use of information technology to support and facilitate process activities must be made a priority. E-mail and shared databases through local and wide area networks are deemed essential. Workflow systems provide an opportunity to share information based on the natural process flow.

Eventually, when the use of information technology for communications and support is well established, automation tools that reduce or eliminate human activity in the process provide the next opportunity for significant process improvement. These tools generally require a substantial investment as well as an IT architecture that can capitalize on its benefits. Automation tools, if implemented properly, can provide significant savings in human labor, cycle time and costs.

D. REDESIGN ALTERNATIVES

1. Background

Now that a general description of the baseline process has been presented, we move on to the redesign process. Our “castle in the clouds” concept for the SEMP process consists of envisioning an “ideal” process of the future. There are two generic approaches available for this. The first is the *baseline transformation* (i.e., analyzing the existing baseline process for pathologies and faults as described above); the second is called the “greenfield” approach or “blank sheet of paper”. This team has chosen a mix of the two approaches. The greenfield approach lends itself to imagining a “castle in the clouds” [Ref. 28]; a notional idea of how the new process will work. While these same ideas may not even be attainable due to technological constraints, it provides an ideal process that the organization might aim to develop and implement.

We envision that the SEMP will behave somewhat similar to a recent TV advertisement statement that said, “we make large organizations move effortlessly like small ones.” In other words, how can we make the SEMP move more effortlessly like a smaller process? The answer comes from the case study of the Boots and Coots organization referred to in Chapter IV. By all accounts, this organization is able to respond quickly due to its size. A smaller company can disseminate information quickly to the “worker bees” effectively reducing the number of handoffs and time to respond to the emergency. This represents a common theme driving the greenfield process development.

Our objective is to make the Guard *act* like a smaller organization. In order to do so, we must examine a high level view of the envisioned SEMP process. The next few diagrams are provided as a cursory glance of the redesign process before the actual details, enablers, and workflow methodology is described later in this section. Although the *process map* for the SEMP baseline looks the same as those for each of the redesign alternatives, the redesigns are actually much different, principally because the associated *enablers* and their use through technology make them powerful agents of change. The end result is a process map that looks the same, but performs far better than the baseline SEMP. In Section 2 that follows, three basic redesign alternatives are presented in detail. The process maps corresponding to these alternatives may be seen in full in Appendix C.

Figure 5.3 below illustrates the Level 0 diagram for our redesign alternatives. This diagram represents the system's major processes and data flows. The input data flow of this new redesign alternative is still the same as it was in the baseline process: a customer request. By obtaining the input, the wheels are put in motion for the process of "solution production and facilitation" to appropriately deal with the tasked emergency. From a customer's perspective, this is what the mobilization process of the Guard is. The output is customer satisfaction, or, more appropriately, a satisfied customer. This high level thinking is analogous of a "black box." A single input is transformed into an output by the process contained within the "black box."

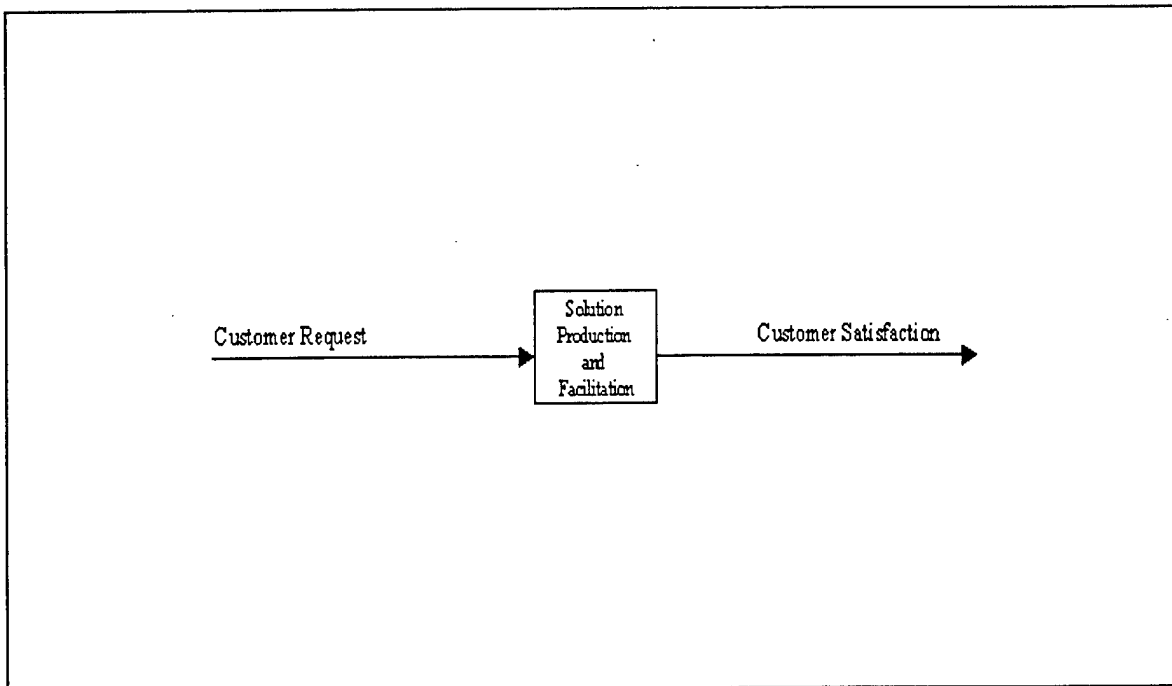


Figure 5.3 - Redesign Alternative Level 0

Many people may not be as concerned with what the output of the box is as much as how the output is created. It is here where a drill-down methodology will facilitate our discussion on this redesign alternative and its use of enablers such as technology, human resources, organizational dynamics, and information.

Figure 5.4 illustrates Levels 1 and 2 for the SEMP. The decrease in the level of abstraction (i.e., increase in the level of detail) provides the reader with an in-depth view of the process structure as envisioned by the redesign team. Here we see that there are really two processes: 1) validation and assignment of a solution, and 2) coordinate and

facilitate services. Both are essential elements of the overall process of solution production and facilitation. These two processes can be further subdivided or decomposed into a level 2 diagram where we see that Mission Validation and Unit Assignment are contained within the Validate and Assign Solution Process. Furthermore, the Coordinate and Facilitate Services step in turn has three sub-processes occurring in parallel. This greatly reduces the time spent waiting on a serial process. These sub-processes are; 1) track mission, 2) coordinate solution provider requests, and 3) mission execution.

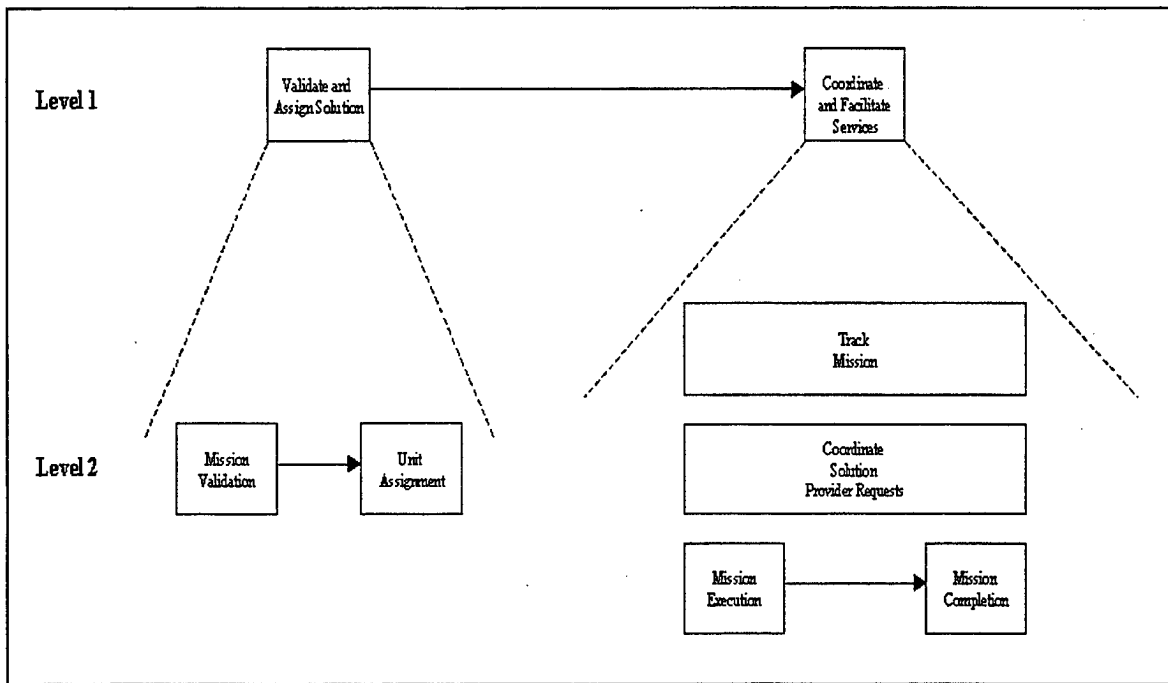


Figure 5.4 - Redesign Alternative Levels 1 and 2

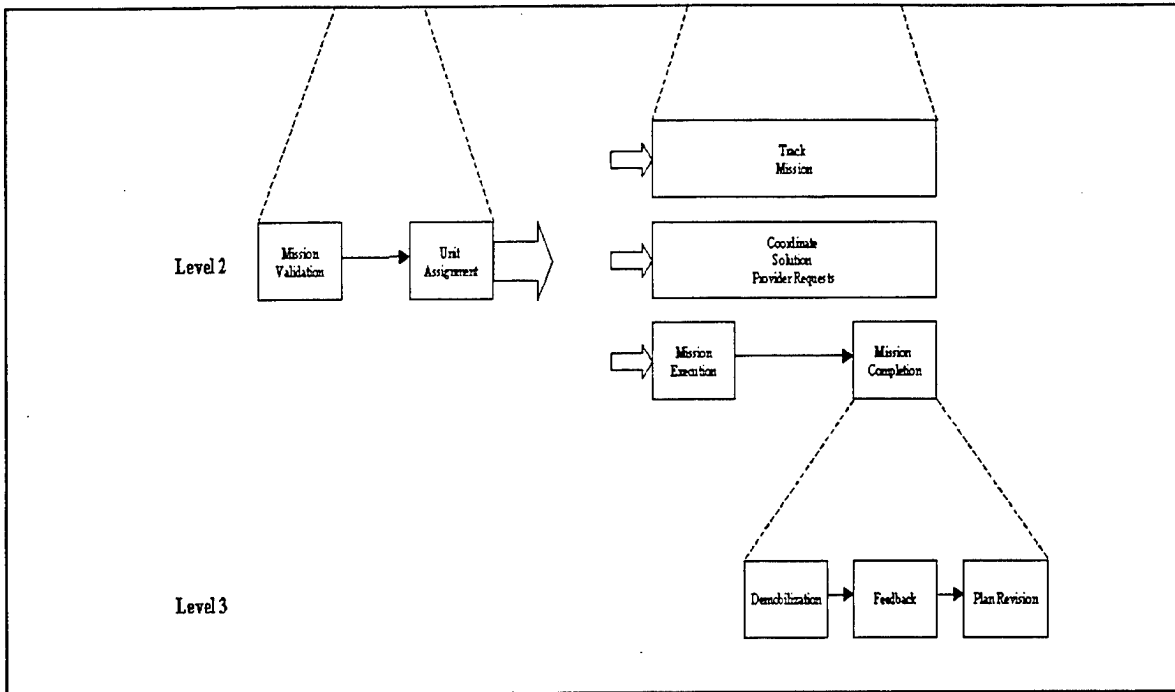


Figure 5.5 - Redesign Alternative Levels 2 and 3

In Figure 5.5 the lowest level of abstraction for this process is presented as Mission Completion is displayed. It consists of three sub-processes: 1) Demobilization, 2) Feedback, and 3) Plan Revision.

2. Redesign Alternatives by Transformation Enablers

Three redesign alternatives are described in detail in this section. It is important that the reader understand several assumptions concerning these alternatives. First, the CA-ARNG role in general with regard to the SEMP is that of “solution provider.” The organization exists solely to solve problems and generate solutions to crisis situations. The “solution” might be in the form of equipment and personnel augmentation, but ultimately, everyone involved in SEMP must view themselves as knowledge workers who produce a product: providing a solution to the current mission at hand.

Second, we find the majority of the work performed in the CAC relates to identifying and validating mission numbers, identifying and tasking units (often through SRCOMS), tracking (units, assets, crisis), reporting (watch officer, key personnel, adjacent units, subordinate units, on-scene Guard commander), and coordinating the overall emergency response effort. Additionally, mission quality, customer satisfaction

and the success of the process improvement and feedback activities are also part of the CAC's responsibility during the SEMP.

The redesign alternatives developed are based on the primary functions and responsibilities of the CAC and its role in the SEMP. While they acknowledge the current situation, these alternatives also look ahead to the future. The three redesign alternatives are summarized at a high level in Figures 5.6 and 5.7.

	Alternative #1-Least Radical	Alternative #2-Radical	Alternative #3-Most Radical
Design Statement How could we do things differently?			
Overall process	Minimize time required to mobilize, respond, and mitigate emergencies tasked by higher authority	• Same as Alternative #1	• Same as Alternative #1
Process Characteristics How will it work?			
Flow	<ul style="list-style-type: none"> Centralized tasking, coordination, and monitoring Decentralized execution by empowered solution provider Enhanced feedback 	<ul style="list-style-type: none"> Same as Alternative #1 Tasking alternatives provided by expert system Near real-time feedback of operation status 	<ul style="list-style-type: none"> Same as Alternative #1 Fully automated tasking by Decision System Real-time feedback of operations status
Output	• Satisfied customer	• Same as Alternative #1	• Same as Alternative #1
Performance	<ul style="list-style-type: none"> Eliminate non value-added steps Facilitate feedback Decrease decision making time 	<ul style="list-style-type: none"> Same as Alternative #1 Provide multiple solution options 	<ul style="list-style-type: none"> Same as Alternative #1 Decision System provides optimized decision
Organization	<ul style="list-style-type: none"> Emergence of empowered solution provider Emergence of information specialist Eliminate traditional chain of command tasking Traditional military reporting relationships redesigned CAC role shifts from manager to facilitator SEMP aligned to solution production and facilitation 	<ul style="list-style-type: none"> Same as Alternative #1 Crisis management facilitated by crisis generalist position Reduction of functional-based staff positions in CAC Reduce human role in formulating routine decisions Changing mindset 	<ul style="list-style-type: none"> Same as Alternative #2 Eliminate human role in routine decision making
Technology	<ul style="list-style-type: none"> SEMP Intranet provides crisis information access Integrated databases expand RIMS crisis management view Guard solution provider communications package 	<ul style="list-style-type: none"> Same as Alternative #1 Expert system generates unit tasking alternatives Crisis information reporting system with near real-time crisis tracking and feedback 	<ul style="list-style-type: none"> Same as Alternative #1 Intelligent agent based decision support system Crisis information reporting system with real-time crisis tracking, feedback and intelligent agents Stochastic modeling application for crisis management
Environment	Shift emphasis from response to prevention	• Same as Alternative #1	• Same as Alternative #1
Performance Measures and Objectives How well will it work?			
Cost	• Implement new costs system in 1 year	• Implement new costs system in 1 year	• Reduce costs for emergency mobilization by 25% in 2 years
Quality	<ul style="list-style-type: none"> Increase the level of customer satisfaction by 90% in 2 years Increase the level of information quality by 80% in 2 years 	<ul style="list-style-type: none"> Increase the level of customer satisfaction by 90% in 2 years Increase the level of information quality by 80% in 2 years 	<ul style="list-style-type: none"> Increase the level of customer satisfaction by 90% in 2 years Increase the level of information quality by 90% in 2 years
Cycle Time	• Reduce process cycle time by 50% in 1.5 years	• Reduce process cycle time by 75% in 1.5 years	• Reduce process cycle time by 80% in 2 years
Responsiveness	• Reduce response time to crisis by 40% in 1 year	• Reduce response time to crisis by 50% in 1 year	• Reduce response time to crisis by 60% in 1 year
Critical Success Factors What things have to go right?			
People	<ul style="list-style-type: none"> How they integrate into the system as a whole Ensuring information quality becomes a critical human skill New focus on facilitating solution provider performance Qualified people to develop, implement, and manage new technology 	<ul style="list-style-type: none"> Same as Alternative #1 Crisis generalist training must be effective 	• Same as Alternative #2

Figure 5.6 - The Redesign Matrix

Technology	<ul style="list-style-type: none"> Utilizes existing infrastructure Data accessibility down to lowest unit level Database must be integrated and kept current 	<ul style="list-style-type: none"> Same as Alternative #1 Expert system must have correct system parameters assigned Crisis management system must provide near real-time updates 	<ul style="list-style-type: none"> Same as Alternative #1 DSS must have the correct decision parameters assigned Crisis management system must provide real-time updates
Product	<ul style="list-style-type: none"> Empowered solution provider Well-trained soldiers Solution must be flexible (scalable) 	<ul style="list-style-type: none"> Same as Alternative #1 	<ul style="list-style-type: none"> Same as Alternative #1
Potential Barriers to Implementation Why might they not go right?			
Resource Allocation	<ul style="list-style-type: none"> Lack of funding for technology Lack of funding for personnel training Lack of funding for infrastructure Time to implement process Lack of assets required to implement empowered solution provider concept 	<ul style="list-style-type: none"> Same as Alternative #1 	<ul style="list-style-type: none"> Same as Alternative #1
Organizational, Culture	<ul style="list-style-type: none"> New SEMP might not be accepted in current organizational culture Senior leaders may not perceive need for change New culture of empowered solution providers might not be politically acceptable Functional managers may be unwilling to share power with process owners and solution providers May not want to disseminate information to unit level. Asset holders not always willing to share or part with assets 	<ul style="list-style-type: none"> Same as Alternative #1 Departure from functional roles and creation of generalist roles might not be politically acceptable Reduction of human role in routine decision making might not be accepted 	<ul style="list-style-type: none"> Same as Alternative #2 Reliance on technology for decision making may not be accepted Elimination of human role in routine decision making might not be accepted
Technical	<ul style="list-style-type: none"> Bandwidth needs at the incident scene Difficulty in implementing and managing technological infrastructure Interoperability among databases and communication protocols, etc. 	<ul style="list-style-type: none"> Same as Alternative #1 Feasibility of implementing leading edge technology 	<ul style="list-style-type: none"> Same as Alternative #1 Technology may not currently exist for these types of intelligent agents
Product Factors	<ul style="list-style-type: none"> Inaccurate information leads to a poor solution and unsatisfied customer Soldiers might not have proper military skills Process workers might not have proper knowledge of the process or technology Solution provider may not receive assets/information in a timely manner to meet customer requirements 	<ul style="list-style-type: none"> Same as Alternative #1 	<ul style="list-style-type: none"> Same as Alternative #1
Environment		<ul style="list-style-type: none"> Other agencies may be unwilling to update data Notion of pro-activity may not seem feasible 	<ul style="list-style-type: none"> Same as Alternative #2 Proposed changes too radical
Information	<ul style="list-style-type: none"> Organizational information requirements must be accurate and easily accessible Timely flow of accurate information Information availability at incident scene 	<ul style="list-style-type: none"> Same as Alternative #1 	<ul style="list-style-type: none"> Same as Alternative #1

Figure 5.6 - The Redesign Matrix (continued)

The figures depict three redesign alternatives generated through the hybrid method from above with visioning process descriptions (e.g., attributes, objectives, measurements, critical success factors, and potential barriers to implementation) derived from Figure 3.8. The use of Davenport's visioning process was primarily responsible for aiding us in developing process redesign alternatives. Although process components identified through visioning (the greenfield approach) are critical to developing the redesign alternatives, an understanding of the baseline pathologies and faults (the baseline transformation approach) helps provide more specific direction in making these redesigns capable of order-of-magnitude performance improvements.

