Survey-guided change in ship design and production: prospects and limitations.

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*SURVEY-GUIDED CHANGE IN SHIP DESIGN AND PRODUCTION: Prospects and Limitations**

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ABSTRACT

SURVEY-GUIDED CHANGE IN SHIP DESIGN AND PRODUCTION:

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This paper describes and analyzes an innovative attempt to improve the ship design organization of a U.S. shipbuilder. As part of this effort, a survey of the engineering workforce was conducted to detect social and technological impediments to organizational effectiveness. While the survey was effective in diagnosing impediments to effectiveness and influenced the priorities of a task force established to improve engineering effectiveness, ultimately the task force was dissolved in response to short-term pressures to complete delivery on the company's major production contract on schedule. The paper argues that the problems that surveys are intended to diagnose are often symptomatic of the very nature of the organization's structure and culture. Organizations are complex, dynamic systems. In the traditional, bureaucratic organizational systems that characterize U.S. shipyards, there are powerful internal dynamics that mediate against major system change. This case illustrates the paradox of using surveys to change a traditional management culture. If managers in the system had the personal flexibility or organizational autonomy to change in response to survey data, it is unlikely that their employees would have reported the problems they did originally. Overall, this case example demonstrates that surveys should *not* be viewed as a guiding force, but rather as an input to organizational change. The survey without a well designed and orchestrated change process will not lead to organizational improvement and may lead to a change in the wrong direction--a decline in employee morale and trust in management.

INTRODUCTION

Shipbuilding in the United States is in the midst of major change. Driven by fundamental environmental changes such as the shift from cost-plus to fixed-cost pricing by the Navy, the dramatic decline in the commercial market, and intensified competition from Japan, shipyards in the U.S. are following many other U.S. manufacturing sectors in struggling to improve internal operations to reduce cost and improve quality. The most obvious response to these environmental changes is through internal adjustment of technical and control systems to increase efficiency. However, a major lesson that is being learned in U.S. industry is that technology-driven approaches to competitiveness are not effective unless they are complemented by appropriate social innovations (Ettlie,1986; Nadler and Robinson, 1983; Tornatzky,1985; Roitman, Liker and Roskies,1987). Going by such terms as participative management, team approaches, socio-technical design, and total quality improvement, these innovations are being experimented with at an astounding rate.

The urgency to change that shipyards are feeling today was experienced by other manufacturing sectors years earlier. A case in point is the automotive industry which was already struggling to respond to competition from imports of small fuel-efficient cars in the early 1970s. Indeed, in a recent conference on "Social Technologies in Shipbuilding" (Maritime Administration,1983), most of the case examples of social innovations were drawn from industries other than U.S. shipbuilding. In their transitional period, U.S. shipbuilding has the opportunity to learn from the experiences of other industries, as well as from their own early experiments with innovative approaches to change.

This paper focuses on an attempt to jointly consider both social and technical factors to improve shipdesign. In the 1980s, U.S. Ship (pseudoname) found that internal engineering design costs were at an all-time high. A large design organization (compared to past headcount) was needed simply to revise design agent drawings and keep up with production problems in the yard, despite a recent heavy investment in Computer-Aided-Design (CAD). By early 1986 the quantity of engineering changes had increased to an alarming number each week. In the heat of this "firefighting mode," U.S. Ship formed a task force to find ways to improve the efficiency and effectiveness of their design organization. As part of this larger effort, the task force hired an outside consultant to conduct a survey of the engineering workforce.

The use of surveys in large-scale organizational change efforts, termed "survey feedback," is by no means new. The survey feedback approach was developed extensively at the University of Michigan's Institute for Social Research, within Kurt Lewin's Center for Group Dynamics in the 1940s, as a major tool in organization development efforts (French and Bell,1972). The purpose was to change the behavior of supervisors to a more participative style. Subordinates rated their supervisor's leadership style and this data was fed back to supervisors as part of an intensive training program. The survey feedback approach was developed further at ISR as part of the University of Michigan's Quality of Work Life research program (Bowers and Franklin, 1972). The survey became a broader diagnostic instrument for assessing organizational effectiveness, as it was used in the current case example. In attempting to improve an organization, it seems sensible to collect data from a variety of sources to get a comprehensive picture of the current state of the organization. There are a number of compelling reasons for conducting employee surveys as part of the data collection effort.