The figures depict a progression of three redesign alternatives, from the least dramatic to the most radical redesign options, as read from left to right (see top row in table). Thus, the first or leftmost redesign represents the least radical combination of change levers and is expected to be the easiest (i.e., least painful in terms of cost, risk and organizational change) to implement. The "radical" and "most radical" redesign alternatives combine more powerful transformation enablers to achieve greater performance.

Each redesign alternative is discussed in the following paragraphs by defining the specific classes of enablers (e.g., technology, human resources, de-linearization, organization structure, and information). To minimize repetition and redundancy, we highlight and focus on the differences between the three redesigns, both when compared to the baseline and each other.

a. Technology

Technology enablers described in Alternative One (Least Radical) offer an expanded use of current technology and the introduction of new technology. In the baseline configuration, RIMS, a Lotus Notes workflow application, delivers OES emergency mission requests to the CA ARNG CAC. Based upon these requests, the CAC watch officer either tasks the SRCOM or State Aviation based upon mission type (SAR, flood, fire, civil disorder, other). RIMS does not presently provide any decision support or ability to access unit, personnel or equipment status of the CA ARNG. In Redesign One, RIMS would be modified to capture and represent specific information designed to provide the watch officer an at-a-glance view of a current emergency response mission. Although RIMS presently provides information relating to SITREPs

and logistics requests, it does not yet provide (according to our baseline observation) specific views and information based upon the watch officer's information requirements when monitoring and facilitating the Guard crisis response.

The development of integrated databases, which provide access to specific information (e.g., personnel, vehicles, aircraft, unit, supply, etc.), is a powerful enabler of this least radical redesign. The baseline configuration presently does not use databases to aid in the emergency mobilization process. Although stand-alone databases exist throughout the Guard to support functional areas, none are integrated to provide support of the mobilization process. It is envisioned that databases would be developed to support all Guard processes by storing information requirements common to these processes. Specifically, the integrated database would be populated with current and accurate information such as personnel availability, supply stocks, and the number and location of operational vehicles, all easily obtained by CAC personnel. Database access would aid CAC personnel in quickly making asset tasking decisions (among many other types of decisions where soldier and other asset information is required), thereby ultimately contributing to the reduction in response time.

Another manner in which technology has precipitated the development of Redesign One is through the introduction of communication and information system access at the incident level. In the baseline process, information from the incident scene is communicated primarily by telephone. This limits the richness of the information that can be provided. The communication and information system "package" is envisioned as a suite of equipment made available to the Guard emergency response commander that ultimately provides a bi-directional flow of information. The package would contain a laptop or palmtop computer, voice recognition software, digital camera and a wireless data transmission capability with statewide access to the Guard's network. The commander would be able to provide digital SITREPs generated with voice recognition software, capture the incident scene with digital pictures or streaming video, and request assets via digital asset request forms.

The flow of information from the incident scene and the CAC would be conducted through a SEMP Intranet designed to display tactical and strategic information for the emergency response commander and SEMP support personnel. Logistics request status (e.g., a system similar to the Internet based FedEx tracking system), intelligence (e.g., weather, civilian authority reports, external agency reports, Guard generated intelligence reports, etc.), and other information would be displayed on the Intranet. In

essence, the SEMP Intranet provides seamless access to all Guard information technology systems. No such system presently exists in the baseline SEMP configuration.

The technology enablers in Redesign Two (Radical) incorporate the same technology described in Redesign One, along with the addition of: 1) an expert system and 2) a near real-time crisis tracking system. In Redesign Two, an expert system would generate unit tasking alternatives based upon mission type (SAR, flood, fire, civil disorder, other), unit and asset availability, and proximity to emergency. Mission requirements processed by the expert system are presented to watch officers as decision alternatives. In this configuration, the watch officer directly tasks the units themselves (discussed in greater detail below).

Expert system decisions are based upon custom designed decision-making algorithms that model human decision making criteria. The expert system is fed by Guard-wide integrated databases that maintain accurate information on unit availability, equipment and personnel status. The system also maintains detailed information on standard issues that accompany any mobilization, thereby providing not only decision-making alternatives but also important information captured from logistics, operations and intelligence experts. With the unit tasking alternatives presented, the CAC watch officer would decide which of the tasking alternatives to choose. Once selected, the system would automatically notify the tasked unit via pager (auto-notification to key personnel pagers), a telephone call to the unit, and remote system notification alarms (a capability soon to be made possible by RCAS data connectivity).

Once the tasked unit has deployed, the CAC coordinates and monitors the progress of the mission. This is accomplished through a near real-time crisis tracking and reporting system that monitors mission progress and tracks logistics support requests. Through the use of an advanced *near real-time* tracking and reporting system, CAC personnel and other senior officers can graphically track mission progress. The system would display position location of mobile assets (e.g., via a Global Positioning System (GPS) application similar to the type used by United Parcel Service to track vehicle location), mission epicenter, and a snapshot of the critical mission related information. The near real-time system is a tool that displays, in rich graphics, an at-a-glance picture of the "battlefield" with "drill-down" capability for more refined information.

The expert system and near real-time tracking system are two new technologies that are dramatic departures from both the baseline process and Redesign Alternative One. The baseline does not utilize any technologies of a decision support tool

like the expert system nor does it employ the use of an advanced crisis tracking and reporting system. Although RIMS in the baseline provides views that present unit assignment, SITREPs, and other crisis operations related information, it does not present it in the manner the new crisis tracking and reporting system proposes.

Redesign Alternative Three (Most Radical) introduces three new enabling technologies differentiating it from the baseline process and both Redesign Alternatives One and Two: 1) an intelligent agent-based decision support system, 2) a real-time crisis tracking and feedback system, and 3) a decision modeling system. In this conceptual design, decision making for basic unit tasking and logistics request processing would be fully automated through the use of a Decision Support System (DSS), utilizing intelligence gathering *agents*--software entities that assist people and act on their behalf. CA-ARNG units would be automatically tasked by the Guard DSS based on mission request and relevant CA-ARNG parameters (i.e., human decision making criteria, ICS Policy, MSCA Policy, unit, personnel, and equipment availability, proximity to emergency, etc.). The DSS would therefore task the appropriate assets and personnel from locations it chooses. The DSS would also automate mundane tasks such as processing logistics requests for additional assets, people, equipment, and aircraft and updating database repositories. Notice the DSS is making tasking decisions in this redesign alternative.

Additionally, the DSS would update the intelligent agent-based *real-time* crisis management system and vice versa. Although similar to the application of the crisis management system of Redesign Alternative Two, Redesign Alternative Three employs intelligent agents and a real-time crisis feedback system (as opposed to the near-real time system and no intelligent agents described in Redesign Two). This real-time system would instantaneously display, to management, feedback of the crisis operation, such as real-time tracks of airborne and ground assets, weather reports, and other intelligence information. Additionally, the technology utilized for a real-time versus the near-real time system is inherently more complex. In essence, the envisioned DSS would provide centralized tasking, coordination, and monitoring of emergency response operations.

Through the use of advanced decision modeling software (Redesign Three), decisions could be optimized through repeated trial and experimentation, thereby actually testing decisions based on a variety of scenarios. Stochastic modeling tools are now being utilized to train decision makers, test decisions prior to implementation, and

notify leaders of potential situation developments based on complex mathematical algorithms. A stochastic model application built for the CA-ARNG and fed by real-time intelligence information could present leaders with “advanced warnings” of events based on their probability of occurrence. This type of tool could be invaluable in defeating emergencies or at least minimizing their impact. Imagine a tool that would notify the CAC when the probability of a major fire or flood occurrence based upon predetermined probability threshold alarms (e.g., when the probability of an event occurring reaches 80%, notify CAC with a threshold alarm). Civilian agencies could be notified and a mobilization warning order could be issued. Optimized decisions or advanced warning would help to produce Guard asset packages designed to provide the incident commander the exact “solution” required for the emergency as well as drastically decrease the cycle and response time to the emergency.

b. Human Resource Enablers

Redesign Alternative One introduces the notion of two new human resource positions: empowered solution providers and information specialists. The *empowered solution provider* is essentially a Guard commander with appropriate assets and autonomy to provide civilian authorities solutions to their mission requirements. This concept is similar to the baseline process Operation Area Team (OAT) concept, in which assets are pre-staged and ready for use (discussed in Section 2 of this chapter). However, the empowered solution providers have the power and available assets to make broad-based decisions relating to crisis resolution. New technology described in Redesign Alternative One enables the empowered solution provider to do this by satisfying critical informational needs (e.g., timely and accurate intelligence, timely resolution to resource requests) at the incident scene. By focusing on the information requirements of the empowered solution providers, the CAC enables the onsite commander to make quick decisions and provides supply requests as well. The empowered solution provider would attain new levels of operational independence, to include access to all Guard resources at his or her discretion.

To aid in the acquisition, synthesis, storage, and presentation of information, an *information specialist* role is also introduced in Redesign Alternative One. The information specialist would focus on processing information requirements (discussed below in Information Enabler section). Specifically, the information specialist

would synthesize information related to the operation such as telephone conversations, radio reports, think-tank discussions, external agency reports, and situation reports from the field according to specific criteria. By having specialists trained in extracting relevant meaning from raw information and producing targeted knowledge, decision makers (e.g., CAC watch officer, empowered solution providers, CAC staff) could devote more attention on the operation itself, thereby allowing the CAC watch officer to focus on the mission accomplishment issues.

Redesign Two incorporates the two aforementioned human resource enablers with the addition of a *crisis generalist* role. The generalist would be responsible for overall coordination of a particular mission. The generalist is someone who is experienced in all aspects of the SEMP process and perhaps even a functional specialist in one or more of the functional categories (combat arms, logistics). The position is designed to reduce the need for numerous logistics, intelligence, administration, and combat arms and other functional area specialists through the use of an expert system built to capture knowledge from functional experts. Crisis generalists make decisions and recommendations in support of the solution provider and/or watch commander. This could reduce the personnel required to be physically present in the CAC during operations and provide a central, empowered authority on all matters pertaining to a single operation. Crisis generalists could then focus solely on the success of the mission by meeting solution providers requests, delivering updated information, and making top-level decisions relating to the specific operation.

As discussed in Alternative One, an information specialist would also be employed to synthesize all sources of information directly related to the process's information requirements. Information ready for consumption by decision makers will allow the crisis generalist to focus on broad mission accomplishment issues. The crisis generalists have no equivalent in the baseline process or Redesign Alternative One. The generalist position is analogous to a case manager role designed to collapse multiple human functions into a single, all encompassing role, enabled through the use of an expert system. The expert system would provide detail-level access to specific areas of the case (i.e., emergency) as well as procedures to resolve common case-related issues.

c. Organizational Transformation Enablers

Organizational enablers contribute significantly to redesign alternatives generation. Redesign Alternative One introduces several organizational change enablers not present in the baseline process: 1) elimination of the chain-of-command tasking, 2) reshaped traditional reporting relationships, 3) alignment of the SEMP to solution development and facilitation, 4) shifting of the CAC role from manager to coordinator and facilitator, and 5) continual organizational feedback. Redesign Alternative One introduces the elimination of SRCOM tasking in emergency response missions. This represents a significant departure from the baseline process. In this redesign, tasking takes place centrally, from CAC directly to the system-identified unit. Direct tasking significantly reduces unnecessary handoffs among various departments and commands within the CA-ARNG. Handoffs relating to unit tasking are deemed non-value-added because they do not significantly contribute to the process output of mission completion and customer (where the customer is defined as citizens impacted by the emergency, civilian authorities, and soldiers) satisfaction.

Due to the elimination of SRCOM tasking, traditional reporting relationships must be redesigned. Redesign One implies that traditional reporting relationships between tasked units and senior organizations are significantly reduced as a means to reduce redundant information and eliminate non-value added relationships during crisis response.

Distilled to its core function, Redesign Alternative One indicates that the SEMP would direct all its people, technology and organizational structure to focus on ensuring the success of the Guard commander conducting emergency operations. In other words, all activities are designed to achieve SEMP alignment to the output of customer satisfaction (i.e., mission resolution). The mindset of the SEMP personnel would become more akin to that of a corporate service process designed to produce a value-added service product to its customer. The SEMP is, in essence, a service process, designed to develop a solution in the form of a customer tailored Guard emergency response team and then apply all resources as needed to ensure customer satisfaction. This would be accomplished by providing the solution provider (Guard commander at the incident scene) with accurate and timely information, equipment assets, and general support. This will allow the commander to focus on producing the outputs of the process: mission completion and exceeding customer expectations.

The CAC's primary role in the SEMP now becomes that of facilitator and coordinator. CAC is the "eyes and ears" of the Adjutant General (TAG); as such, it is concerned with coordinating the accomplishment of the mission without producing non-value added overhead. Facilitating information and asset requests from the empowered solution provider while coordinating (when required) the delivery of these requests is the primary CAC responsibility aside from unit tasking. The facilitation and coordination role also implies a "think-tank" function, where potential mission developments can be postulated and notional solutions developed.

The continuous feedback identified in Redesign One is considered an organization enabler. Feedback on the operation would be continuous. With the availability of communication technology and information systems, solution providers and information specialists would receive feedback on internal and external customers needs. For example, during the demobilization phase, structured feedback sessions would be conducted with representation from all key stakeholders and an emphasis on the external customer. The goal of these sessions is to develop action plans to correct agreed-upon process faults. Feedback sessions would create an empowered team, whereby the team has the authority to take corrective action through policy and plan modification. Feedback might also be gained through on-line forms filled-out by internal and external customers. This highly dynamic process is designed to review all known process activities, measurements (discussed below) and customer feedback. It uses this feedback to produce meaningful information, which allows team members to make educated, performance-driven decisions to improve the overall health of the process. The lack of feedback in the baseline SEMP is viewed as a critical deficiency; increasing this valuable enabler will shift the focus towards customer satisfaction.

Redesign Alternative Two incorporates each of the organizational enablers described earlier with the addition of: 1) the reduction of functional-based staff (J1, J2, J3) positions in CAC, 2) the decreased human role in formulating routine decision alternatives, and 3) shifting the organizational mindset to from crisis response to crisis prevention. With the introduction of the crisis generalist, the need for a large functional staff decreases. This would potentially allow a CAC staff reduction during crisis operations. The generalist position also allows end-to-end oversight and feedback from a specific operation. Functional experts would focus on information accuracy, administrative process activities that aid the SEMP, the execution of specific mission areas, and support the generalist when issues are beyond their ability to solve it.

The second redesign also implies a decreased role in human decision generation. With the use of the expert system, decision alternatives are generated. Generalists or watch officers task units based on one of the decision alternatives. Humans would no longer be required to gather the information needed to formulate decision alternatives. This represents a dramatic departure from both the baseline process and Redesign One.

Finally, Redesign Two introduces a cultural paradigm shift that impacts organizational behavior and structure. Shifting the mindset from reaction to prevention produces creative initiatives designed to prevent or minimize crisis impact. A suggested manifestation of the new mindset is the creation of *joint-agency prevention teams*. These teams would be designed to develop action plans and acquire funding for projects and other initiatives designed specifically to reduce the impact of future crises (fires, floods, civil disorder, weapons of mass destruction). It is envisioned that this team would assemble innovative members of participating joint-agencies (i.e., CA-ARNG, CDF, OES, Highway Patrol, FEMA, etc.) with the goal of ultimately preventing a crisis from beginning in the first place. For example, by quantifying the total loss of property and the cost of solving a crisis, funding for dam shoring, forest clearing, fire breaks, additional rangers, advanced technology, and perhaps increasing use of civil air patrols over potential fire and flood areas, the Guard could proactively work to prevent many emergencies. Prevention teams would also foster a closer working relationship among key agencies often required to work together in combating an emergency situation. In short, the prevention teams would be proactive rather than responsive. Prevention is ultimately the best defense against a emergency situation.

Redesign Alternative Three incorporates the organizational enablers described in Redesigns One and Two. However, it makes the most radical departure from the baseline process in that it proposes elimination of the human role in routine decision making altogether. Redesign Three proposes the implementation of an advanced decision support system with intelligent agents. The full use of this system would completely eliminate the need for human decision making on routine matters such as unit tasking and supply request processing. The elimination of human decision making will produce enormous changes in the SEMP process; based upon factors such as ownership, trust in the decisions themselves and organizational culture. The salient issues surrounding the ramifications of the DSS are discussed in subsequently in greater detail.

d. Information Enablers

Redesign Alternative One introduces the concept of information requirements. By defining the specific information required by the SEMP at all levels of the process, this information can be acquired, stored and presented in a variety of systems and formats. This supports the redesign of the SEMP by distilling the vast amount of information communicated in a crisis into a set of key information requirements. We view an information management process like that described above as a critical success factor that would negatively impact the SEMP if not addressed. Redesign Alternatives Two and Three both view defining information requirements as an essential element in SEMP process performance. Compared to the baseline process, no known work has been done to define information requirements at any part of the SEMP.

e. KOPeR Comparisons of the Redesign Alternatives

This section provides quantitative support for the redesign alternatives presented in the aforementioned paragraphs. Beginning with the baseline process mentioned in Section C of this chapter, the KOPeR measurement techniques have been applied to the redesign alternatives to provide measurable tracking of the power of redesign technology and organizational enablers. Below are the KOPeR measurements of the least radical redesign alternative.

<u>Measure</u>	<u>Value</u>	<u>Pathology</u>
Parallelism	1.2	Sequential Process
Handoffs Fraction	0.167	Satisfactory
Feedback Fraction	0.0	Satisfactory
IT Support Fraction	0.75	Satisfactory
IT Communication Fraction	0.75	Satisfactory
IT Automation Fraction	0.0	Inadequate

Table 5.2 - Redesign Alternative 1 KOPeR Analysis

When comparing the SEMP baseline with the information provided above for Redesign Alternative One, the parallelism of this redesign has increased over the baseline from 1.1 to 1.2 resulting in a gain of 9%. While this may seem like an insignificant amount, it does offer marginal improvement over the baseline process. The

redesigned process performs more steps in parallel than that of the baseline, thus reducing the number of handoffs and effectively reduces the cycle time required to respond to an emergency. The real benefits of this redesign are in using information technology as an enabler. The use of this enabler helps to make the organization more efficient by allowing direct access to data vice “trickle down” dissemination, which often results in delays and the loss of meaning. Workflow has decreased the number of handoffs and resulted in a 63% decrease over the baseline. As evidenced by the KOPeR measurements above, the use of information technology support and communication have each increased to 0.75 resulting in gains of 37% and 75% over the baseline, respectively. This is due in large part to the deployment of the RIMS system to the unit level, and the increased functionality described in Redesign One. By doing so, valuable time is not wasted on trying to access this information.

Recall that in Redesign Alternative Two, the use of information technology automation is introduced. Although automation is present only to a minimal degree (i.e., through expert system), it does provide improvement over Redesign One and offers substantial performance enhancements over the baseline process. The corresponding KOPeR measurements are presented below.

<u>Measure</u>	<u>Value</u>	<u>Pathology</u>
Parallelism	1.2	Sequential Process
Handoffs Fraction	0.167	Satisfactory
Feedback Fraction	0.0	Satisfactory
IT Support Fraction	0.917	Satisfactory
IT Communication Fraction	0.917	Satisfactory
IT Automation Fraction	0.25	Satisfactory

Table 5.3 - Redesign Alternative 2 KOPeR Analysis

Automation requires substantial information technology support (capabilities) and a robust communication infrastructure. As such, the measurements in the information technology support and communication categories, when compared to Redesign One, have increased by roughly 22% while automation has dramatically increased from zero to 25%. Additionally, all of the pathologies are now deemed satisfactory by the KOPeR analysis tool. This essentially represents a "clean bill of

health" by KOPeR. Should the Guard opt to implement this radical redesign alternative from the start (i.e., skip Redesign Alternative One), they could realize substantial gains. When compared directly to the baseline process, Redesign Alternative Two yields an IT automation with a 174% increase. Other areas of significant improvement are the 63% decrease in handoffs, and the 68% and 174% increases in information technology support and communication, respectively.

In the Third Redesign Alternative, automation is given a top priority. The measurements are depicted below.

Measure	Value	Pathology
Parallelism	1.2	Sequential Process
Handoffs Fraction	0.083	Satisfactory
Feedback Fraction	0.0	Satisfactory
IT Support Fraction	0.917	Satisfactory
IT Communication Fraction	0.917	Satisfactory
IT Automation Fraction	0.583	Satisfactory

Table 5.4 - Redesign Alternative 3 KOPeR Analysis

The measurements from this table represent the last of our three redesign alternatives and offers further improvement over the other two redesign alternatives. While it is difficult to improve much on the dramatic gains made possible through the other redesign alternatives, we believe this third redesign to represent the future end state the Guard should strive to achieve. Although it still remains impossible to predict with certainty the nature and time of a crisis, it is possible to reduce the amount of time required responding to an event. Evidence confirming this is presented in the above chart where the number of handoffs is decreased by 50% to .083 percent from .167 percent. This effectively results in a corresponding decrease in cycle time. Information technology automation has increased with the introduction of a decision support system utilizing intelligent agents realizing a net gain of 133%.

3. Performance Objectives

The performance objectives described for each of the redesign alternatives are developed during process visioning sessions like those depicted in Figure 3.8. These

objectives answer the question, "How well will it work?" Generic categories such as cost reduction, customer satisfaction, information quality, and cycle time are derived from Davenport and recommendations are shown in Figure 3.8. In order to be meaningful, performance objectives must be assigned quantitative targets like those described in the three redesign alternatives. Quantitative targets are developed based upon what we believe would produce order-of-magnitude process improvements (i.e., generally objectives that target over 50% increase in performance).

Each redesign alternative identifies five generic performance objective categories: 1) cost analysis or reduction, 2) customer satisfaction, 3) information quality, 4) cycle time, and 5) response time. In the following paragraphs, each objective category is described with quantifiable targets for the three redesign alternatives.

a. Cost Analysis or Reduction

The first performance objective targets the identification and reduction of process costs. This includes analyzing not only the cost of equipment and soldier deployment such as fuel costs, maintenance cost, material expenditures, and soldier pay but also the cost of the process activities expended in coordinating the emergency operation. Redesign Alternatives One and Two target the implementation of a new cost analysis system within one year. This objective recognizes the effort required to capture and quantify process costs to include training and actual deployment of the costing procedure. This is reflected in the objective to increase awareness the importance of process costs and make the actual costs understandable (referred to above as "cost visibility") to decision makers. Once this has been accomplished, key process executives and managers can begin to pinpoint areas for improvement based on the total cost of "doing business."

Redesign Three is more ambitious due its targeting of actual cost reduction. Specifically, it proposes a reduction of emergency response costs by 25% in two years. This target is selected due to the radical design of the process (i.e., combination of change levers) and the potential for cost saving. The recommended methodology is Activity Based Costing (ABC), a Department of Defense endorsed methodology used to capture and quantify process oriented costs.

b. Customer Satisfaction

The next performance objective focuses on the achieving greater levels of customer satisfaction. Redesign Alternatives One, Two and Three have the same customer satisfaction targets. Specifically, considering that there is no data on actual levels, we feel customer satisfaction should first be measured and can then be increased through process innovation by 90% in two years for each of the redesigns. The 90% target represents the kind of performance improvement targets required for process innovation and serves as an aggressive target against which redesign teams can assess future improvements.

This target could be reached by 1) engaging customers in meaningful dialogue and quantifiable feedback measurements, and 2) delivering flexible solutions, on time, to customers. Customer satisfaction could be measured by surveys to target performance improvement opportunities. Feedback forms could be provided to customers on a web-site with weighted categories to quantify qualitative input (e.g., outstanding equals a point score of 5). More dynamic input should be obtained through formal feedback sessions where participants (internal and external customers) focus on quality and performance issues.

c. Information Quality

Information quality represents a performance category designed to focus the organization on the critical role information quality plays in process performance. Redesign Alternatives One and Two target an increase in information quality by 80% in two years. No information is provided in the Baseline process regarding information quality. However, once it is assessed, 80% represents a bold target designed to push SEMP process workers toward the notion that information quality begins with the individual worker. This target could be reached by first defining information requirements, and then acquiring, synthesizing, storing, and presenting rich information in an accurate, timely and easily accessible manner.

Information quality measurement represents a new area of measurement research. Many new metrics are being developed and represent an area for future thesis research and implementation. However, survey forms similar to the type mentioned above might be employed to develop a baseline understanding of how customers feel about the quality of information they receive. Responses in the area of information

quality may produce extremely useful data for analysis and information to help IT executives plan for increased utilization of their respective resources.

d. Cycle Time

Cycle time is a process measurement designed to identify the elapsed time between process input and output. One definition of cycle time for the SEMP begins with mission order number receipt and ends when the tasked unit actually deploys to the crisis. Redesign Alternative One targets a reduction in process cycle time by 50% in one and a half years. This number reflects the possible cycle time reduction commensurate with the enablers described in Redesign Alternative One. Further, based on more significant change enablers, Redesign Two targets a 75% cycle time reduction in one and a half years, while Redesign Alternative Three targets an 80% reduction in two years.

These targets could be achieved by significantly reducing or eliminating non-value-added processes and handoffs. In Redesign Alternatives Two and Three, for instance, crisis generalists and advanced technology (expert system and decision support system) would assist in reducing non value-added activities and processes. Additionally, the introduction of parallelism in normally sequential processes can play a major role in reducing cycle time.

e. Response Time

Reducing crisis response time can produce significant performance improvements for the Guard. We define this measure beginning from the time the assigned unit is tasked until the main-relief effort arrives on scene. The response time improvement targets vary with the degree of change enabler severity (i.e., the number and type of change enablers applied). Redesign Alternative One targets a 40% reduction in 1 year, Redesign Two a 50% reduction in 1 year, and Redesign Three a reduction of 60% in 1 year. We believe these targets represent moderately aggressive targets that could be realized when the process is fully implemented. Reducing response time provides one of the most significant tangible impacts on external customers.

4. Critical Success Factors

Critical success factors (CSF) are also developed during process visioning sessions like those depicted in Figure 3.8. CSFs answer the question, "What things have

to go right?" This is an important element in a process innovation plan, as it identifies the issues most central to the success of the process. Generic critical success factors, derived from Davenport's recommendations described in Figure 3.8, are applied to three categories: 1) people, 2) technology, and 3) product. These factors are also developed through brainstorming sessions and represent a best effort approach to identify the key issues.

a. People

Of the many critical success factors relating to people identified in the three redesign alternatives, the two most salient are: 1) understanding human roles in the process, and 2) the need for qualified people to develop, implement, and manage the process and technology. The roles of people in the process must be clearly identified. This implies that like other enablers, people must know how their performance impacts the process as whole. They must see themselves as critical element in the system and identify with their responsibilities. Individual and group performance objectives, tied to credible and tangible incentives, will significantly increase the productivity and satisfaction of people in the process.

Related to understanding the roles of humans in the process is the need to have qualified people to perform process work. In essence, training and hiring of qualified people based upon clearly defined skill sets (i.e., the types of skills workers must possess in order to be successful) for process workers is deemed essential to the success of the process.

b. Technology

Technology critical success factors are also numerous, each defining issues that must be addressed in order to realize performance objectives. Three CSFs that apply to all three redesign alternatives are particularly important: 1) new technology must utilize existing infrastructure, 2) data must be accessible at all levels of the organization, and 3) databases must be integrated and information kept current.

The use of the existing infrastructure is central to the success of any technology implementation in the SEMP. The Guard has invested heavily in recent years to develop a robust communications infrastructure. All systems that are targeted for implementation must be capable of utilizing the infrastructure. Additional investment to

increase the capabilities of the infrastructure is viewed as financially and technically impractical, however.

The implementation of this new infrastructure makes it possible to provide communication and information services at the lowest unit level. In the new process, all process workers must have access to information technology in order to perform their roles. This is particularly critical at the incident scene, but more technically challenging as well. However, by not providing access to all process workers and the crisis solution provider in particular, the process will be incapable of reaching its performance objectives while leaving many critical workers "out of the loop". This perpetuates the state of information "haves" and "have-nots", ultimately impacting worker satisfaction and product output.

The critical of importance of integrated databases and information maintenance cannot be overstated. If the information is to be of value to the process, it must be accurate and easily accessible for all who require the information. Databases must be built with technology that is scalable and capable of storing and accessing a wide variety of data formats. Furthermore, identifying information requirements and building robust databases that support the storage of this information is essential to process success.

Redesign Alternatives Two and Three must also have the correct system decision-making parameters. Both the expert and decision support systems require algorithms that model human decision making criteria in order to produce accurate decisions that take into account human factors. Redesign Alternative Three must also have intelligent agents that can search, process, and deliver information required by the system users. Without the proper technology embedded in these tools, they serve no purpose and therefore significantly decrease the likelihood that their stated performance objective can be reached.

c. Product

Two critical product success factors common to all three redesigns account for the most significant impact: 1) empowered solution provider, and 2) well trained soldiers. The output of the SEMP, mission accomplishment, should exceed customers' expectations of service. As stated in all redesign alternatives, SEMP is essentially a process designed to produce a service. That service is packaged in the form of a solution

provider, tailored to satisfy customer requirements. Critical to satisfying customer requirements is to empower the solution provider with broad access to resources and the authority to make on-the-scene decisions. We view establishment of the empowered solution provider role, along with resources and authority, as essential to the success of all redesign alternatives. Nothing short of full autonomy within the mission requirement parameters will allow the Guard commander (solution provider) and his or her soldiers to achieve their full potential.

Closely related to the success of the empowered solution provider is the requirement to field only well trained soldiers. A force of qualified, professional soldiers, skilled in their respective military occupation specialty (MOS), is how the Guard truly impacts the citizens of California. This is perhaps the most critical among all success factors. Without qualified, competent, and professional soldiers, the Guard has far more serious problems than non-optimized processes.

5. Potential Barriers to Implementation

The potential barriers to implementation of the three redesign alternatives are developed during process visioning sessions depicted in Figure 3.8. These objectives answer the question, "Why might they not go right?" Generic potential barrier categories are derived from Davenport's recommendations shown in Figure 3.8. Each redesign alternative identifies six generic potential barriers to implementation categories: 1) resource allocation, 2) organizational, cultural, 3) technical, 4) product factors, 5) environment, and 6) information. In the following paragraphs, each objective category is described with targets that vary by redesign alternative.

a. Resource Allocation

Resource allocation barriers encompass a wide range of issues. However, two issues emerge as the most critical: time and money. All three redesign alternatives can be equally affected by these constraints. Lack of time to implement any of these redesigns could be a product of poor planning or operational commitments taking priority over the process implementation. And funding is nearly always a constrained resource. A successfully redesigned SEMP implementation requires funding for training, technology, infrastructure, and personnel. The critical nature of these two resources and

their inherent volatility (i.e., propensity to rapidly change) make these two resources potential barriers to implementation.

b. Organizational, Cultural

Cultural and organizational barriers preclude any change from happening smoothly. Whenever there is change, cultural resistance is never far behind. This is a universal reality common to all redesign alternatives. Furthermore, those intimately familiar with the current process may not perceive the need for change or may not be willing to share their responsibility and power with the new culture of the empowered solution provider.

Redesign Alternative Two could meet additional resistance beyond that described above with regard to the creation of the generalist role vice the traditional functional roles prevalent in the CAC. The generalist position allows for a reduction in human labor, which might upset the balance of power within the organization. Further, redesign Alternative Three fosters a reliance on technology for decision making and in some routine decisions, eliminates humans entirely. This may seem too radical to most people, especially those who have risen through the ranks who may not want to allow technology to make decisions formerly done by unit commanders.

c. Technical

Technical barriers to implementation are characterized by an ever-increasing need for more bandwidth, the difficulty in building and implementing a technological infrastructure, and the interoperability among software applications (databases in particular). These barriers can appear in any of the redesign alternatives and can impede progress. In Redesign Alternative Two, for example, the feasibility of implementing leading edge technology becomes an issue. As with any implementation of new technology, adequate time may not have been allotted to properly test and verify the new technology. The possibility exists that the technology may not yet even be demonstrated, as is the case of Redesign Alternative Three. Intelligent agents exist, but may not be able to provide the functionality and services demanded by this redesign alternative.

d. Product Factors

Potential barriers to implementing the product can be distilled to two primary factors that potentially impact all three redesigns: 1) inaccurate information, which leads to a poor solution and unsatisfied customer, and 2) soldiers not having the proper military skills. Quality information has been described in the aforementioned paragraphs as being directly tied to a quality product. The product can be considered as both the development of the Guard response and the process output of a satisfied customer. In either respect, inaccurate information would lead to both a poor Guard response and ultimately an unsatisfied customer.

e. Environment

Environmental barriers to implementation may be defined as those issues outside the actual SEMP, yet that would negatively impact the process if not accomplished. No environmental barriers were identified in connection with Redesign One. However, alternatives two and three share 2 potential barriers: 1) unwillingness of external agencies to share information, and 2) prevention initiatives may be viewed as unfeasible. Alternatives two and three require information from external agencies such as weather, intelligence reports and other information important to a successful product. If these agencies are unwilling to provide access to their information, or allow Guard systems developers to create links to their information, the entire SEMP process could be deprived of its required external information.

The notion of developing initiatives that target crisis prevention may be deemed as too "far fetched" to obtain needed executive support for team establishment and funding. The idea of being able to prevent crises or take action based upon probabilistic occurrence represents a foreign concept in the minds of most veterans within the Guard culture. Because the prevention concept is unusual, it faces a significant barrier in the form of resistance by those who deem it infeasible.

f. Information

Information barriers to implementation describe issues that impact the ability of information to support the SEMP. Two barriers common to all redesigns represent the most significant issues: 1) improper identification of SEMP information

requirements and 2) timely flow of accurate information. In order for SEMP workers to perform functions as knowledge workers (i.e., workers who are empowered with information and knowledge about their role in the process), information requirements must be identified throughout the process. This requires a thorough analysis of the kinds of information people need to perform their jobs. Information requirements identification is also critical to constructing robust information systems that can capture data based on the requirements of the process. This is not a simple endeavor and is therefore deemed a potential barrier to a successful process implementation.

Tightly coupled with the identification of information requirements is the ability to communicate timely and accurate information throughout the organization. Inaccurate information negatively affects the process. Accurate information that is not communicated in a timely manner adds no value to the process if it cannot be utilized at the decision point. Accuracy is ultimately the responsibility of each process worker (to include executives). The timeliness of the information is related to the ability of the information to be synthesized, stored, and made available to the user. The difficult nature of training process workers to be information managers as well as the technical (e.g., performance of the system and network) and human issues (e.g., information synthesis) related to timeliness and speed of information delivery make these issues potential barriers to process implementation.

E. SUMMARY

This redesign phase of the thesis culminates six months of process analysis of the California Army National Guard. We discussed our use of a hybrid methodology based upon Davenport's high-level approach to process innovation as a means for conducting the CA-ARNG process analysis and redesign. A thorough examination of the baseline process was undertaken to discover existing process pathologies and faults. Utilizing KOPeR, the baseline was measured and redesign recommendations were presented.

During our examination of the State Emergency Response Process (SEMP) we made several assumptions regarding the role of the CAC. The SEMP is essentially a service production process. Specifically, the CAC develops a solution (Guard's emergency response package), and coordinates the delivery of the tailor made solution based on external customer needs. The majority of the work performed by CAC relates to the tasking, tracking, reporting, and coordinating Guard emergency mobilization. The

performance and quality of the solution package and ultimately the output of the SEMP, customer satisfaction, fall under the responsibility of the SEMP owner, the Director of Plans and Operations. Based on these assumptions, the thesis team developed three redesign alternatives that address these roles and responsibilities.

Redesign One represents the least radical redesign alternative, but it still offers good potential for performance improvement. It utilizes RIMS in an innovative way to assist in the tracking of the crisis. In addition, the redesign describes how the SEMP Intranet could be used to harness other applications and information and make it available to SEMP solution providers and process workers. Unit tasking is direct from CAC to an available unit. Empowered solution providers deploy with custom tailored solution packages organized by region, all of whom possess the basic capabilities needed for the most common types of emergencies. Guard "solution providers" are aided by a communications and information package that facilitates the collection and dissemination of information to include intelligence information and logistics requests. Information specialists assist information collection and disseminating activities by fusing structured and unstructured information into a usable product based on mission needs and generic information requirements. The performance objectives focus on increasing the availability of cost information, dramatically reducing cycle and response time while increasing information quality.

Alternative Two is considered a radical redesign based on its use of cutting edge technology to automate many routine processes (tasking, tracking) and reduce the personnel requirements of the CAC. An expert system was introduced as a tool to generate tasking decision alternatives for the watch officer's approval. A near real-time crisis information system coordinates and facilitates the command and control functions of emergency mobilization. Near real-time feedback displayed in a graphically rich manner would help crisis generalists and watch officers track the progress of the operation. The system's primary focus is to ensure that the solution provider is supported with accurate information and timely resolution to logistics requests. The notion of agency prevention teams is discussed in this design. Prevention teams are based on a proactive approach to prevent crises before they are able to develop. Cost reduction and dramatic reductions in cycle and response are the objectives driving process performance.

The third alternative is the most radical redesign, primarily due to use of leading-edge technology and the complete elimination of routine decision making related to unit tasking and logistics requests. The decision support system automatically selects a course

of action based on mission requirements then seamlessly tasks a solution provider. It is envisioned that additional assets would be processed in a similar manner to goods ordered on the Internet, where requests for goods are submitted by customers who are also provided an expected delivery time and a tracking number. CAC personnel would be released from traditional functions to focus on managing information quality and supporting the empowered solution provider. Alternative Three also prescribes the use of advanced probabilistic modeling tools to examine potential decisions and provide advanced warning of possible emergencies based on their probability of occurrence.