First, one can argue that the use of surveys to monitor employee attitudes and improve unsatisfactory conditions is important in its own right. The myth that satisfied employees are *productive* employees has been repeatedly refuted by scientific research (Dunham and Smith, 1979). However, satisfied employees are less likely than dissatisfied employees to leave the organization, will have better attendance records, and are less apt to support unionizing non-union firms or militant union activity in unionized firms (Hamner and Smith,1978). Lawler (1986) argues that the latter reason, the prevention of unionization efforts, is a major reason why large non-unionized firms such as Sears, Westinghouse, and IBM regularly conduct employee surveys and attempt to allay employee dissatisfaction.

Second, survey data can help target change efforts. Those persons doing the work know their jobs better than anyone else. This management philosophy is a cornerstone of many quality improvement efforts. For example, Deming's (1982) quality management approach emphasizes that workers should check their own quality using control charts and be given a substantial role in correcting variances. This approach emphasizes defect *prevention* rather than defect *detection*. Surveys in this context are simply another way of gathering data on impediments to effectively doing work which emphasize systemic barriers faced by a substantial portion of the workforce (Hancock, 1982; Liker and Hancock, 1986).

Third, survey data can help motivate change. Beckhard (1969) argues that the motivation to change depends on three factors--Dissatisfaction (D) with the current situation, a Vision (V) of what the new system will look like, and a First (F) step to get there. According to Beckhard, there will always be some resistance to change and the product, D*V*F, must exceed this resistance to motivate change. By surfacing employee dissatisfaction, surveys can provide one of these factors--dissatisfaction with the current system. People are particularly motivated by numbers, especially if the numbers are linked to a reward system (Cammaan and Nadler, 1976). Employee surveys can be used to quantify problems in organizational systems that are hard to otherwise quantify, particularly in white-collar settings in which the output is not tangible or easily measureable (Liker and Hancock, 1986).

Finally, data can be used to track change. The bottom line is often not immediately affected by organizational change efforts. The benefits are apt to be long term (Dennison, 1985) and not directly traceable to specific organizational changes in a simple cause-and-effect chain. Again, this would seem particularly true in white-collar work. Hence, attitudes and perceptions of employees might be one of the few available short-term measures of change (Seashore et al.,1983).

Despite these arguments in favor of organizational surveys as a tool for change, managers are often very critical of surveys. The following are typical complaints about surveys: "The individual employee only sees a small piece of the big picture--they are biased." "All you're really getting in your survey is a bunch of opinions, not facts." "We already know what the problems are. We spend too much time studying them, and too little time solving them." "We've done surveys before and nothing changed and then attitudes were worse than they were before the survey."

While it is tempting to discount these criticisms as management "resistance" to potentially incriminating assessments by employees, these are often legitimate criticisms based on common experiences with surveys that failed to stimulate change. There are documented cases of substantial improvements in organizations as a result of well-executed survey-feedback programs (Nadler,1977; Bowers,1973), but the track record of surveys is tarnished by failures as well (e.g., Mohrman et al., 1977; Nadler, 1976, 1977; Chesler and Flanders,1967).

The use of survey feedback at U.S. Ship illustrates the potential, as well as the limitations, of survey-guided change. The potential of the survey was most evident in the reactions of the task force to the survey data--it helped them gain insights into their own organization and surfaced employee concerns that had not been seriously considered by the task force. The potential was also evident from the results of a planning retreat that centered on the survey results--the task force chose new priority projects based on the results and followed up on several of those projects after the session. Hence, the results show:

- Survey data can provide management with new insights into their organization.
- Survey data, coupled with a carefully planned social process, can redirect management priorities.

A clear indicator of the limitations of survey-guided change at U.S. Ship was the fact that several months after the data were fed back and projects were launched all activity of the task force came to an abrupt halt. Top management announced that completing their major construction project on schedule was a top priority and all non-essential activities should be curtailed. It was up to engineering management to decide exactly what would be cut. The leadership of the task force chose to cancel all task-force projects, including those initiated as a result of the survey.