All three redesign alternatives are designed to introduce innovative practices and approaches to the SEMP. These recommendations reflect over a year's worth of contact and with and study of the CA-ARNG, and reflect the assumptions and relatively unbiased viewpoints of the thesis team as well. The ideas explored in this chapter are inherently provocative since most of the redesigned process characteristics are based on an external perspective. As such, recommendations are not limited to traditional notions of organizational structure, reporting relationships, and cultural boundaries. The three redesign alternatives are compared, in detailed chart form, in Appendix C to provide the reader another view of how the alternatives are similar in many respects and yet different in their application of technology, human resources, organizational structure, and information management enablers of process innovation.

VI. CHANGE MANAGEMENT PLAN

With the three recommendations for process redesign provided in Chapter V, the primary research questions posed by the thesis have been answered. However, for any of these redesign alternatives to be successfully executed, more will be required than just the blueprint for the new process. A means for introducing, organizing, administering and monitoring the change inherent in the redesigned process is needed – in short, a change management program.

Without a doubt, the need to effectively manage and facilitate organizational change is critical to the success of any new program. Business process innovation requires organizations to leave behind the comfortable, known ways of doing business; it requires management and individuals to think as process owners, to think about intra- and inter-organizational boundaries in new ways. Repeatedly, it has been found that the main barriers to process innovation are organizational, not technical. Making things even more difficult is the fact that there are as many reasons for organizational change, and particular methods of implementing change management programs, as there are organizations performing these programs. Even so, certain basic fundamentals are found in all change management programs. This chapter examines two central models of change, highlighting the essential characteristics as well as advantages and disadvantages of each. It then presents some of the factors that typically affect organizational change, including critical success factors necessary for any change program to succeed. Finally, characteristics of an information-age organization, based on socio-technical systems design principles, are addressed. We follow this discussion by incorporating these design principles into a change management plan through the use of parallel learning structures, a method especially well-suited for the implementation of reengineered processes. We conclude this chapter by describing a high-level framework for utilizing a parallel learning structure within the CA-ARNG. Team composition, organizational change roles, and possible resources needed in order to implement the redesign alternatives proposed are discussed.

A. CHANGE MANAGEMENT PRINCIPLES

As leaders of many types of organizations today have discovered, guiding an organization – whether a corporation or a brigade – requires new kinds of thinking and

new ways of doing business. One major trend is the reduced reliance placed on management authority and formal rules and procedures. Top-heavy, bureaucratically choked organizations are struggling to streamline their structures, decision processes, and work processes in order to become more agile in the extremely competitive markets of the information age. These companies are examining the narrow definitions of work created during the industrial age, and finding them lacking compared to the requirements of work in the information age, as discussed in Chapter III. Emerging from this analysis is the concept of teams organized around work processes, as opposed to isolated individuals working in very narrowly-defined jobs in an assembly-line type structure. Teams offer significant advantages over the old way of doing work. They share information more effectively, manage themselves internally, cross-train and educate their members independently according to the specific demands of the process they own, and generally feel tremendously more significant to the overall organization. As a result, responsibility and authority are being delegated farther down into the organization's hierarchy than ever before. Organizations are becoming "process-driven", where the requirements of the business drive inter-relationships and reporting roles. However, these changes are not happening overnight, nor are they occurring without significant effort. In order to be truly successful it also requires one other crucial ingredient – a change management program. [Ref. 31, p. 158]

Depending on their fundamental approach, most change management programs will fall into one of two broad categories. These are top-down or management driven change, and bottom-up, or participative change. The defining difference between these two extremes lies in the manner in which they initiate and propagate change, as opposed to the ultimate goals of the change programs used by each. The sub-sections below highlight the central principles of each approach, beginning with top-down change.

1. Top-Down Change

Top-down or programmatic change programs fundamentally begin with the attitudes and beliefs of individuals. Changes in attitudes produce changes in behavior. Changes in individual behavior repeated by many individuals will result in organizational change [Ref. 31, p. 159]. In order to effectively lead change and revitalize an organization, the impetus, vision, and overall stewardship must come from the senior management/leadership of that organization. Although many of the activities performed

and roles assigned during this type of program are identical to those in a bottom-up change effort, the primary difference is ownership of the overall change process. In a top-down strategy, these functions belong to the top management of the organization. Change management here is treated as a directed process, with the Commanding Officer/Chief Executive Officer and other senior leaders in the organization orchestrating it through a sequence of planned steps in order to bring about the desired end-state. In a model suggested by Kotter [Ref. 32, pp. 59-67], there are eight primary phases during a transformation process, each critical to the success of the overall effort. A brief description of this model follows.

a. Establish a Sense of Urgency

The leader or a small group of senior management individuals within an organization begins this step by becoming aware of issues negatively affecting the organization's performance. These issues may arise out of the organization's competitive situation, trends in technology, market position, or financial performance. Although these measures address commercial business, corresponding factors for military organizations include changes in operating environment, missions, threat profiles, new weapons systems technologies, new training methods and procedures, changes in readiness status due to manpower fluctuations, decreased budgets, and others. An unflinching examination of the organization and its overall vital signs is crucial at this stage in order to demonstrate a need for change.

Next, this need must be communicated in the strongest possible terms to the entire organization. Everyone must be made aware of the absolute necessity of achieving significant improvement; the status quo must be made to seem more dangerous in comparison. Organizations which falter at this stage often fail to generate a sufficient sense of urgency, and therefore lack the inertia to move people out of their "comfort zones" [Ref. 32, p. 60]. Based on his observation of various change efforts over a period of some years, Kotter estimates that successful change efforts were those in which at least 75% or more of middle management were convinced that the status quo had become untenable. [Ref. 32, p. 62]

b. Form a Powerful Guiding Coalition

The role of a guiding coalition is to guide the overall transformation process. Specifically, it should maintain the impetus behind the process, remove obstacles, monitor results, ensure that progress and decisions made during the effort are communicated to the rest of the organization, and plan the organization's new strategies. In large organizations, this body needs between 20-50 members in order to achieve critical mass [Ref. 32, p. 62]. For an organization such as the CA-ARNG, that number would certainly be larger. As the guiding coalition tends to operate outside the normal hierarchy of the organization, it is capable of accomplishing acts the normal bureaucracy cannot produce. The difficulty in this stage is developing a powerful enough coalition to overcome the inevitable resistance any serious change effort will encounter. Also, it is crucial to place a line officer/manager in charge of this effort. Programs lead by a staff division (such as human resources, information systems, etc.) will never achieve the power required to truly institutionalize the changes. [Ref. 32, p. 62]

c. Create a Vision

At the heart of a successful change effort is a strong guiding vision, one that inspires customers, employees, and management alike. The vision must be clearly defined, easily communicated, and must completely incorporate the desired direction for the organization. Without the right vision, a program can disintegrate into unrelated and ineffectual improvement programs.

d. Communicate the Vision

Kotter states that unsuccessful change programs typically under-communicate the vision by factors of 100 to 1000 [Ref. 32, p. 63]. Every single available channel must be maximized in order to really get the message across effectively. Newsletters, meetings, and speeches are not enough. The vision must be incorporated into the hour-by-hour work of everyone in the organization. Individual and unit performance reviews, strategy planning sessions, routine meetings, and question and answer sessions should all tie into the vision. The actions of senior management, especially, must reflect adherence to the common vision. This step should be continuous throughout the life of the transformation. [Ref. 32, pp. 63-64]

e. Remove Obstacles to the New Vision

Obstacles may come in a variety of forms, from narrow definitions of work, outdated compensation or performance review methods, or personnel who simply refuse to support the change effort. Individuals causing problems need to be treated fairly and in keeping with the vision; they also need to be given a chance to accept changes. Those not responding to the new vision and change effort will serve as counterpoint to the types of performance, capabilities, and attitudes expected in the new organization. Removing them will send the organization a powerful message – top management is truly committed to the change effort.

f. Plan for and Create Short-Term Wins

Motivation is a serious concern for a change effort and can be a significant boost or impediment, depending on how the program is handled. The identification and successful realization of short term goals are critical to maintaining a high level of morale over the long haul faced by real change efforts (anywhere from 12-24 months or perhaps longer). While the long-term focus must be maintained, proving positive results that can be achieved through the selected course of action is necessary to keep members interested and motivated to continue. The level of urgency must still be maintained. Therefore, the “low-hanging fruit” of the change program should be used as signposts of the successful beginning of the change effort. [Ref. 32, p. 65]

g. Consolidate Improvements and Produce Still More Change

The basic task in this phase is to continue to execute the program, and not celebrate victory too soon. Many organizations fail during this phase, citing short-term wins as evidence of victory and reason to resume normal activities. Instead, what should occur here is a jump forward into the next level of difficulty. The confidence gained from short-term wins should be used as a springboard to attack more difficult goals. How personnel are promoted, hired, and developed professionally should be examined for alignment with the vision. Other formal structures or systems which may be inconsistent with the vision and have not been dealt with yet should also be addressed. Overall, it is important to understand that successful change efforts take years, not months, to effect.

Organizations should allow from five to ten years for changes to become part of the organizational culture. [Ref. 32, pp. 66-67]

h. Institutionalize New Approaches – Anchor Changes in Corporate Culture

The importance of this stage cannot be overemphasized; for changes to truly be effective in the long term, they must become rooted in the social norms and shared values of the organization. Two actions must be taken to help this process along. First, the true link between the change efforts and results achieved must be communicated to the organization very strongly. A very visible attempt must be made to demonstrate how the new behaviors, approaches, and attitudes have helped effect the transformation. Next, sufficient time and effort must be put into educating future senior leadership in the philosophy of change so that the organization will not become static in the future. [Ref. 32, p. 67]. Many elements of the top-down model are echoed in the overall list of critical success factors for change management, addressed in a following sub-section. An obvious advantage to this model is its compatibility with the military organizational hierarchy. However, the military paradigm is significantly different than that of commercial industry, and other factors specific to DoD must be considered (personnel rotation, reporting relationships, etc). Also, while the approach may work for some organizations, it clearly relies heavily on the ability to direct a challenging process such as organization-wide transformation. The bottom-up change model, on the other hand, relies on grass-roots action by employees to advance change throughout the organization.

2. Bottom-Up Change

Bottom-up or "participative" change management programs take the diametrically opposite approach from top-down programs; that is, instead of seeking to first change attitudes and beliefs, the participative approach endeavors to change the organizational roles that people play as a way to shape individual behavior. The most effective way to change behavior is to put people in a new organizational context, where new roles, responsibilities, and relationships are thrust upon them [Ref. 31, p. 159].

The existence of bottom-up change is perhaps in response to several assumptions of the top-down model which do not prove to be true in every circumstance, or for every organization. The first is that organization-wide programs, such as mission statement

development, "corporate culture" programs, and training courses will actually transform the organization in some basic way. The second is that an employee's behavior can be changed by altering the organization's formal structure and management systems. According to the model proposed by Beer, Eisenstat, and Spector [Ref. 31], the exact opposite is true – the greatest obstacle to true revitalization is the flawed idea that it will come from these company-wide change programs (particularly when sponsored by the human resources or similar department). In other words, formal organizational structures and systems cannot lead the charge in a corporate renewal process. [Ref. 31]

Instead, according to Beer et al, successful changes actually begin at the periphery of an organization, usually in some unit or division of a larger company which has the need (and enough autonomy) to experiment with new methods of doing things in order to solve real business problems. They begin not with formal structures but with ad hoc bodies created to deal with specific issues. Redesigned business processes may evolve out of these working structures, as middle managers try to achieve "task alignment," wherein employee roles, relationships and responsibilities may be changed in order to support the primary business process of the unit. The focus in these nascent change efforts, unlike some top-down change programs, is on the work itself – not on abstract concepts. [Ref. 31, p. 159]

In a military organization like the CA-ARNG, the "unit" analogy is a fitting one. The size, ingrained bureaucratic hierarchy, and geographically dispersed nature of its forces translates well into the model for peripheral change. However, in order for such change to ever cross the boundaries of a few successful units and become officially adopted by the entire organization, the support of the Guard's senior leadership will be essential. The defining element of this support will be the leadership's ability to assume the role of enablers of grass-roots change, not directors of programmatic change.

The temptation to flush out successful policies and methods developed by one unit and make them mandatory for the entire organization is ever-present, and indeed a standard means of striving for small, continual improvement. However, the crucial role that top management must assume is that of facilitators to change efforts. Attempting to grab the reins and direct what started out as a non-directive process will derail the effort before it can become successful. How can senior management facilitate the change effort begun by operators and middle managers? By creating a "climate for change", and then spreading the lessons learned from various successes and failures to the rest of the organization. Instead of specifying specific solutions or steps to be taken, top

management indicates the general direction in which the organization should move. Eventually, as this grass-roots change reaches critical mass, the senior leadership must transform itself into the management structure required for the new organization. Formal structures, systems, and policies must now also be aligned with the new practices of the organization. [Ref. 31, p. 159]

As a means for bringing about the “task-alignment” required for successful bottom-up change, Beers et al. describe six steps which should be taken by organizations as they begin the change process. Task alignment is accomplished first in small units within the organization, where work processes are central to the unit’s operation. The challenge for senior management later becomes spreading the change to the rest of the organization. The steps outlined here are designed to move an organization through that process.

a. Mobilize Commitment to Change Through Joint Diagnosis of Business Problems

A clearly defined problem is the launching point for any change effort. In order for the necessary participants to be behind such an effort, there must be a consensus on the nature of the problem. Candid discussion among process owners may elicit surprising differences in opinion on both the nature of the problem(s), as well as on the manner in which it should be solved. It is tremendously important to hash out these differences up front and honestly, and build a shared prognosis of the organizational ills. There are a variety of ways in which to accomplish this task; many involve removing the management team from the normal organizational setting and focusing solely on the nature of the problem at hand. Visits to other sites are useful, especially to successful organizations which have undergone similar change. Benchmarking, as discussed in Chapter IV, provides an opportunity to evaluate successful methods used by other businesses or organizations. It can provide insight into the successful adoption of new management roles and functions and employee-manager relationships in regards to team-oriented definitions of work. Outside consultants may be useful in this area, especially those specializing in organizational development, in order to help develop managers’ inter-personal communication skills. They may also help shape positive group dynamics and constructive means of dealing with conflict, assist in developing various helpful communications skills and exercises, and provide the expertise and perspective needed to

help management achieve the close interaction necessary for the change effort to succeed in the unit. [Ref. 31, pp. 161-162]

b. Develop a Shared Vision of How to Organize and Manage for Competitiveness

This step is virtually identical to the third step outlined in the top-down model developed by Kotter, in which the vision defining the change effort is culled from the initiators of the change effort. This step is heavily linked to the process of developing a consensus on the business problem. It extends this understanding to the next step, which is creating the vision to inspire and guide the members of the organization in the change effort [Ref. 31, p. 162].

c. Foster Consensus for the New Vision, Competence to Enact It, and Cohesion to Move it Along

Merely allowing employees, even middle management, to participate in the development of a joint vision will not overcome resistance to the change effort or magically cultivate the skills needed to make it work. Strong leadership from the person in charge of the business/military unit, in the form of staunch commitment to change, is an absolute necessity. It is at this juncture that those who refuse to support the change effort must be addressed. Members of the unit (and later, the entire organization) need to witness the kinds of skills, attitudes and behaviors needed in the new organization through the successes and failures of others to adapt to the new environment. As Beers relates, one general manager offered support to those who wanted to help him with the change effort, and offered outplacement and counseling to those who didn't. It is possible that personnel restructuring at this delicate stage could be somewhat detrimental to morale. However, it may also have the opposite effect - motivating members of the organization in a positive way by signaling that the commitment to change is strong enough to make success possible. [Ref. 31, pp. 162-163]

d. Spread Revitalization to All Departments Without Pushing It From the Top

The organization's senior leadership must not succumb to the lure of forcing the new insights produced from a unit or division undergoing the change process

onto the rest of the organization. In order for the rest of the organization to embrace the change, and internalize it successfully, they must more or less come to it on their own. As Beer puts it, it's better to let each unit "reinvent the wheel", and thus experience the need for the change and its benefits firsthand, than to simply force the issue on them because it seems to work elsewhere. That approach resembles the top-down change management style, and short-circuits the necessary change process. Instead, top management should endeavor to create the atmosphere for change in the rest of the organization, fostering a good balance between creativity/experimentation and accountability. The pressure to succeed can be a positive motivator, if utilized constructively. [Ref. 31, pp. 163-164]

e. Institutionalize Revitalization Through Formal Policies, Systems, and Structures

Referring to the generic 'unfreeze-change-freeze' model of change management, this step would be analogous to the 'freeze' stage, in which the changes implemented successfully throughout the organization must now be locked in as part of the formal structure. Trying to accomplish this too soon will yield counterproductive results. The new approach must be firmly in place, with management and employee structures solidified and functioning successfully, before attempting to bond the new changes with the organization's formal structures. In order for these changes to sink in, members of the organization must be given the chance to work out the difficulties themselves. Decisions made by senior leadership during this phase must not attempt to rush or smooth out the change process artificially. It must be allowed to proceed through the final steps with the same hands-off approach used throughout the entire change effort. [Ref. 31, p. 164]

f. Monitor and Adjust Strategies in Response to Problems in Revitalization Process

The stakeholders in the organization need to have a means for monitoring the renewal effort in order to provide feedback to the change owners. The organization not only has to learn how to change successfully, it must also learn how to *learn*. The change process will surely be repeated in the future under different environmental and organizational conditions. If anything of value is to be taken from the organization's

previous experiences, it must be ingrained into the overall process. The subject of learning organizations is much broader than can be addressed here. However, the reader is directed towards appropriate sources on the subject, most notably *The Fifth Discipline* by Peter Senge. Overall, mechanisms must be created to develop ongoing learning and adaptation skills. [Ref. 31, pp. 164-165]

3. Characteristics of Organizational Change

While every change management program implementation is unique, even within the same organization, a number of common trends occurring in most transformations have been documented. For instance, during change programs, there is a definite transition process that members of the organization experience as they come to terms with the effects of the change. Understanding the dynamics occurring during the transition process, and how to identify where people are in the process assists change agents in dealing with possible resistance. However, resistance to change is inevitable in every instance, even though the particular dynamics of each situation may change. Understanding and dealing with this resistance from the beginning of any change effort will aid in reducing and overcoming it. Similarly, there are a number of common success factors which are found in almost all top-down or bottom-up change programs. Ensuring that your change management program takes these into consideration adds to its chances of success.

a. Transition State Dynamics

During the evolution of a change management program, an organization functions in what has been described as a "transition state". Characteristics of this state are high levels of uncertainty, energy, perceived inconsistency, emotional stress, and conflict with overall stability fairly low. These are natural by-products of the change process, and should be managed carefully in order to assure success. There are several distinct stages of the transition state, and personnel should be managed differently depending on where they are in the process (see Table 6.1). For instance, those not yet in the transition have not accepted the possibility of being affected by the change. Those further along in the "neutral zone" (the midway point in the overall process) may feel lost and overwhelmed. They have let go of the old organization but not yet accepted the new one, and are struggling to find a foothold. These people may be experiencing completely

different feelings from those still dealing with the ending of the old order as well as from those who have begun to perceive how the new organization will function. Finally, when people are finished with the transition, there are issues of loss to be dealt with through renewing morale and employee motivation. Change agents must recognize that while organizational change may bring significant gains, transition always begins with loss. [Ref. 33]

Not Yet in the Transition	Dealing With Endings and Losses	In the Neutral Zone	Creating a New Beginning	Finished with the Transition
<ul style="list-style-type: none"> - belief that change will not affect them, or is insignificant - scorn/categorization of change effort as passing fad 	<ul style="list-style-type: none"> - Anger, uncertainty - Shock, feeling of betrayal - Surprise - Grief; feelings of loss, low morale 	<ul style="list-style-type: none"> - Lost, directionless feelings - Continued uncertainty about direction of change, overall organization - Forebodings of disaster 	<ul style="list-style-type: none"> - Creative suggestions forthcoming - Beginnings of acceptance, willingness to see possibilities - Returning signs of hope 	<ul style="list-style-type: none"> - Acknowledging loss - Forgetting old way, pain associated with change - Acceptance of new system - Return to normal business

Table 6.1 - Identifying Where People Are in the Transition Process

b. Overall Success Factors for Organizational Change Management Programs

In nearly all successful change management programs, whether programmatic or participative, common themes have been identified that contribute significantly towards the program's overall success. Taking these factors into consideration should be part of the plan for every change management effort (but does not necessarily guarantee victory). First, the need for a powerful vision to unite the organization and guide it through the rocky shoals of change is an absolute must. Without it, change efforts can disintegrate into isolated programs which do not succeed in transforming the organization. Second, the vision developed must be effectively communicated to the entire organization through every possible channel, over and over again. It must become a part of every day, normal hour-to-hour operations if it is to be

internalized. It should be linked to every aspect of the organization's operations, including performance reviews, strategy planning, question and answer sessions, and monthly department meetings, until it is a part of the organization as a whole.

Third, short-term wins must be planned for and accomplished within a reasonable time frame in order to demonstrate the viability of the transformation effort. Twenty-four months is the maximum time limit a program should wait before reaching some sort of realistic, significant goal of the program. It should then be highly publicized, and used as a means to motivate people on to bigger and better things, and not as a sign that the effort has worked (signaling for a return to business-as-usual). Fourth, it is absolutely critical that change programs be led by line managers and not by staff departments such as human resources or information systems. Without the visible support and participation of top management, change efforts are doomed to failure. The senior leadership must set the example by "walking the walk" if the rest of the organization is expected to follow suit.

Fifth, pressure can be a useful tool in driving change. Change agents must create a relentless discontent with the status quo, sufficient enough to drive people from their comfort zones and get them interested in participating in the change effort. Sixth, the need for an intimate understanding of the business, its customers, and requirements in order to drive the impetus for change forward is critical. Additionally, employees must have a sense of contribution towards and an understanding of where the business is headed in order to achieve true buy-in from all levels of the organization. Lastly, all members of an organization must realize that change takes years, not months. Even after the change effort is finished, it takes still more time for the change to become a lasting part of the organization's culture. Top management must ensure good turnover when the time comes or risk losing the effects of the change by not maintaining the organization's forward momentum over time.

B. IMPLEMENTING PROCESS INNOVATION-ORIENTED CHANGE MANAGEMENT

The models described above, although generic, provide a general recipe for implementing change management plans or programs. The actual shape a change effort takes is unique to the organization and its particular circumstances. However, change management methods specifically oriented towards process innovation initiatives will

enable the CA-ARNG to move forward with a more customized roadmap than a general model can provide. The participative change model developed by Beer, Eisenstat and Spector, the socio-technical framework developed by Pasmore, and the related parallel learning structures described by Bushe and Shani for managing organizational change each have certain aspects applicable to the types of organizational change produced by process innovation. For an organization such as the CA-ARNG, a fusion of these frameworks combining the most relevant principles of each provides the process innovation orientation needed to implement the redesign alternatives presented in Chapter V.

Typically, process innovation tends toward a top-down approach to change, where the change champion or advocate driving the initiative is an executive or senior manager. Sponsorship for the idea, necessary to realize legitimacy in the organization, comes from even higher up. Frequently, a senior line executive (or in the military paradigm, a senior officer sufficiently high in the rank and power structure) with enough political support and positional strength to influence others and promote change assumes this role. [Ref. 1, pp. 179-180]

However, the change process is not totally programmatic, especially as it moves past the planning stages. Socio-technical principles, such as those incorporated in parallel learning structures, emphasize the participative nature of process innovation through the use of study groups (labeled process innovation teams by Davenport). These process innovation teams perform the actual detailed work of process innovation. They research business requirements and gather information on key business processes, customers, and suppliers; they identify businesses with recognized "best practices" to use as benchmarks, and enablers (such as information technology) to support the alternatives for process redesign; they map process flows, create redesign alternatives, and develop plans for transitioning to the new processes. [Ref. 1, p.183]

Based on this assessment, a discussion of the primary change roles (and the responsibilities associated with them) required for process innovation-induced organizational change is provided. These roles outline team compositions which are described in more detail by parallel learning structures. Such mechanisms can also be used as transitional vehicles for implementing process-oriented change, in addition to helping define and develop redesigned processes.

1. Roles and Responsibilities for Process Innovation-Oriented Change

Although in many cases a single person may be the driving force behind a change effort, there are several different leadership positions which emerge over the course of a change program. The breadth and depth of leadership, organizational position, commitment, and conceptual understanding of detailed business operations necessary to conduct a successful change cannot be fulfilled by one person. Instead, a structure which often evolves utilizes the strengths and capabilities of several of the senior leadership, as well as many more in middle management positions. These roles develop during the three general stages of a change program: originating the process innovation initiative, making it acceptable and necessary among all members of the organization, and then managing it through to completion.

a. Advocate

The advocate becomes the member of the organization who initially proposes and subsequently pushes for change. According to Davenport, in many organizations this role is often played by the Information Systems department or its equivalent. A senior IS executive/staff officer will frequently have the experience, process understanding, and commitment necessary to alert the organization to the danger in the status quo and corresponding need for change. However, he or she needs the weight of an executive of significant influence and standing in the organization to help get the program started. Sponsorship is one of the pivotal roles in the leadership structure, and must not be taken lightly. One of the most common mistakes made by organizations beginning process innovation is choosing the wrong sponsor. [Ref. 1, p. 179]

b. Sponsor

The sponsor is an extremely important part of a successful process innovation effort, one who legitimizes the change proposed by the advocate. The sponsor sells the idea to the rest of top management and wins the buy-in and acceptance necessary to launch the effort. Also referred to as the "transformational leader", a sponsor must understand the intimate details of the organization's key processes and excel at articulating the new vision for these processes. Transformational leaders are charismatic,

driven, and impatient for results but still capable of dealing with the "softer" personnel issues of change in a caring, sensible way. The sponsor's level of commitment to the process innovation must be very strong, in order to weather the inevitable doubts, criticism and duration such efforts face.

The sponsor should never be an IS or other staff executive. Key ingredients for the sponsorship role include strong, visible top management representation and support. In actuality, sponsorship must be broader than a single individual, even the transformational leader. A consolidated front of the organization's senior leadership is necessary for the change effort to be taken seriously. One of the most difficult tasks the sponsor may face is creating and maintaining the strong commitment and consensus required among executive team members. This is particularly difficult in the face of the inevitable power restructuring which takes place during process innovation. Determining the receptiveness of the organization's key stakeholders prior to beginning the planning process helps to identify resistance. If strong leaders in the company are seen to ignore the effort, people will suspect that management lacks the necessary commitment to it. Such efforts will never reach the critical mass needed to affect the entire organization. [Ref. 1, pp. 179-180]

c. Change Target

The change target is the functional unit, group or part of the organization which must undergo the change. In the normal reporting hierarchy of the organization, these people should report to the change sponsor. This is an important point. The sponsor must have direct influence and control over the group in order to exert the kind of "good pain" or positive pressure needed to get results. Such pressure sometimes includes removing managers and other key individuals who are not adapting to the change program. This is one of the strongest statements a sponsor can make to the organization. It signals a serious commitment to the change effort, enforcing the message that the sponsor and advocate are willing to put the good of the organization ahead of individuals who will not be able to contribute to the new way of doing things. It is, without a doubt, one of the most powerful change tools available to the senior leadership of a process innovation effort.

d. Change Agent

The change agent is the individual or group which will implement the change on the change target. The types of teams and groups which can be used for this all-important position are described in the following sub-section, which addresses the parallel learning structure model and its adaptability to military organizations.

2. Teams - Using a Parallel Learning Structure to Implement Process Innovation

Parallel learning structures incorporate not only the mechanisms used to diagnose and provide solutions for organizational ills, but also a transitional vehicle for accomplishing these changes within a socio-technical systems design framework. In a case written by Bushe and Shani, an Army data processing unit (DPU) undergoing significant organizational change was able to successfully implement and maintain new methods of work through a parallel learning structure approach. Although it is clear that the CA-ARNG has unique differences and requirements from other military organizations (indeed every instance of organizational change is different, even for very similar organizations), an analysis of the Army DPU case strongly suggests the feasibility of the parallel learning structure approach for any military organization. Before discussing the pros and cons of the parallel learning structure, a short summation of its primary elements according to the model presented by Bushe and Shani is beneficial.

a. Overview of the Parallel Learning Structures Model

The "parallel" in the title refers to the existence of at least two separate learning groups involved in the change effort - a steering committee and a study group (or groups). If needed, an outside consultant group may also be a part of the process. The steering committee is composed of a cross-section of the top level management in the formal organization, and may also include the Commanding Officer if he or she so desires. Cross-functional representation is essential to ensure that the full scope of operational perspectives are heard during the planning and later guiding phases. It is a good idea to perform a stakeholder analysis at this stage, and identify all the key individuals who will be affected by the process innovation [Ref. 1, p. 182]. Key individuals such as influential decision makers and those reluctant to accept changes

should be a part of the steering committee. Having these individuals as close to understanding the change effort as possible will aid the project proposal and approval process.

The steering committee selects the initial set of activities for the groups to work on. First, it develops consensus on the problem areas to be examined, as well as a shared vision of the purpose for the parallel learning structure itself. The steering committee also decides what the appropriate measures will be for assessing the progress and success of the parallel learning structure's activities. Later, as part of the implementation plan, top management accountability for the results and progress of the learning structure is assigned by the steering committee as well [Ref. 1, p. 182]. The steering committee also creates the procedures and criteria for selecting the members of the study group(s), and considers how they should be constituted and what rewards there will be, if any, for participation. The help of outside consultants with knowledge of and experience in parallel learning structures and organizational development may be necessary in order to accomplish all of this. The steering committee must make that determination [Ref. 34, pp. 126-128].

The study groups, some members of which may also be part of the steering committee, are composed of a cross section of the organization as a whole, and should accurately represent the functional composition and personnel strength makeup of the organization. While Davenport recommends that middle to upper management should form these groups, in reference to the military organization, Bushe and Shani argue for a good cross-section of all personnel, including operational-level members. The study group(s) conducts the "Inquiry Phase" of the process, in which the organizational problems are researched and quantified, if necessary. They then analyze the data and recommend solutions to the steering committee. The manner in which study groups interact with each other, with the steering committee, and with the functional groups within the organizations they represent must be decided by the steering committee [Ref. 34, p. 128].

After proposals are approved by the steering committee, they must be approved by the formal top management in order to be implemented. At this point, the parallel learning structure may shift to a transitional vehicle for implementing the changes it recommended. Throughout its existence, it is important that the organization as a whole be kept informed of its purpose and progress in order to enable the change implementation to go forth. [Ref. 34, pp. 128-129]

b. Advantages of the Parallel Learning Structures Model

An obvious discontinuity exists between the principles of socio-technical design espoused by parallel learning structures and the traditional military organizational design. Typical military organizational design is characteristic of a highly mechanistic, rigid machine bureaucracy with hierarchical levels of management. However, this does not preclude the possibility of morphing a military organization towards a socio-technical system. Historically, the military has not effectively handled the impact that work design and other technical considerations have on social subsystems, nor has it been especially adept at effectively designing the work systems themselves. However, the primary elements of socio-technical system design are quite applicable to certain military organizations.

The importance placed on establishing small teams of operating personnel is well suited to the military environment, particularly since it resembles the typical unit structure. Task organization is a familiar concept operationally, and can be used in administrative settings to help create "whole jobs" and engender more satisfaction and commitment from workers towards their jobs. The need for social interaction is met more fully, and timely feedback from group members can add to the accelerated learning experience. In keeping with the improved capacity for feedback, a new method of peer evaluations could be formed from the group working structure, in addition to the current performance reporting system which only derives input from supervisors. Skill variety would also become more readily assimilated into the work design, such that it could be accomplished with less downtime and distraction from the normal working routine. For example, the workgroup could continue to perform its overall task while intra-member rotation and training took place. "Task identity", another by-product of a workgroup design, also results in increased commitment and job satisfaction on the part of the members of the group [Ref. 34, p. 118]. Process ownership can be a powerful motivator, both in terms of morale and the desire to do well in the eyes of other groups and the organization as a whole. The same feeling exists on a larger level between units: a friendly rivalry and desire to be the best.

Closely related to the autonomy afforded to the workgroup is the principle of minimum critical specification, or allowing the workers in the group to develop their own methods of accomplishing the group's task based on the minimum advance planning needed to become operational. In addition, "controlling variance at the source" (solving

problems at the lowest level by empowering workers with the decision-making capability to correct them without management supervision) allows workgroups to realize their effectiveness and capabilities without the need for constant, close supervision and allows management to shift into the role of coach and facilitator vice controller. [Ref. 34, p. 117]

Part of the strength of this model is its ability to transform from a vehicle for diagnosis into a vehicle for implementing change. Bushe and Shani describe the parallel learning structure as a "'real-time' training experience in STS [socio-technical systems] design", citing the elements of STS design that it represents [Ref. 34, p. 116]. It is ideally suited to managing complex change for the same reasons that make it successful for diagnosing deficiencies. Parallel learning structures offer flexibility, cross-functional composition, a role in the organization as an agent of change, and deep understanding of the organizational problems with recommended solutions. Especially valuable is the atmosphere of a learning organization which exists within its groups; transferring this ethos to the rest of the organization is one of the underlying tasks during the change management process.

c. Disadvantages of the Parallel Learning Structures Model

The dampening effect of authority can be a serious inhibitor to achieving the necessary synergy in the groups comprising the parallel learning structure [Ref. 34, p. 115]. The rigid rank structure ingrained in military members from the day they enter the service can be a difficult force to overcome. For example, when the commanding officer (CO) of a unit decides to be part of the steering committee, it significantly shifts the power base and may cause a tilt in the opinions and outputs of the group towards the CO's own opinions and beliefs. This same principle also applies to the study groups, which may have members of top management in them for coordination purposes. Enforced participation on study groups, which will most likely be the case in a military unit, may not be the best way to elicit enthusiasm and dedication to the process. Another dynamic often present is the inherent distrust for outsiders displayed by many members of the military. This poses a threat to the success of the endeavor. Outsiders could be civilian consultants or civil service workers, depending on the culture of the particular organization and the climate established by the CO and others in positions of power or influence.

Another constraint imposed by the military bureaucracy is the inability to change reward systems (aside from small changes, like extra liberty, etc), rank, promotion systems, or affect other organizations except through dialogue and by example. With three-year tours standard for most active duty members (civil service may be in place permanently) and command billets assigned in eighteen month cycles, the relatively rapid turnover of personnel in military organizations is a considerable problem. Effecting real organizational change can be quite a serious challenge by itself, especially when nearly everyone in a unit rotates every three years. Resistance often arises from permanent employees who may be willing to wait out a program until its champions have been transferred out, and the changes begin to disappear.

3. Recommended Change Management Approach

The fundamental principles of change management programs described in the previous subsections discuss parallel learning structures as a potential change management vehicle for the California National Guard. Based on the nature of the redesign recommendations made in Chapter V, proposals for the creation and organization of a parallel learning structure within the Guard in order to implement the redesigned emergency mobilization process is provided here.

These suggestions do not identify specific individuals for the parallel learning structures teams, nor do they provide a detailed plan for execution of the change management process. Instead, what they offer are guidelines for steering committee and study group organization with respect to the CA ARNG hierarchy. The change management roles identified in subsection one – change advocate, sponsor, target, and agent – are also discussed in the context of these Headquarters staff sections. Finally, suggestions are given for using organizational consultant and change management groups as additional enablers to the transition process.

Following these proposals are descriptions and examples of the many change management resources available to the Guard. We feel very strongly that active intervention from outside professionals will most likely be required for the full implementation of the redesigned process and concurrent change management program. This assistance could be obtained from individual consultants specializing in process innovation and/or change management, or from consultant firms like Andersen Consulting, Ernst & Young LLP, or Price Waterhouse Coopers LLC which provide a full

spectrum of consultant services in the BPI and change management domains. Another key ingredient for success is the education of senior management and parallel learning structures teams in a variety of organizational development and group interaction disciplines. Courses, seminars, and certificate programs, as well as websites, books and other reference materials addressing these subjects are listed in Appendix E.

a. Organizing the Parallel Learning Structure

The composition of the steering committee is the most crucial aspect of the initial phase of the parallel learning structure process. Senior leaders from each of the functional staff sections in the CA ARNG Headquarters should be on the committee, as well as chiefs of staff for either or even both of the top echelons of the Guard – the California Army National Guard and the California National Guard. It may also be beneficial to have California Air National Guard representation on the steering committee. Outside of the Headquarters command, representatives from each of the major commands (40th Infantry Division (Mechanized), etc.) headquarters should also actively participate in the steering committee.

For the parallel learning structure to work effectively, it will have to become a full-time occupation for the members of both the steering committee and study group(s). This is representative of the type of commitment required in order to see the process through to completion. Understandably, it may be extremely difficult to commit the head of each staff section to such an effort, especially when the effort may take several months or even much longer before the groups can stand down as permanent entities and shift to a more periodic meeting schedule. The temptation is to make the second-in-command of each staff section responsible for full-time steering committee participation, ostensibly reporting back to and receiving guidance from the staff officer he or she represents. However, it is crucial that the organization see the appropriate level of commitment from its leadership; if section heads and others in command billets are seen as too important to have time for such an effort, it will fail. Why should small unit leaders commit their time and the time of their best and brightest workers to study group participation and other requirements, they will reason, if the headquarters doesn't? The bottom line is that only the organization's nominal leaders can inspire the necessary level of dedication to a change effort in the rest of the organization's members. With this level of commitment evident at the key levels in the organization's hierarchy, it is acceptable

for the head of the entire organization (i.e., the Commanding General) to remain as overall head of the steering committee while not actively participating in its daily functions. Even though the process innovation effort being managed should be recognized as wide-reaching in its scope and extremely important to the organization, it may not require the presence of the Guard's senior-most official to lead it full-time. The state emergency mobilization process was selected for redesign because of its overall importance to the Guard and its role as the central process among all of the Guard's key processes. However, the redesign suggestions are by far not the most radical changes the organization could possibly undergo. While the changes will have far-reaching impacts on the rest of the organization, they are mainly concentrated at the headquarters level, and on its relationships with lower level units and state organizations. Given these characteristics, the acting head of the steering committee should be selected from among the CG's (Commanding General) chiefs of staff, or similar level of command. This person and in effect the entire steering committee fulfill the 'sponsor' role discussed above.