Unfortunately, the problems that surveys are intended to diagnose are often symptomatic of the very nature of the organization's structure and culture. Organizations are complex, dynamic systems. In the traditional, bureaucratic organizational systems that characterize U.S. shipyards, there are powerful internal dynamics that mediate against major system change. The lessons learned on the limitations of survey feedback are:

- Survey data alone do *not* change organizations.
- Top management involvement and support is necessary for major system change.
- Hierarchically-integrated planning is needed as a cornerstone for an effective change effort. That is plans at the sub-unit level must be integrated with a broader company plan.
- Survey data alone do *not* change attitudes or behavior.

- Hardened organizations do *not* value soft data alone.
- Surveys without action can lower employee morale and trust in management.

This particular failed attempt to proactively change a central part of their ship production process should *not* be interpreted as an indictment of this particular company. U.S. Ship is a highly regarded shipbuilder based on a long history of quality construction and timely delivery. Like other U.S. shipyards, they are struggling to adapt to a new environment in which old ways are not as effective as they were in years past. This case example is particularly interesting and important precisely because it is characteristic of the challenges faced throughout the U.S. shipbuilding industry. By looking in depth at one experience of one company trying to rise to this challenge, important lessons can be shared with the larger community of shipbuilders.

As background to the case analysis, a brief review is presented of what is known about traditional organizations and why they are so difficult to change. Second, the context, process, and survey results are described. Third, an analysis of what happened at U.S. Ship is presented organized around the lessons stated above. A concluding discussion considers the prospects and limitations of survey-guided change in light of this single case study.

TRADITIONAL VERSUS OPEN-SYSTEMS MANAGEMENT

An essential step in a successful organizational change effort is a vision of where the organization needs to go--what is the purpose of the change effort? (Lawler, 1986; Nadler,1981) There is a growing consensus that changes in the environment are pushing U.S. manufacturing toward a fundamentally different type of organization. When Max Weber first developed the concept of the modern bureaucracy to describe the changes taking place in the late 1800s, he described it as a new, highly efficient organizational form. Traditional management theorists like Henry Fayol (Sashkin,1981) developed principles to efficiently manage this new type of organization, e.g., no one should have more than one boss, bosses should have a small number of subordinates they could closely supervise, and highly specialized staffs of professionals should be kept organizationally separate from managers of the main production operations. While traditional organizations have proven to be highly effective in stable economic periods, they have shown themselves to be cumbersome and ineffective in a rapidly changing environment (Burns and Stalker,1961; Lawrence and Lorsch,1967). New models of flexible organizations that can respond quickly and proactively to the volatility of the 1990s and beyond are providing visions to many companies of future direction. These new organizations have been given many different names (e.g., "organic" organizations, "Theory Z" organizations, "high-involvement "organizations), but they are all based on an open-systems model of organization[1] and have a number of common features that distinguish them from traditional, closed system management. These are summarized in Table 1.

(TABLE 1 ABOUT HERE)

Traditional management is based on a closed-system or "machine" model of organization (March and Simon, 1958; Burns and Stalker,1961). Like a machine, fixed, specialized components of the system are designed to serve specific, fixed functions; the system is designed to operate under a range of operating conditions, but not adapt to changing conditions; a change in one part of the system is assumed not to alter the functioning of other parts of the system; and the machine is designed to respond passively in rational, predictable ways to a centralized control system. By contrast, open-systems management is based on "organic" or living-system models of organization (Burns and Stalker,1961). Components of the system are designed to serve multiple, changing functions; the system itself is designed to respond flexibly to a changing environment; changes in one part of the system are assumed to alter the functioning of other parts of the system; and the organic system is designed to respond purposefully and often unpredictably based on feedback from decentralized control systems.