As the second element of the parallel learning structure, study groups are the next item of major importance to consider. These people will be the 'change agents' for the organization, acting on the 'change target' identified by the sponsor through the steering committee. Accurate representation of the overall organization is a fundamental requirement for successful study groups. This prerequisite arises from the tasks which the study group or groups are designed to perform: make recommendations to the steering committee on the problems faced by the organization, provide several potential solutions to these problems, and then go forth with the steering committee's decision and implement it. In order for this to actually work, each of the various factions, functional areas, units, etc. of the organization must be well represented in the study group(s). The person acting as the 'change advocate' (i.e., someone with the drive, energy, intimate operational knowledge of the organization's processes, and unwavering commitment to the process) should be involved at this level. Within the study group medium, this individual can act as the primary facilitator and direct link to the sponsor on the steering committee and can help keep the change agents on track. The energy, enthusiasm, charisma and dedication of this individual can propel the change effort forward immeasurably; it is essential that the right person fill this position.

The representatives of each unit within the organization help initiate the buy-in within these units necessary for the parallel learning structure's recommendations

to become reality. Just as importantly, they bring with them the diagnosis of organizational ills from the [company] unit level, where the actual day-to-day work of the organization is being performed. This degree of granularity is a necessity in order for the study group(s) to make realistic surveys of what problems exist and recommend sound solutions to these problems. Groups which should be represented include all company-level units and higher from each of the major commands (i.e., the 40th ID (mechanized), 100th Troop Command, etc.), as well as the appropriate headquarters representatives from each of the major commands (most likely soldiers whose immediate superiors are on the steering committee).

These two groups fulfill the basic requirements described in the parallel learning structure model, but are not the only types of teams that may be of use to the organization. Another entity that may be useful to the California National Guard is an integrated product team- or IPT-oriented group which advises the steering committee directly. This group represents the outside organizations the Guard interfaces with during the execution of its emergency mobilization mission. For example, the State Office of Emergency Services (OES) could provide personnel from its headquarters element as well as from each of the Regional Emergency Operations Centers (REOCs) in the state. County emergency services organizations from each county in California could provide representatives from EMT, fire, police, and other services interacting regularly with the Guard during emergencies. Other organizations within the state such as the California Department of Forestry and Fire Protection, State Fire Marshal, U.S. Coast Guard, weather services, earthquake tracking services, Environmental Protection Agency, and a host of others could also add value to this group. Although most likely not a full-time team, the IPT group could provide timely information and responses from sponsoring organizations on relevant issues before the steering committee. Such coordination exists currently, but is more decentralized and sporadic; bringing these entities together as liaisons to Guard leaders would create a more open line of communication between these organizations.

As mentioned earlier in this chapter, outside consultants may be able to provide invaluable assistance during the creation and implementation of the parallel learning structure. Whether individual consultants providing guidance on change management issues or firms with teams of consultants managing the entire process, a separate group advising the steering committee and actively guiding the whole process

could prove essential to such an effort. More information on this is provided in the following sub-section.

b. Recommended Change Management Resources

Throughout the process innovation and corresponding change management program phases, the members of the organization will undergo a series of transitions in organizational roles, personal interaction and conflict resolution dynamics, all of which challenge the overall context of their normal behavior and attitudes. The members assigned to participate in the parallel learning structures will help shepherd everyone else in the new ways of doing business, as well as the new skills, behaviors and attitudes required. These team members themselves will require skills in such areas as group dynamics, conflict resolution, group problem solving, decision making, team building, and other fields of personal and group communications. Not all members of the groups must receive this much training; certain team members designated as "facilitators" can help educate their teammates in these skills. They should also receive training in parallel learning structures, action research, and organizational development. Through the intensive training they receive in these subjects, these facilitators will lead the charge in helping prepare and develop the organization for what lies ahead.

There are several avenues available to organizations seeking this type of training and knowledge. Active intervention, through the use of consultants or firms specializing in these disciplines, should be used during at least the early stages of the parallel learning structure process. They can provide timely, knowledgeable, and extremely helpful experience in forming and training groups in the necessary areas. Firms such as Andersen Consulting and most of the big-five accounting firms including Price Waterhouse Coopers and Ernst & Young LLP provide these types of services. While fairly expensive compared to other options discussed here, the level of assistance rendered by such firms is very advanced. They can either lead an initiative through from "cradle to grave" or simply provide the advice and training necessary for organizations desiring a more involved role in their own change program.

A closely related but less expensive option is the use of individual consultants specializing in particular areas, like change management, process innovation, or both. Many resources are available in this field. For instance, an online storefront called the "Consultants Mall" offers a variety of general and targeted consultant services

to businesses and government offices as well. Within the Naval Postgraduate School are a number of change management and process innovation specialists available for consulting services. See Appendix E for specific references.

Next in terms degree of training and assistance provided are course and seminars aimed at executives and senior managers. These courses deal with process innovation, information technology management, change management, and other subjects. Some, such as the Organization Development and Change Leadership Certificate Program offered by Georgetown University, are full-fledged curricula involving multiple courses and certification for participants. Others, such as the Chief Information Officer Course taught at the Center for Executive Education at the Naval Postgraduate School, specifically target leaders faced with information technology management, business process reengineering/innovation, and other high-level issues (this course is offered to O-8 and O-9 grade officers in DoD). Finally, some are more broad in nature and offer seminar-style presentations on relevant issues, such as the seminars offered by Miller Howard Consulting and others.

Lastly, there are a large number of helpful resources to be found on the World Wide Web, as well as in books in print. See Appendix E for lists of these resources.

C. SUMMARY

No change management program can guarantee success. However, following general guidelines like those presented above, in concert with a program specifically tailored to the organization and its strategic objectives, can be the beginning of a successful change effort. Transformational leaders signal the need for change to the top management, then sell it to the rest of the organization. Many times, this is how the kernel of change begins to grow within an organization. Even though visionary leaders can push an organization a long way towards successful process innovation, in the end no one person is enough. It requires the skill and total dedication of many individuals in the organization, working toward a shared vision, to bring a change program to fruition. Every attempt to bring about process innovation and the concomitant change associated with it has its own unique circumstances, which only those directly involved in the effort can truly appreciate. Hence the lack of a single model for change which can be used for every organization in every instance.

In order to accommodate this phenomenon, parallel learning structures are designed to be flexible, adapting to the particular requirements of each circumstance. They incorporate important elements of socio-technical systems design into a change management framework, one that is well-suited for the specific attributes of change as a result of process innovation. In order to use them effectively, they must be mapped to the organization's hierarchical structure. Even though they operate outside of the normal structure, in effect accomplishing what existing management systems could not, the formation of these teams must nonetheless take this structure into consideration or risk creating a "paper tiger."

VII. RECOMMENDATIONS

A. CONCLUSION

The CA-ARNG is renowned around the world for the efficiency, effectiveness, and flexibility of the State Emergency Mobilization Process. While the focus of this thesis is on using process innovation in order to improve SEMP performance, it should be reiterated that this process currently works quite well. However, through complementary application of process innovation and benchmarking techniques, we feel that it could become even better.

Through the hybrid process innovation methodology, we identified and analyzed several SEMP process pathologies and identified redesign transformations that offer good potential for dramatic performance improvement. We determined methods by which the shortcomings we diagnosed could be eliminated or mitigated through better process design and the use of powerful transformational enablers. In order to provide the Guard with a range of choices in the level of difficulty, risk, and organizational change required, we developed three redesign alternatives, which embraced varying degrees of technological advancement and process redesign. These alternatives present the Guard with a great opportunity to dramatically improve the performance of the process central to all of its other operations.

B. RECOMMENDATIONS

The true value of the process redesign alternatives presented in Chapter V may not be apparent when comparing these alternatives with each other. Rather, the real benefit to the CA-ARNG stems from the selection and use of all three alternatives in succession, as stepping stones to reach progressively greater levels of change and innovation. Although each offers advantages when viewed independently, their combined effects over time will create a synergistic effect enabling the Guard to make great strides over the long term. Additionally, as the alternatives are implemented, these gradual changes will transition into institutional doctrine and make more difficult challenges attainable.

Enacting Redesign Alternative One is the first step in this metamorphosis. As the alternative incorporating the lowest degree of new technology and organizational change, it is the best way to gradually build up to the more drastic changes called for in Redesign Alternatives Two and Three. By utilizing the RIMS more effectively in crisis monitoring and coordination, and employing an intranet to provide other knowledge-sharing applications as well, this alternative represents a significant improvement in process performance. Empowered solution providers are provided with regionally customized packages and given the authority to deploy them accordingly whenever emergencies arise. As with the more aggressive alternatives, information specialists also provide added value to the process. However, Redesign Alternative One does not attempt to apply the more advanced technological solutions proposed in the other alternatives, dramatically lessening the difficulty of the organizational change associated with its implementation.

After achieving significant short-term gains through the implementation of Redesign Alternative One, the Guard should consolidate its successes and prepare to launch itself into the next phase of redesigning the SEMP – Redesign Alternative Two. This alternative represents a process constructed to achieve order-of-magnitude performance improvements when compared to the baseline analysis. It employs a diverse set of change enablers designed to dramatically reduce cycle time and cost while improving response time. These performance objectives translate into value for Californians in the form of a quick disaster response and cost savings based upon the total cost of the business process. The use of technology change enablers (e.g., expert system, Intranet, integrated databases, workflow application, mobile communication) can dramatically improve the speed and accuracy of information delivery throughout the entire organization anywhere in the State. Again, citizens would benefit from having properly equipped soldiers, knowledgeable of the situation, who can quickly adapt to a rapidly changing crisis environment. Well organized, motivated and informed, the Guard relief effort would arrive at a disaster scene bringing with it leading edge technology able to provide a clearer picture of the crisis and how to solve it.

After the concepts and technologies contained in Redesign Alternatives One and Two have been implemented, the cut-over to highly advanced technologies can be achieved more easily. Redesign Alternative Three requires significantly more cultural change than the first two alternatives in order to fully utilize the capabilities of the decision support system and other technologies proposed. These technologies eliminate

the need for a person to make routine tasking and logistics requests decisions, improving the efficiency and cycle time of the SEMP to an even greater degree. With each successive redesign, the focus of the CAC increasingly shifts towards managing information quality and timeliness in order to support the empowered solution providers.

As the Guard ushers in these process innovation initiatives, it should also strive to increase the organizational awareness of the pathologies and faults of the SEMP to demonstrate the need for change. Achieving the level of buy-in and commitment needed from members of the organization requires significant effort and education in change management and process innovation. Training in these two disciplines should begin as soon as possible, concurrent with development of an organizational structure to carry out change management functions. The suggestions provided in Chapter VI serve as a transition plan through which to begin this process.

C. AREAS FOR FURTHER RESEARCH

The thrust of this thesis, which is primarily concerned with process innovation, also serves to identify a number of other areas for potential research and exploration in the CA-ARNG. Certain areas addressed in this thesis in broad terms are not explored in detail (e.g., leading change management produced by process innovation). While the background provided is a necessary first step in the overall process, a more detailed, exhaustive change management plan will be required by the Guard in order to enact some of the recommendations for process redesign presented in this thesis. Unless this area receives outside intervention (i.e., from a consulting firm), it remains an excellent topic for further academic inquiry. Several such critical topics are discussed below.

1. Further Top-level Process Analysis/Redesign

During the top-level process analysis conducted at the CA-ARNG State Headquarters during the initial stages of the thesis, several principal business processes were identified as possible targets for process innovation. The State Emergency Mobilization Process represents the most compelling but not the only process that could benefit from a thorough analysis and possible subsequent redesign.

Although similar to the SEMP, the federal mobilization process is oriented toward deployment to and extended operations in tactical environments. It mobilizes assets unique to the Guard's federal mission for transport to international locations using DoD

joint airlift and sealift capabilities, as opposed to the more localized operations performed under the SEMP. These two high-level processes encapsulate nearly every other process performed within the Guard. In order to effect further process innovation, across the entire organizational front, the federal mobilization process should be the next target of redesign analysis.

2. Change Management Implementation Plan

As mentioned above, the Guard organization will require a detailed change management implementation plan in order to move forward with the parallel learning structure process. The change management information presented within this thesis is intended to introduce the subject, and make the readers aware of its importance to the implementation of the suggested process redesign alternative. Although many other models and methods for addressing this need exist, it is the feeling of the authors that the parallel learning structure design will best suit the particular requirements of process innovation-induced change faced by CA-ARNG. In particular, the eight-phased generic model for intervention suggested by Bushe and Shani can be custom tailored, even further, to the specifications of the Guard and its current situation as part of further research [Ref. 33, p. 123].

Researchers can assist in this process even more by acting as inside consultants to the steering committee and providing valuable insight into the overall procedure. Additionally, they could hold workshops designed to elaborate on the communications skills needed by group members, parallel learning structure training targeted at steering committee or study group members, and any other organizational development-oriented training not received elsewhere. If external consultants are used, thesis researchers could act as Guard representatives and interface directly with the consultants in implementing process redesign initiatives.

3. Three-Tiered Architecture Development

Another area for further research lies in the network infrastructure of the CA-ARNG, specifically the network enterprise software architecture. This subject falls under the broader issue of the Reserve Component Automation System (RCAS) II Program. Designed and developed by the Boeing Corporation under the guidance and financial backing of the National Guard Bureau (NGB, the parent organization for all National

Guard Units & part of the Department of the Army), RCAS II is intended to provide all National Guard units around the country with a common hardware, software and network infrastructure platform. The driving goal is to bring these units to an adequate level of information technology capability immediately, on a common platform, in order to help improve overall mission capability and effectiveness. Each state's National Guard forces can decide exactly how to implement the assets provided, while certain broad functions like life-cycle management and software upgrades are handled at the NGB level as necessary. Boeing contractors provide the network wiring and hardware components, but the management of these resources falls to the Guard itself. Network operations, customer service functions, e-mail deployment and maintenance, network operating system architecture and other enterprise software architecture and maintenance along with a host of other issues are all responsibilities of the appropriate National Guard body within each state.

Research presented by Lewis on a three-tiered architecture for DTIC (Defense Technical Information Center) suggests that an organization like the CA-ARNG would benefit enormously from an integrated approach to enterprise architecture [Ref. 34]. The three tiers refer to software and hardware assets organized such that tier-two application servers connect tier-one clients to tier-three database systems. Web servers, transaction servers, client systems, database servers and all other enterprise software assets can be arranged in a three tiered architecture to provide the maximum flexibility and scalability. Product lock-in and obsolescence impacts are reduced or eliminated. [Ref. 34, p. 14]

While RCAS II addresses a host of related issues, it does not specify an enterprise software architecture for the management of applications such as web and database servers specific to an organization like the CA-ARNG. As their information resource requirements continue to increase in number and complexity, the need for such a plan will become even more critical. See Appendix F for a more detailed description of the three-tiered architecture approach.

4. Process Innovation as a Core Competency

Conditions necessitating change will always continue to arise, and the Guard must continue to evolve as well in order to maintain its effectiveness. This evolution becomes the hardest task for an organization to accomplish – in effect it must *learn how to learn*. The subject of learning organizations, although related to socio-technical design and the

change management principles discussed in earlier chapters, is a unique subject deserving further attention within the Guard. The reader is directed to one of the defining texts on the subject, *The Fifth Discipline* by Peter Senge. Senge presents the necessary characteristics of a successful learning organization, and provides excellent guidance on how to develop these attributes. Through a strategic viewpoint, deep level of commitment, and multiple stages of growth over time, an organization can follow this guidance to become a true "learning organization."

APPENDIX A. RECOMMENDED IT STRATEGY: SOFTWARE DEVELOPMENT TEAM

In an enterprise as large and distributed as the CA-ARNG, it is difficult to maintain common software standards across the entire organization. Even as the RCAS II Program is being deployed throughout the Guard, individual units of major commands and staff sections within the State Headquarters itself are developing software in-house to meet immediate needs. Unfortunately, even though these separate software applications may satisfy these needs, they are not typically applicable throughout the rest of the organization. Requirements determination is not performed beyond the level of intended local use, rendering such applications as helpful in the short term but ultimately isolated and redundant.

For instance, an application being developed within the Logistics section addresses the location and status of Guard equipment, pulling information from several existing "stovepipe" applications which do not share data and making it available via a web server. Simultaneously, a separate unit within the 40th ID is developing a similar application in order to track personnel and equipment status (specifically, related to OATs - Operational Action Teams) during and after mobilization for state emergencies. The two applications were both developed with the Access database and perform similar functions, providing similar informational views to different end users. These two applications could have been developed together as a complete, unified program able to share information to both the unit and Headquarters levels without the duplication of effort which occurred. It is also possible that RCAS II may provide software addressing part if not all of these requirements. This could sound the death knell for both applications, relegating them to isolated, redundant systems which do not interoperate at the required level.

This example, multiplied across the entire array of organizational functions and depth of the hierarchy, results in wasted resources - time, manpower, money, computer equipment, and the eventual product itself. But as long as units have the ready ability to develop their own applications using easily available database, web server, and authoring software tools, feel that immediate mission needs are not being met through standard systems, and ensuing software development is allowed to continue unmanaged, then this problem will continue .

However, the software provided as part of RCAS II is not the whole solution, even if it contained everything currently needed; requirements will continue to evolve faster than subsequent versions can be introduced. In fact, the solution will never be just a newer, better, more integrated application; today's hottest thing will be tomorrow's minimum acceptable standard. To prohibit the development of software for the CA-ARNG and rely solely on software provided by RCAS II is not a desirable solution.

On the contrary, the ability to quickly develop customized software applications in-house in order to meet mission needs is tremendously useful. But this capability must be more effectively harnessed. Individual efforts should not be halted; commands developing software for their own use know their requirements better than anyone else. However, the process must be more effectively managed in order to minimize scarce resources. And most importantly, it must be coordinated to create more powerful, accessible, and integrated applications benefiting the entire organization. The answer is to consolidate the development of all new software under a centrally managed development team lead by the DOIM.

This software development team would have a small number of permanent members, each assigned to various projects at any given time in a matrix type structure. The members would be composed of experts in a few critical software development skills, such as fourth generation language programming (Visual Basic/Java/C++), web authoring, database programming, and any other abilities deemed necessary for typical projects. Other team members would be temporarily assigned from units sponsoring software development projects. By supplying personnel who are able to assist in the development effort and have an intimate knowledge of their requirements, units will directly benefit from the software team's existence. Several distinct advantages gained are: 1) broader range, more software experience available through team than units can muster in-house; 2) development efforts are centrally coordinated, ensuring compliance with Guard directives, compatibility with other projects, and therefore much greater chance for success and full implementation; and 3) reduced development overhead at unit level.

Significant DOIM oversight will be required for the software development team concept to work effectively. A project development and selection board must be created as part of the management infrastructure of the software development team. This board's purpose would be to review all potential IT projects within the organization and rank them. Projects would then be chosen according to factors such as value to the

organization/need for the project, cost, technical difficulty, scheduling, and a host of other relevant project management considerations. Hoffer et al provide helpful selection criteria and other points to consider in developing potential IT projects [Ref. 36, pp. 195-225] . Final project approval should be made according to guidance from the Director, DOIM in support of key CA-ARNG business processes and in keeping with the Guard's strategic business plan.

Through these efforts, the CA-ARNG can realize a significant improvement in the quality, scheduling and cost performance, risk management, and overall success rate of all software applications developed in-house.

APPENDIX B. PILOT STUDY BIBLIOGRAPHY

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APPENDIX C. REDESIGN PROCESS MAPS AND SUPPORTING DOCUMENTATION

The following chronicles this team's understanding of the baseline process of the CA-ARNG SEMP. Each step is listed with its associated activities, information needs, personnel, technology, and pathologies and faults.

1. MISSION RECEIPT/VALIDATION-BASELINE

- Describe Process-How is Mission Validation Accomplished i.e., how is work done?

Mission tasking received from OES via phone call followed by an official mission number with basic mission related information. Decision made by Watch Officer in CAC as to the missions scope in compliance with CA-ARNG directives. Mission details are obtained directly from the customer contacted by the Watch Officer. Purpose is to validate/update requirements for assistance i.e., nature of emergency, time, location, priority, POCs, current status and next action on the part of the Guard.

1. Activities

- Receive Mission number/tasking from OES

How? Either by RIMS or phone call

- Decide on mission legality

How? Knowledge of Watch Officer or consulting the official guidance

2. Information needs

- OES mission number
- Points of contact at emergency site
- Location of event
- Nature of event
- Time event occurred

- Who/what is already onscene
- Who is incident commander
- Is this legal/fits mission parameters
- Have other agencies been contacted

3. Personnel

- CAC Watch Officer
- CAC Support Staff
- Incident Commander
- OES Watch Officer

4. Technology

- Telephone (POTS Line)
- Cellular
- E-mail
- RIMS (Regional Information Management System) Lotus Notes
- Word processor, spreadsheets (MS Office)
- Pager

5. Diagnose Pathologies and Faults

- Lack of rich and timely info received through RIMS.
- More info, more timely, could reduce response time, possibly eliminate customer validation step. Notion of fewer points of contact with customer decreases chance of conflicting information and confusion.
- Possible increase in cycle time due to off-duty notification procedures (pagers and cellular phone only)

2. CUSTOMER VALIDATION-BASELINE

- Describe Process How is Customer Validation accomplished i.e., how is work done?

CAC watch officer contacts the incident commander (normally by phone) to verify the request i.e., nature of emergency, time, location, priority, POCs, current status and next action on the part of the Guard. This is done primarily to ensure info is current and positive contact is established.

1. Activities

- Contact Incident Commander and verify mission information
How- Phone conversation

2. Information Needs

- Point of contact at emergency site
- Location of event
- Nature of event
- Time event occurred
- Who/what is already on-scene
- Who is incident commander
- Have other agencies been contacted

3. Personnel

- CAC Watch Officer
- Incident commander
- Key personnel from other external agencies

4. Technology

- Phone

5. Diagnose Pathologies and Faults

- Redundant information already received in mission receipt/validation
Viewed as unnecessary step

3. SRCOM MISSION TASKING - BASELINE

- Describe Process-How is Mission tasking accomplished i.e., how is work done?

Assign mission task to appropriate CA ARNG command (determined by nature of emergency) to satisfy mission requirements for assets. Normally accomplished by phone call to SRCOM operations (40th ID (Ground), 40th AVBE (Aviation), under 5 helicopters to State Aviation).

1. Activities

- Determine appropriate response to mission tasking from OES
 - How? Assess request
 - Determine asset availability
 - Decide who and what to task (by unit, by command)
- Contact Senior command
 - How? Phone call to tasked entity/Pager
- Provide mission order to tasked entity (information including requested assets)
 - How? Phone call
- Senior command tasks subordinate commands
 - How? Phone call

2. Information needs

- Formal Mission tasking by CAC - What response is needed
- What is being requested
- Points of contact at emergency site
- Location of event
- Nature of event
- Time event occurred
- Who/what is already onscene
- Who is incident commander
- Other agencies responding
- Estimated Duration
- Identify unit/assets for most timely response (SRCOM to subordinate unit)

3. Personnel

- CAC Watch Officer/Authorized Personnel
- Operations Officer, 40th ID
- Operations Officer, State Aviation
- Tasked Guard unit commander

4. Technology

- Telephone (POTS Line)
- Cellular
- E-mail
- RIMS (Regional Information Management System) Lotus Notes

- Word processor, spreadsheets (MS Office)

5. Diagnose Pathologies and Faults

- Military chain of command tasking incurs non-value added handoffs
- Poor asset avail. Info both on Air/Ground makes tasking difficult
- Phone conversation limits quality of information- more information able to be passed electronically.

4. ORGANIZE AND DEPLOY – BASELINE

Describes the process which units recall personnel, organize equipment and people and deploy to the emergency site.

1. Activities

- Units Receive mission orders

How? SRCOM or CAC tasking by phone

- Units mobilize for mission

How? Recall key personnel and others required for mission. By phone.

Manually check equipment status reports to determine equipment availability

- Units deploy for mission

How?

2. Information needs

- Points of contact at emergency site
- Location of event
- Shortest functional route to arrive at event site
- Nature of event

- Time event occurred
- Who/what is already onscene
- Who is incident commander
- Have other agencies been contacted
- Target on time
- Required equipment and personnel
- Estimated mobilization time (how long will they be mobilized?)
- Equipment status and location
- Soldier readiness info
- Pay system access

3. Personnel

- CAC Watch Officer
- CAC Support Staff
- In full operations: G-1, G-3, G-2, Aviation
- Incident Commander
- Guard field commander
- Guard unit personnel

4. Technology

- Telephone (POTS Line)
- Cellular
- E-mail
- RIMS (Regional Information Management System) Lotus Notes

- Word processor, spreadsheets (MS Office)
- Tactical phone, sat, radio

5. Diagnose Pathologies and Faults

- Increased cycle times due to military chain-of-command handoffs.
- Lack of rich and timely info received through RIMS. More info, more timely, could reduce response time, possibly eliminate customer validation step.
- Notion of fewer points of contact with customer decreases chance of conflicting information and confusion.
- Unit/asset status visibility is uncertain.
- **CAC Level of control based on scope of mission. Watch officer decision determines level of CAC control.

5. MISSION EXECUTION – BASELINE

Describes the process which units perform their role as Guardsmen accomplish their tasked mission objective.

1. Activities

- SOPs

2. Information needs

- Updated mission information
- Status of crisis resolution
- How long will they be there?
- Anticipate further tasking?

3. Personnel

- Guard field commander
- Guard unit personnel
- Incident Commander
- Supporting agencies

4. Technology

- Telephone (POTS Line)
- Cellular
- Tactical phone, sat, radio

5. Diagnose Pathologies and Faults

- Increased cycle times due to military chain-of-command handoffs.
- Unit/asset status visibility is uncertain to CAC
- **CAC Level of control based

6. MISSION COMPLETION - BASELINE

- Describe Process

Describes the process which units receive word that the mission has been successfully completed. Units then stand by awaiting further tasking from CAC or SRCOM. If none exists, then Guard personnel begin to stand-down and then this process moves into the demobilization process.

1. Activities

- CAC Notified by unit commander that mission requirements are satisfied.

How? Phone

- CAC verifies that no further operations are required

How? OES coordination

2. Information needs

- Updated mission information
- Status of crisis resolution
- Anticipate further tasking?
- Incident commander feedback

3. Personnel

- Guard field commander
- Guard unit personnel
- Incident commander

4. Technology

- Telephone (POTS Line)
- Cellular
- Tactical phone, sat, radio

5. Diagnose Pathologies and Faults

- Unit/asset status visibility may be uncertain to CAC
- Units are not always proactive to let CAC know of mission completion and availability of assets.
- ** CAC Level of control based on scope of emergency

7. DEMOBILIZATION - BASELINE

Describes the process which units stand-down from the operation. The mission is completed satisfactorily. Guardsmen inventory/repair equipment and handle administrative matters. Soldiers return home

1. Activities

- Units officially order to stand-down

How? CAC issues verbal order to SRCOM or individual unit commander

- Units return to armories and out process soldiers
- Equipment inventoried and shortfalls identified
- SOP

2. Information needs

- Official stand-down order
- Soldier personal information updates

3. Personnel

- Guard field commander
- Guard unit personnel
- CAC Watch Officer

4. Technology

- Telephone (POTS Line)
- Cellular
- Tactical phone, sat, radio

5. Diagnose Pathologies and Faults

- None

8. FEEDBACK - BASELINE

Information is collected from unit commanders and CAC personnel on the Guards performance during an operation. The pro's and con's are rolled up into an after action report to be staffed up the chain.

1. Activities

- Key Guard personnel provide input to AAR

How? E-mail, phone call, informal meetings

- Facts are collected

- How? Basic info such as prop loss, life loss etc is obtained. Duration of emergency and number of soldiers assets

- Recommendations are proposed

How? From input of key Guard personnel

2. Information needs

- Facts from crisis

- Opinions from unit commanders and CAC staff

3. Personnel

- Guard field commanders

- CAC Watch Officer

4. Technology

- Telephone (POTS Line)
- Word Processor

5. Diagnose Pathologies and Faults

- Too little involvement from customers (incident commander/victims?)
- Feedback session organization is critical to achieving maximum returns

9. PLAN REVISION - BASELINE

- Describe Process

After action report recommendations validated by senior officers. Plan revised based on after action input.

1. Activities

- AAR recommendations are staffed to get "approval" for seniors
- AAR recommendations are incorporated into Operations Plan

How? Admin paper chain and informal meetings

How? Staff action officer writes plan revision which is incorporated in next revision of plan then promulgated.

2. Information needs

- After action report
- Current Op Plan
- Impact of changes

3. Personnel

- Dir. Of Plans and Ops

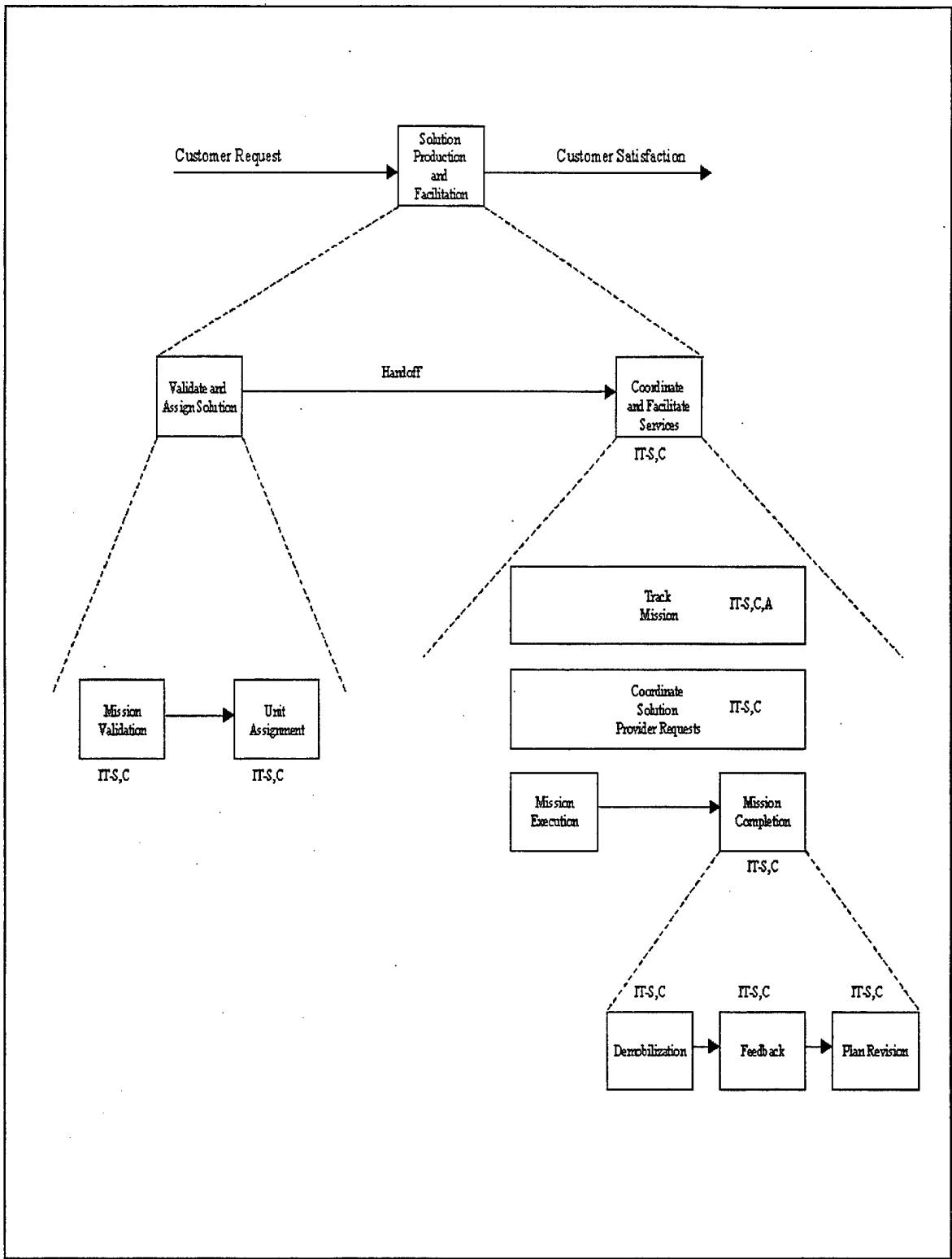
- Plan revision action officer

4. Technology

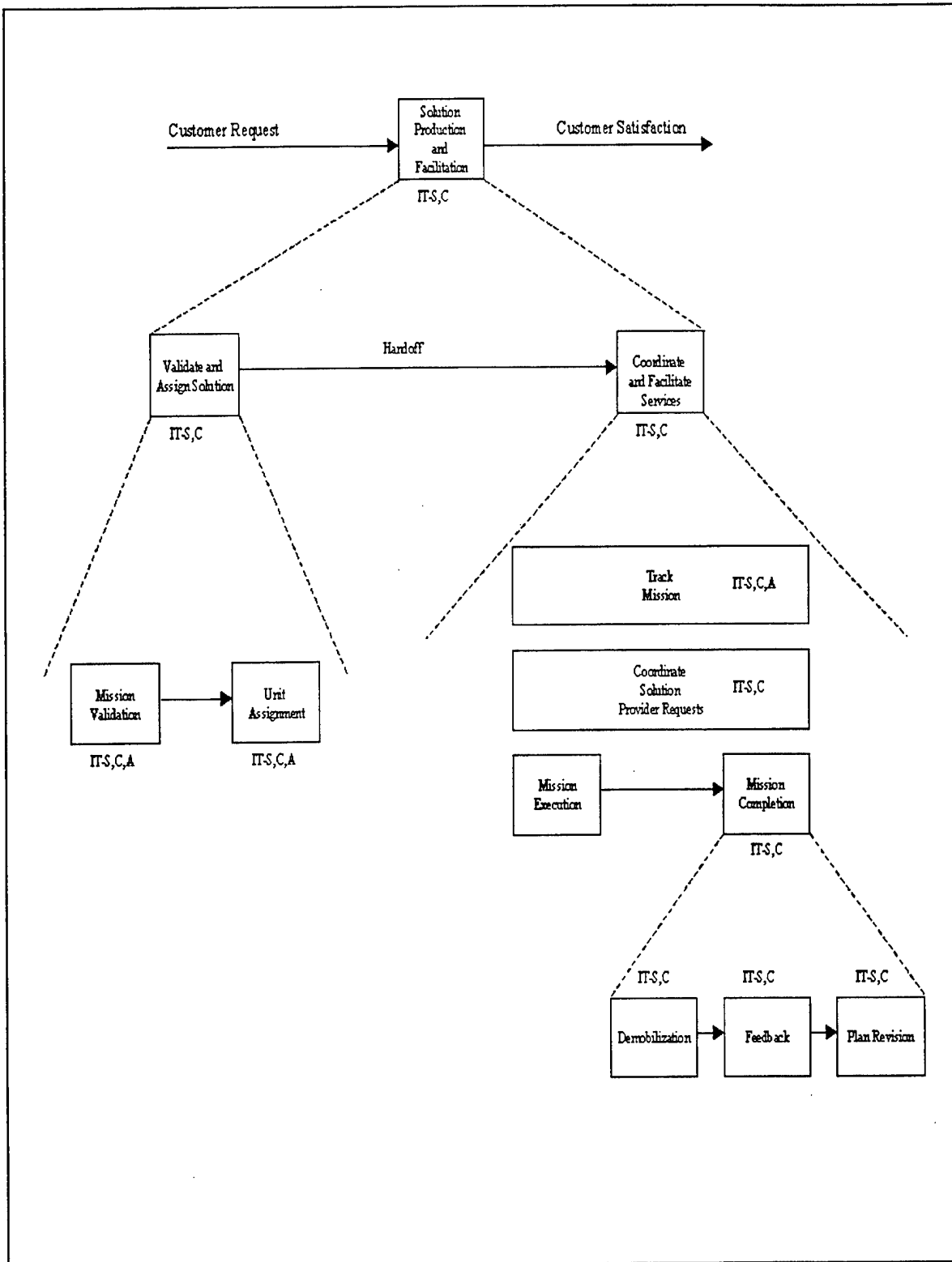
- Telephone (POTS Line)
- Word Processor
- E-mail

5. Diagnose Pathologies and Faults

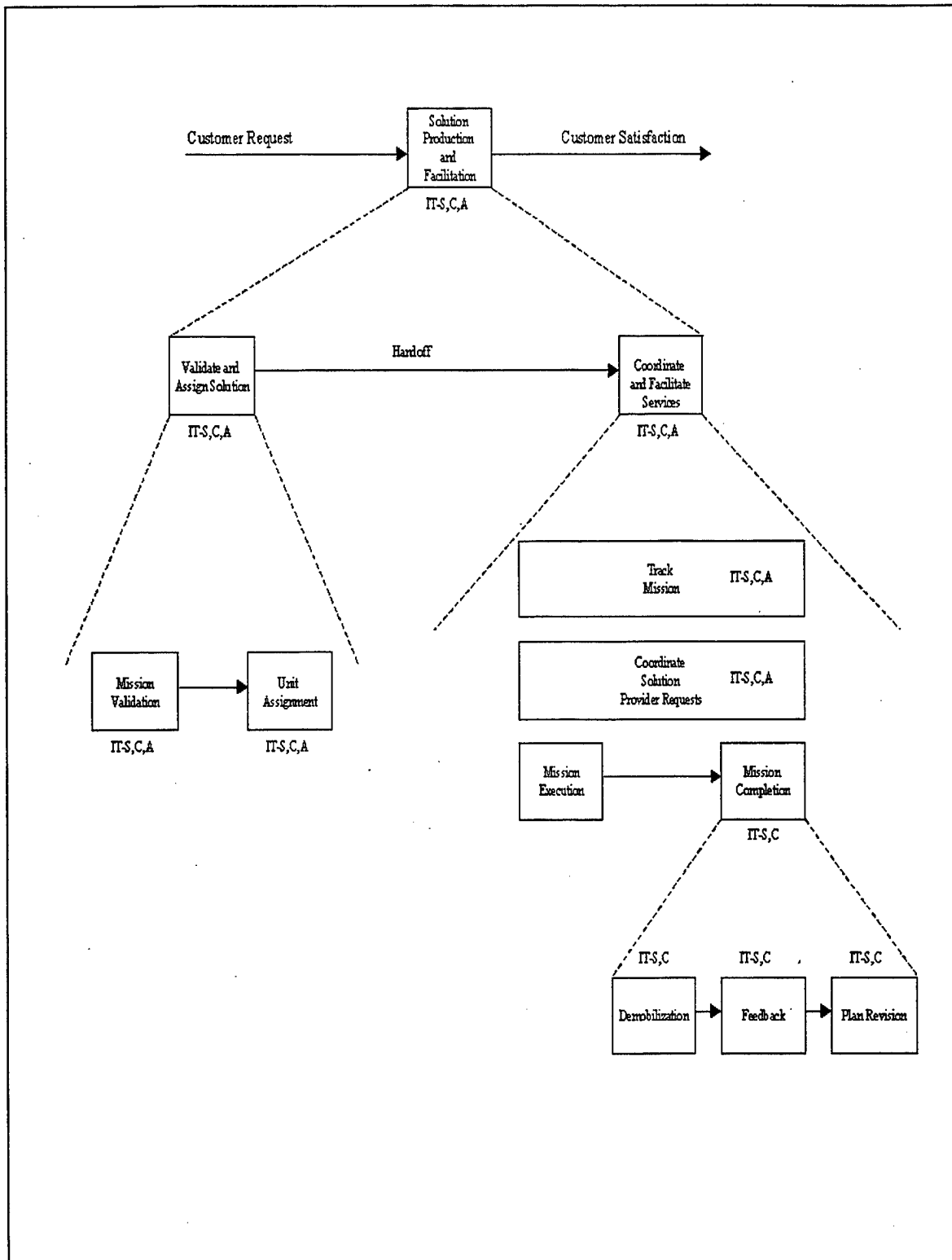
- Too little involvement from customers (incident commander/victims?)
- Could be organized into feedback process.
- Requires too many chops? Why not self empowered plan rev teams?