There are five interrelated themes that distinguish the traditional from the open-systems model:

1. Integration with the external environment. The traditional model emphasizes efficiency and control of the internal environment with little regard for how it is matched to the external environment. For example, on the input side, suppliers of materials, parts, designs, and prospective employees are dealt with by specialized units (e.g., purchasing, personnel) on a transitory basis as the need arises and inputs are selected on the basis of formal criteria (e.g., cost, formal professional credentials, in-coming inspection). One of the hallmarks of open-systems management is constant attention to the external environment. Persons throughout the company are concerned with managing transactions with the environment. For example, if quality and timely delivery of supplies are critical to achieving the organizations mission, open-system organizations will develop close, long-term relationships with a small number of suppliers whom they select on the basis of a broad range of considerations in addition to cost. This long-term relationship will be carefully managed and nurtured. On the output side, a purpose-driven, market orientation drives the internal functioning of the open-system organization. They are "close to the customer" (Peters and Waterman,1982) and know their markets.

[1] The classic work explicating open-systems theory as applied to organizations is The Social Psychology of Organizations by Katz and Kahn (1978). The concept of "organic" as contrasted with "mechanistic" organizations was developed by Burns and Stalker (1961). The notion of Theory Z organizations was coined by Ouchi (1981) to describe U.S. firms that had a management culture similar to successful Japanese firms. Lawler (1986) calls organic, Theory Z organizations that use open-systems management principles "high involvement organizations."

2. Internal Integration. Traditionally managed companies are characterized by an extensive division of labor and low levels of internal integration. One example is the well-known metaphor of the designer throwing the design over the wall to production (Ettlie and Reifeis, 1987). Different departments develop goals for their own subunit and neither cooperate nor communicate effectively with other departments to work toward common organizational goals. As conditions change new specialized departments and roles are developed to manage new tasks, but old departments and roles linger on leading to a continually more elaborate, expensive, and complex system (Selznick,1949). By contrast, open-systems organizations are highly integrated horizontally and roles change as conditions change leading to a leaner organization. Through job and organizational design, job rotation, and appropriately designed reward systems, communication and cooperation across units is high (Lawler,1986).

3. Centralization of Control Systems. Traditional organizations depend on "carrot-and-stick" systems that control individuals based on "external" control (Cammann and Nadler, 1976). Individuals in the system are controlled by elaborate standard operating procedures, rules, and rewards and punishments to keep them in line. By contrast, open systems depend more heavily on subtle, "internal" control systems in which individuals control themselves. Individuals are bound to support organizational goals by a shared vision of a common organizational purpose. This requires that individuals understand the vision, see their fate tied to the fate of the organization, and have the knowledge and ability to make many of their own decisions. Reward systems are holistic. For example, individuals are evaluated based on how they function as team members, as well as on economic performance measures. Lawler (1986) calls these high-involvement organizations because they are designed to *involve* employees in the overall operation of the company rather than *use* employees to perform fixed and limited tasks.

4. Social and Technical Planning Systems. In traditional systems, planning is vertical, top-down, and focuses on technical systems. It is assumed that a rational plan can be developed at the top and then exploded out to provide targets and deadlines for each part of the system. Managers of individual units plan their department's activities to meet the schedule but may not contribute to or even be knowledgeable about the larger plan. Technology planning is also top-down, and social systems are not explicitly considered in the planning process except as a possible constraining force (e.g., "some people may resist change so let's limit the number of people we train on CAD at first and keep this quiet"). Open-systems planning is purpose driven (i.e., how does this contribute to the organization's mission?), vertically and horizontally integrated (i.e., there is a great deal of upward input and horizontal communication in the planning process), and explicitly considers the social system in the plan (e.g., "how can we design the social system to get the most out of the technical system?").

5. Feedback Systems. Feedback systems are central to both traditional and open-system organizations; however, they are fundamentally different in nature under these two management models. As noted above, "open systems" are more open to the environment. They have more

"permeable boundaries," meaning that interaction with the external environment is handled by more than a few specialized departments (i.e., an employee building the ship may interact with outside designers or suppliers). Moreover, the way feedback is used varies considerably across these organizational models.

According to Chris Argyris (1982), feedback is ideally a part of "double-loop learning" as opposed to "single loop learning" process. By single-loop learning Argyris means that the present structure and goals of the organization are taken as a given and feedback is used only to correct deviations from the current goals. Accounting control systems are prime examples. Budgets set the acceptable level of spending for an organizational unit and expenditures are considered reasonable as long as they do not exceed the budgeted level. By contrast, in double-loop learning one first questions the current structure and goals. Is the current budget-setting process effective? Is conformance to budget a reasonable criteria for judging organizational performance? What types of games do people play as a result of the current budget-setting process? Thus, we are adding a second, prior loop. The first loop questions the goal and system of evaluation, and the second loop asks whether achievements are in line with goals. Questioning and challanging current goals and organizational arrangements is an ongoing process in double-loop learning.

Argyris (1982) demonstrates that single-loop learning is self-sealing and self-reinforcing.[2] Over time managers develop a psychological investment in the current organizational arrangements. This commitment to the current system is reinforced by the very act of controlling the system using existing single-loop measurement systems. This psychological investment causes managers to accept feedback only on "correctable errors...of which people are aware and whose discovery and correction pose minimal threat to individuals and to systems or whose discovery is a threat but whose camouflage is more threatening." Management rejects feedback on "uncorrectable errors...whose discovery is a threat to individuals and to the system of hiding the error and inability to correct error." Hence, managers in single-loop learning systems insulate themselves from critical feedback that suggests the need for change. Moreover, to the extent that it becomes impossible to camouflage negative feedback, such organizations develop what Argyris calls "espoused theories," empty words with no basis in actual practice: "Camouflage may resort to espoused theory ("We are open, trusting, and cooperative with one another") in which everyone makes an open secret of the incongruity... Members of the organization may make a public show of attacking the problem while covertly sharing an understanding of the ritual nature of that attack."

Contemporary survey feedback is purported to be based on an open-systems planning model (Nadler, 1976; Bowditch and Buono,1982). What does this mean in practice? First, the purpose of the change effort should be clear and part of an integrated plan to achieve the organization's mission. Second, the survey should analyze the system as a set of interrelated parts, not as a series of isolated

[2] The distinction between single-loop and double-loop learning is only part of a broader theory of organizational learning developed by Argyris and Schon (1978). This part of the theory is emphasized here since it directly addresses how organizations use feedback.

pieces. For example, it should not focus on either social or technical issues separately without considering how they interact. Third, the planning and feedback process should resemble a network model of communication across organizational levels and across departmental boundaries. Finally, the feedback should result in double-loop, not single-loop, learning--problems that require major change in structure and/or direction should be attacked at their root cause, not simply acknowledged and then ignored.

While an admirable vision, what does it mean in practice to apply an open-systems approach to survey feedback in a traditionally managed system? Should the purpose be to completely transform traditional management into open-systems management? Argyris and social scientists before him (March and Simon, 1958, Chapter 3), have demonstrated that there are powerful internal dynamics in the structure and culture of traditional systems that reject the open-systems approach. For example, traditional organizations locked in single-loop feedback will reject feedback that suggests the organization should move toward fundamental structural change (Argyris, 1982); traditional top-down planning is incompatible with a bottom-up survey feedback process (Nord and Durand,1978); individual organizational units will protect their turf against attempts to redefine organizational structures that may reduce their power or resources (Selznick,1949); and without a clear mission statement and business plan supported by the entire organization, projects that result from survey feedback are likely to be piecemeal fixes that fail to get at root causes. The case example of U.S. Ship exemplifies the difficulties in effectively using survey feedback in traditional organizations.

CASE DESCRIPTION

The Company. U.S. Ship has an excellent reputation in shipbuilding as a reliable, experienced, quality manufacturer with a highly skilled workforce. Top management considers people to be their most important asset and a major competitive advantage. While this people orientation is sincere, it is part of a paternalistic, traditional management culture, not a high involvement, open-system culture as described above. Virtually all of the characteristics of traditional organization in Table 1 fit U.S. Ship. Major planning and decision making is the province of top management and the engineering department is a highly controlled environment. Problems with their main contract and the external demands for standard operating procedures and paperwork imposed by the Navy simply added to the bureaucracy making it more difficult for U.S. Ship to respond proactively to a changing environment. With the fixed-cost contracts of the Navy, the unpredictable design problems, and the enormous amount of red tape, it was becoming increasingly difficult to make a profit.