REDESIGN ALTERNATIVE ONE



Redesign Alternative Two



Redesign Alternative Three

APPENDIX D. GLOSSARY OF TERMS

- **Activity**
A series of transactions that translates inputs into outputs using resources in response to a business requirement; sequences of activities in logical combinations form processes.
- **Benchmark**
A measured, "best-in-class" achievement; a reference or measurement standard for comparison; this performance level is recognized as the standard of excellence for a specific business process.
- **Benchmarking**
A systematic and continuous measurement process; a process of continually comparing and measuring an organization's business processes against business leaders anywhere in the world to gain information that will help the organization take action to improve its performance.
- **Benchmarking gap**
The difference in performance between the benchmark for a particular activity and other companies in the comparison; the measured leadership advantage of the benchmark organization over other organizations.
- **Best-in-class**
Outstanding process performance within an industry; words used as synonyms are best practice and best-of-breed.
- **Best-of-breed**
Outstanding process performance within an industry; words used as synonyms are best practice and best-in-class.
- **Best practices**
Superior performance within a function independent of industry, leadership, management, or operational methods or approaches that lead to exceptional performance; best practice is a relative term and usually indicates innovative or interesting business practices that have been identified as contributing to improved performance at leading companies.
- **Capability mapping**
The analysis of the business infrastructure of an organization to determine unique abilities and potential.

- **Case Manager**
 The case manager transformation involves replacing specialized employees in a process (often from different functional departments) with a generalist case manager who performs all process activities from start to finish. A case manager can have positive performance effects in terms of cycle time (and often cost), as a single case manager obviates the need for handoffs and inter-departmental coordination. A case team involves the same concept extended to a dedicated team of people. In the DoD, these are referred to as 'integrated product teams' (IPTs).
- **Code of conduct**
 A behavioral convention that describes the protocol of behaviors — the set of conventions prescribing correct etiquette and procedures to be used in a common activity.
- **Common interest group**
 A network of individuals who share a mutual interest in a specific subject and have agreed to share their own experiences.
- **Competitive analysis**
 Analyzing the magnitude and rationale for the gap between one's own organizational performance measures and the performance measures of competing organizations.
- **Competitive**
 A measure of organizational performance compared against benchmarking competing organizations.
- **Continuous process**
 Ongoing improvement of business processes in terms of quality, improvement cost, or cycle time.
- **Core competencies**
 Strategic business capabilities that provide a company with a marketplace advantage.
- **Critical success factors**
 Quantitative measures for effectiveness, economy, and efficiency; those few areas where satisfactory performance is essential in order for a business to succeed; characteristics, conditions, or variables that have a direct influence on a customer's satisfaction with a specific business process; the set of things that must be done right if a vision is to be achieved.

- **Customer advocate**
The role played by a member of some teams where that individual pleads the case of the customer and calls the team's attention to issues that would concern the customer.
- **Customer analysis**
The evaluation of a customer's conditions and trends relative to a particular product or service of a business — tools include customer focus groups, field trial testing, customer satisfaction measurement, customer feedback systems, and the use of various types of questionnaires and survey instruments.
- **Decision Support System**
Computer-based systems composed of a language system, presentation system, knowledge system, and problem-processing system whose collective purpose is the support of decision making activities.
- **De-Linearize**
De-linearization involves rearranging a sequence of process activities to be performed in a more parallel or concurrent manner. Process parallelism or concurrency has positive performance effects in terms of cycle time (and often cost), as activities are performed in parallel as opposed to sequentially. This redesign transformation affects the sequence and flow of process activities, but not how or by whom they are performed.
- **Empowerment**
Empowerment involves delegating responsibility to front-line employees and authorizing the people doing process work to ensure the quality of their work. Empowerment can have positive performance effects in terms of cost and cycle time, as quality 'checking' steps can be avoided and empowered employees often produce superior work products at lower cost. Empowerment entails some job enlargement.
- **Enabler**
Those processes, practices, or methods that facilitate the implementation of a best practice and help to meet a critical success factor; enablers help to explain the reasons behind the performance indicated by a benchmark.
- **Entitlement**
The best that can be achieved in process performance using current resources to eliminate waste and improve cycle time; obvious improvements that are identified during the process of benchmarking and that may be accomplished as short-term goals.

- **Etiquette**
The conduct or procedure required to be observed in social or official life.
- **Exchange**
The act of giving or taking one thing in return for another.
- **Executive champion**
An executive supporter who serves as a "militant defender" or advocate of a particular civil right or activity.
- **Functional**
Process benchmarking that compares a particular business benchmarking function at two or more companies.
- **Generic benchmarking**
Process benchmarking that compares a particular business function or process at two or more companies independent of their industries.
- **Global benchmarking**
The extension of strategic benchmarking to a global scale.
- **Goals**
The numerical target value or observed performance that indicates the strategic direction of an organization.
- **Implementation**
Specific tasks that will make a strategy into a reality.
- **Internal benchmarking**
Process benchmarking that is performed within an organization by comparing similar business units or business processes.
- **Internal benchmarking**
Process benchmarking that is performed within an organization by comparing similar business units or business processes.
- **IT Automation**
IT-Automation involves the application of information technology (IT) to automate process activities. This powerful redesign transformation can have positive performance effects in terms of cost and cycle time, as computer-based tools can replace and improve human performance. As a 'automation' enabler, IT in this class is used to *obviate* human labor (i.e., in contrast to IT-support).

- IT Communication**
 IT-Communication involves the application of information technology (IT) to support process communications. This powerful redesign transformation can have positive performance effects in terms of cost and cycle time, as computer-based tools can replace slow paper-based communications.
- IT Support**
 IT-Support involves the application of information technology (IT) to support process activities. This powerful redesign transformation can have positive performance effects in terms of cost and cycle time, as computer-based tools can augment human performance in terms of memory, speed, thoroughness and other attributes. As a 'support' enabler, IT in this class is used in *conjunction* with human labor (i.e., in contrast to IT-Automation).
- Joint Reviews**
 IT-Support involves the application of information technology (IT) to support process activities. This powerful redesign transformation can have positive performance effects in terms of cost and cycle time, as computer-based tools can augment human performance in terms of memory, speed, thoroughness and other attributes. As a 'support' enabler, IT in this class is used in *conjunction* with human labor (i.e., in contrast to IT-Automation).
- Key business process**
 Those processes that influence the customer's perception of your business.
- Leadership goal**
 A goal whose achievement will place an organization in a leadership position among similar organizations.
- Long-term goal**
 A goal that may be accomplished in a longer term, usually one to five years.
- Milestone**
 A mark of a significant point in development.
- Model**
 A description, representation, or analogy that is used to help visualize something that cannot be directly understood.
- Networking**
 A decentralized organization of independent participants who develop a degree of interdependence and share a coherent set of values and interests.

- Objective**
 The set of results to be achieved that will deploy a vision into reality.
- Parity goal**
 A goal whose achievement will place an organization at an equal position among similar organizations.
- Partner**
 To form relationship between two parties who are associates or colleagues involving close cooperation and implying joint rights and responsibilities.
- Performance**
 Measurement of the performance of one company's product benchmarking against that of another company.
- Process**
 A series of interrelated activities that convert inputs into results (outputs); processes consume resources and require standards for repeatable performance; processes respond to control systems that direct the quality, rate, and cost of performance.
- Process benchmarking**
 The measurement of discrete process performance and functionality against organizations that are excellent in those processes.
- Process owner**
 The individual who exercises the possession or control over a process.
- Process stakeholder**
 An individual who has an interest in the conduct of a particular process.
- Project facilitator**
 The individual who focuses on the process of benchmarking and makes that process easier for the team.
- Project sponsor**
 The individual who provides the financial support for a benchmarking project; an individual who plans and carries out a project or activity; one who assumes the responsibility for a project.
- Protocol**
 A set of conventions governing the actions of individuals, organizations, or nations as specified by a written agreement; a code prescribing adherence to correct etiquette.

- Questionnaire**
 A set of questions for obtaining statistically useful process or personal information.
- Recalibration**
 To readjust the calibration of a measure; to standardize by determining the deviation from a measure against a standard.
- Recycling**
 To reprocess in order to gain additional information; to return to an earlier condition so that the operation can begin again.
- Reengineering**
 The radical redesign of business processes, organizational structures, management systems, and values of an organization to achieve breakthroughs in business performance.
- Reverse engineering**
 A comparison of the product characteristics, functionality, and performance with similar products made by competitors.
- Root cause**
 The fundamental causal reason for a particular observation.
- Secondary research**
 The practice of searching for information about a particular subject area from indirect sources.
- Short-term goal**
 Goal that may be accomplished within a short time frame, usually less than one year.
- Strategy**
 The plans and means to achieve the goal for a particular objective.
- Strategic alliance**
 A strategic bond or connection between organizations with common interests; an association to further the common interests of its participants.
- Strategic benchmarking**
 A systematic business process for evaluating alternatives, implementing strategies, and improving performance by understanding and adapting successful strategies from external partners who participate in an ongoing strategic alliance.

- Strategic intent**
A statement of the persistent ambitions of a company that helps to guide its decisions for resource allocation and goal setting.
- Strategic planning**
A road map to gain competitive advantage by achieving goals that define business objectives for critical success factors.
- Subject matter expert**
An individual whose knowledge of the content of a particular subject is considered to be exceptional.
- Survey**
To query individuals in order to collect data for the purpose of analyzing some group or sample of a population.
- Target**
A mark to shoot for; a goal to be achieved.
- Team leader**
An individual who participates on a team and takes on the leadership role for that team.
- Team member**
An individual who participates on a team and may take on one or more roles with respect to that team.
- Thesaurus**
A book of words and their synonyms.
- Total quality**
A customer-focused management philosophy and strategy management that seeks continuous improvement in business processes using analytical tools and teamwork that encompasses the participation of all employees.
- Vision**
The achievable dream of what an organization wants to do and where it wants to go.
- World-class**
Leading performance in a process independent of industry, function, or location.

APPENDIX E. LIST OF RESOURCES

Consultant Services

Firms

1. Andersen Consulting <http://www.andersen.com>
2. Ernst & Young LLP <http://www.ey.com>
3. Booz-Allen & Hamilton <http://www.bah.com>
4. Arthur Andersen <http://www.arthurandersen.com>
5. Price Waterhouse Coopers <http://www.pricewaterhouse.com>
6. Deloitte & Touche <http://www.us.deloitte.com>
7. EDS/A.T. Kearney <http://www.atkearney.com>
8. American Management Systems <http://www.amsinc.com>
9. IBM Consulting Group <http://www.consult.ibm.com>
10. KPMG Peat Marwick <http://www.us.kpmg.com>
11. Miller Howard Consulting Group, Inc. <http://www.millerhoward.com>
12. Pax Consulting <http://www.paxconsulting.com>

Consultants

1. Dr. Erik Jansen (408) 656-2623 ejansen@nps.navy.mil
2. Dr. Mark Nissen (408) 656-3570 mnissen@nps.navy.mil
3. Dr. Ted Lewis (408) 656-2380 tedglewis@friction-free-economy.com
4. Various consultants www.consultants-mall.com

Courses and Seminars

1. Organization Development and Change Leadership Certificate Program - Georgetown University <http://guweb.georgetown.edu/ssce/pdp/pdpodv2.htm>
2. Chief Information Officer Course, Revolution in Business Practices Course, Leading Change in the Information Age Course
<http://www.sm.nps.navy.mil/CEE/>
3. Leading Change Management, Miller Howard Consulting Group, Inc.
<http://www.millerhoward.com>

Literature

Books

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3. The Change Management Toolkit for Reengineering, Holland & Davis, Inc.
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6. Zuboff, S., *In the Age of the Smart Machine: The Future of Work and Power* New York: Basic Books, 1988.
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Websites

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2. http://tiger.bpa.missouri.edu/s-support/studentactivities/mu_consult/weblinks.html
3. <http://www.prosci.com/change98.htm>
4. <http://www.cob.ohio-state.edu/~fin/jobs/mco/mco.html>

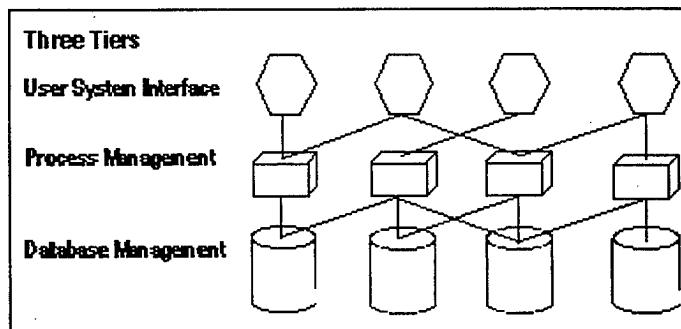
APPENDIX F. THREE TIERED ARCHITECTURE

This appendix discusses the concept of the three-tiered architecture and provides a brief synopsis of its component elements. For the sake of brevity and clarity, the information below is taken from web pages provided by the Software Engineering Institute (SEI) at Carnegie Mellon University. Further reading on three-tiered architectures should include at a minimum research by Lewis on a three-tiered architecture plan for the Defense Technical Information Center (DTIC) [Ref. 35].

The three tier software architecture emerged in the 1990s to overcome the limitations of the two tier architecture (see Two Tier Software Architectures). The third tier (middle tier server) is between the user interface (client) and the data management (server) components. This middle tier provides process management where business logic and rules are executed and can accommodate hundreds of users (as compared to only 100 users with the two tier architecture) by providing functions such as queuing, application execution, and database staging. The three tier architecture is used when an effective distributed client/server design is needed that provides (when compared to the two tier) increased *performance*, *flexibility*, *maintainability*, *reusability*, and *scalability*, while hiding the complexity of distributed processing from the user. For detailed information on three tier architectures see Schussel and Eckerson. Schussel provides a graphical history of the evolution of client/server architectures [Schussel 96, Eckerson 95].

Technical Detail

A three tier distributed client/server architecture (as shown in Figure 28) includes a user system interface top tier where user services (such as session, text input, dialog, and display management) reside.



Three tier distributed client/server architecture depiction [Louis 95]

The middle tier provides process management services (such as process development, process enactment, process monitoring, and process resourcing) that are shared by multiple applications. The third tier provides database management functionality and is dedicated to data and file services that can be optimized without using any proprietary database management system languages. The data management component ensures that the data is consistent throughout the distributed environment through the use of features such as data locking, consistency, and replication. It should be noted that connectivity between tiers can be dynamically changed depending upon the user's request for data and services.

The middle tier server (also referred to as the application server) improves performance, flexibility, maintainability, reusability, and scalability by centralizing process logic. Centralized process logic makes administration and change management easier by localizing system functionality so that changes must only be written once and placed on the middle tier server to be available throughout the systems. With other architectural designs, a change to a function (service) would need to be written into every application [Eckerson 95].

In addition, the middle process management tier controls transactions and asynchronous queuing to ensure reliable completion of transactions [Schussel 96]. The middle tier manages distributed database integrity by the two phase commit process (see Database Two Phase Commit). It provides access to resources based on names instead of locations, and thereby improves scalability and flexibility as system components are added or moved [Edelstein 95].

It should be noted that recently, mainframes have been combined as servers in distributed architectures to provide massive storage and improve security (see Distributed/Collaborative Enterprise Architectures).

Usage Considerations

Three tier architectures are used in commercial and military distributed client/server environments in which shared resources, such as heterogeneous databases and processing rules, are required [Edelstein 95]. The three tier architecture will support hundreds of users, making it more scalable than the two tier architecture (see Two Tier Software Architectures) [Schussel 96].

Three tier architectures facilitate software development because each tier can be built and executed on a separate platform, thus making it easier to organize the implementation. Also, three tier architectures readily allow different tiers to be developed in different languages, such as a graphical user interface language for the top tier; C, C++, SmallTalk, Basic, Ada 83, or Ada 95 for the middle tier; and SQL for much of the database tier [Edelstein 95].

Migrating a legacy system to a three tier architecture can be done in a manner that is low-risk and cost-effective. This is done by maintaining the old database and process management rules so that the old and new systems will run side by side until each application and data element or object is moved to the new design. This migration might require rebuilding legacy applications with new sets of tools and purchasing additional server platforms and service tools, such as transaction monitors (see Transaction Processing Monitor Technology) and Message-Oriented Middleware. The benefit is that three tier architectures hide the complexity of deploying and supporting underlying services and network communications.

Maturity

Three tier architectures have been used successfully since the early 1990s on thousands of systems of various types throughout the Department of Defense (DoD) and in commercial industry, where distributed information computing in a heterogeneous environment is required. An Air Force system that is evolving from a legacy architecture to a three tier architecture is Theater Battle Management Core System (TBMCS).

Costs and Limitations

Building three tier architectures is complex work. Programming tools that support the design and deployment of three tier architectures do not yet provide all of the desired services needed to support a distributed computing environment.

A potential problem in designing three tier architectures is that separation of user interface logic, process management logic, and data logic is not always obvious. Some process management logic may appear on all three tiers. The placement of a particular function on a tier should be based on criteria such as the following [Edelstein 95]:

ease of development and testing

ease of administration

scalability of servers

performance (including both processing and network load)

Dependencies

Database management systems must conform to X/Open systems standards and XA Transaction protocols to ensure distributed database integrity when implementing a heterogeneous database two phase commit.

Alternatives

Two tier client server architectures (see Two Tier Software Architectures) are appropriate alternatives to the three tier architectures under the following circumstances:

when the number of users is expect to be less than 100

for non-real-time information processing in non-complex systems that requires minimal operator intervention

Distributed/collaborative enterprise computing (see Distributed/Collaborative Enterprise Architectures) is seen as a viable alternative, particularly if object-oriented technology on an enterprise-wide scale is desired. An enterprise-wide design is comprised of numerous smaller systems or subsystems.

Complementary Technologies

Complementary technologies to three tier architectures are Object-Oriented Design (to implement decomposable applications), three tier client/server architecture tools, and Database Two Phase Commit processing.

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