At the time of the survey, the number of employees was particularly high compared to historical employment, a concern of management who was trying to reduce costs. At the same time, the main project, a ship for the Navy was particularly problematic as it was based on a new design, it was a technically complex ship with a high density of piping and electrical wiring, and all of the original designs were developed by outside design agents (based on Navy specs) who developed drawings that needed considerable rework due to interferences. Because of the unanticipated design and construction problems, the workload was far in excess of that projected (and covered by the bid) and additional hiring of outside contractors and overtime was necessary.

The Engineering Organization. Engineering is traditionally organized around functional specialties. Designers/draftsmen are in four main units each with its own manager and set of supervisors--hull (structural and outfitting), piping, electrical/electronics, and HVAC/mechanical. A variety of staffs support this design organization, including administrative (i.e., clerical), testing, CAD systems support, and a small group of degreed engineers. By and large, designers respond to requests for engineering changes and develop two-dimensional drawings on CAD, while any analytical work (e.g., finite element analysis) is contracted out to specialized engineering firms. As such there are very few degreed engineers at U.S. Ship.

At the time of the survey, engineering was staffed with 99 employees. Of these, 87 persons, 88 percent, responded to the survey. Of these 87 respondents, 44 were designers, 27 were managers/supervisors/engineers, 4 were clerical, and 12 were technical support.

Technology Management. The main technology of engineering was CAD. U.S. Ship invested heavily in one of the leading CAD systems in 1980 and had a total of 10 workstations tied to a central computer. The planning and installation of CAD was done in a traditional mode with little input or involvement by those who would be using the system. The workstations were shared among 40-50 regular users on two shifts. The system was used by designers (not engineers) for two-dimensional drawing. The purchase of three-dimensional software was being considered at the time of the engineering survey and no engineering analysis software (e.g., pipeflow analysis) had been purchased. Attempts to electronically transfer drawings from outside design agents to U.S. Ship's system were of limited success. Since the systems were not compatible, drawings were digitized. However, the dimensions on the printed drawings were not completely accurate and the digitized drawings reflected these inaccuracies. This made the automatic dimensioning, tolerancing, and interference-checking features of CAD unusable. Hence, many of the most powerful features of CAD were either not available to designers or unusable because of the heavy reliance on outside design agents.

Training for CAD was limited mainly to designers. Early users had been trained by the CAD vendor. Later, a cooperative program with a local community college was started in which one of U.S. Ship's most skilled users became an instructor for CAD short courses. Training only covered introductory courses in two-dimensional drawing.

Controlling the CAD system became a major concern of engineering management. Elaborate procedures were set up to schedule "tube time" as workstations were scarce relative to demand, ensure as much utilization of workstations as possible, protect drawings from unauthorized changes, and monitor designers to see that they were efficiently using the system. Heads of the three main departments had the autonomy to manage their groups as they thought best and used different approaches to management of the technology. For example, the only available measure of efficiency of use was built into the computer. The computer recorded the number of drawing "functions" per unit of time on the system. A function meant pushing a button that selected a geometric shape, line, etc., which was then sized and placed by the user. The assumption was that a more efficient designer would push the function button more frequently in a given period of time. Though all managers agreed this was a crude measure of efficiency and definitely not a measure of effectiveness, some managers took the measure seriously. Moreover, there was confusion between managers and designers as to how seriously this was being taken as a measure of performance. In short, an entire bureaucracy was being created to control and maintain the CAD system, and thus, further *control* the designers who used CAD.

The Need to Change. The need to change engineering came from short-term and long-term pressures. The engineering organization was becoming large and costly and, despite the new CAD systems, could not keep up with the enormous number of engineering changes generated by the main construction project. Overtime was becoming common and several short-term organizational innovations were developed to speed up the response of engineering to Production Change Requests (PCRs). One innovation was the formation of a small liaison group of designers/engineers who could authorize many changes right in the yard and then send any drawing revisions on to engineering after the fact. Another innovation designed to short circuit the standard engineering change process was the formation of a large committee of production managers and executives who could review and authorize engineering changes without going through engineering. One designer was assigned to make any changes requested by this group.

Serious tensions were developing as a result of the immense work pressures and the short-term measures management had taken to deal with these pressures. Designers were dissatisfied with management's approach because their historical responsibility for design was being usurped; they were spending much of their time making changes to drawings after the changes had already been authorized and made in the yard. They were becoming bureaucrats rather than designers. Designers argued that production was requesting changes that were either unreasonable or did not really require drawing changes. Investigating these changes took at least as much time as investigating legitimate requests for changes. At the same time designers felt attacked by production who they perceived as blaming engineering for the design problems. Engineering claimed that the principal causes of design problems were outside design agents whose drawings looked fine individually, but were hampered by a multitude of interferences when they were put together to build a ship. Hence, engineering was left with the tedious task of cleaning up a mess made by poor coordination between outside design agents and felt that they were being accused of creating the problem.

Apart from these short-term problems, management saw their external environment as changing from the relatively benign market of the past to a much more demanding market potentially threatening to their future survival. Thus, engineering had to be leaner and more efficient and had to design products right the first time to remain competitive in this new arena.

The Engineering Task Force. Within this context, a task force of managers in engineering was formed and led by a newly hired chief engineer. As a new manager, he had been promised considerable leeway in changing the engineering organization. The task force had actually been instigated by the head of industrial engineering as an innovative approach to organizational change. The new chief engineer appeared committed to the concept of a participative, integrated approach to organizational analysis and change. The task force, led by the chief engineer, included all department heads (piping, hull, electrical, technical services, administrative services), a project manager, the head of the recently created liaison group, and an industrial engineer. This group of nine professionals/managers met regularly (sometimes exceeding the conventional once/week) to identify and solve problems and generally shape the future of engineering.

Prior to the survey, the task force had used an individual voting process within the committee to develop a prioritized list of projects. (From a brain-stormed master list, each committee member ranked the importance of individual projects. The scores were averaged to generate this priority list.) Special-purpose action teams were created to work on selected high-priority problems. These action teams included participation from lower levels in the organization. Several projects were launched and under way before the survey feedback process began.

The energy levels of the task force and the spinoff action teams were tremendous; however, there were early signs of deficiencies in preparation and support that threatened the long-term success of the change effort. First and foremost, the task force was largely isolated from top management planning and support. The task force leader and members agreed that the less top management knew about task force activities the better, since they might prematurely stop particular projects. The task force believed that their participative style ran counter to the company's autocratic culture and was potentially threatening to top executives. Moreover, their priorities were more long term, while they perceived management wanted immediate results and might demand this of task force projects. In this way the group was also protecting itself from accountability--a project that failed was not a failure if no one on top knew about it. Thus, the task force sealed itself off from top management's criticism as well as support. By setting themselves up as a counter measure to the prevailing culture, they were in danger of becoming what Lawler (1986) calls a "guerrilla" participative group.

A second possible deficiency was that there was no up-front team building or training of task force members. It was presumed by the leader and members that they had the necessary skills to facilitate group process and would learn to become a team by working together. As an example of a possible cost of this approach, there was no serious effort to develop a mission statement for engineering. Also, minor conflicts were evident within the group and the chief engineer vacillated inconsistently between consensus decision making and autocratic decision making. For example, in their original priority-setting process, after getting input from the group, it was said that the chief engineer took a rather heavy hand in sorting the project areas according to his personal priorities for engineering.

The Survey Process. If years of experience with survey feedback have taught one lesson, it's that the *social process* of designing and using surveys is as important as the *technical content* (e.g., questionnaire design, analysis procedures) for an effective improvement effort (Nadler, 1979; Bowditch and Buono,1982). "Social process" means the why and how of survey feedback: What are the goals of the improvement effort and how does the survey fit into the overall effort? Who will be involved in the improvement effort? How will the survey be designed and executed? How will the resulting data be fed back and used?

The survey feedback process used in this case is summarized in Table 2. In many ways this was a highly participative, model process. A consultant was hired to work with the industrial engineer assigned to the task force to design the questionnaire and analyze the data. In orientation meetings with the task force the open-systems model was presented and the purpose of the survey discussed. The consultant emphasized that conducting the survey without follow-up action would damage morale of the workforce tremendously. The task force agreed that they were committed to acting on the survey results and that the process by which the survey was designed and conducted was important to gain commitment and get the best results. Indeed, the task force insisted employees should be involved in the process to the extent possible and be kept informed of progress. In the meantime, projects already launched and any new business should progress parallel with the survey.

(TABLE 2 ABOUT HERE)

In the planning and development phase two questionnaires, one for support staff and another for designers and engineers, were designed based on open-ended interviews with about one dozen employees and a brain-storming session with the task force. The support staff questionnaire was a subset of the designer/engineer questionnaire--excluded were questions on CAD and technical questions about design. The questionnaires were revised after extensive pretesting and critical review by employees and the committee.

Prior to administering the questionnaire, the chief engineer met with small groups of employees throughout engineering to acquaint them with the survey and answer questions. The entire engineering workforce was included in the survey, including support staff and managers on the task force (the chief engineer did not fill out the questionnaire as he was new to the company). The questionnaires were hand delivered and picked up by the industrial engineer. Since respondents were asked ***not*** to include their names on the questionnaire and the industrial engineer was not part of the design engineering organization, it was felt that this personal approach would not threaten anonymity or bias responses. This preparation and personalized delivery and pick up paid off with a response rate of almost 90 percent. The data were analyzed by the industrial engineer and outside consultant. Prior to the final feedback and planning session, a draft report was circulated to the committee for critical evaluation.

Feedback and planning was a critical step in the process. The committee decided that a two-day retreat was warranted and the data should be used as input into a broader planning process. The design of the retreat itself was a modification of Lindaman and Lippitt's (1979) planning and goal-setting process. First, based on the survey results, the task force developed a prioritized list of what the employees wanted to see changed. This was compared to their own previously developed list of priority projects. Second, a technique called preferred futuring (Lindaman and Lippitt,1979) was used to establish an image of where the group wanted to see engineering go. This involved each member of the committee envisioning what they would like to see engineering look like in five years. The nominal group technique was used to generate a pooled image of their preferred future and prioritize key goals. Third, based on the preferred future and the survey data, a list of new priority initiatives was developed. Finally, the consultant emphasized that for each initiative a succinct goal statement was needed and led the group through the development of a goal statement for the highest priority initiative.

Members of the task force were highly energized by the retreat. They were not only excited about working on the new initiatives, but also enthusiastic about some of the new group process techniques they had experienced (e.g., nominal group technique, brainstorming, futuring, goal setting). As a direct result, several members of the committee volunteered on the spot to attend a several-day training session on group facilitation to be sponsored by industrial engineering, a commitment counter to the policy that no time was to be spent on learning group process.

Engineering personnel who were not part of the task force were informed of the survey results through posted summaries on bulletin boards, as well as through small group meetings with the chief engineer. Several of the new priority projects were launched and greeted with enthusiasm by engineering employees.

<u>The Survey Results</u>. The actual results of the engineering survey are pertinent to the analysis of what happened at U.S. Ship in two ways. First, the data provide insights into the negative consequences of their traditional management system from the viewpoint of people working in the system. Second, the survey data indicate what was important to the workforce. What needed to be changed as far as they were concerned? If their perspectives were already well understood and considered by management, why collect survey data? Evidence presented below shows that while there were points of agreement, there were also significant differences between management's view of what needed changing and the viewpoints of the workforce.

1. <u>Inputs to Engineering</u>. The primary inputs to engineering were the original designs provided by outside design agents and requests for changes, mainly from production in the form of Production Change Requests (PCRs). According to designers, the main cause of the high level of engineering changes were problems with the outside design agents' drawings. Designers estimated that in the prior month, over half of the changes they made resulted from problems with the original design. The second greatest source of errors resulting in the need for changes was internal to engineering. Because of poor organization and communication, designers and engineers estimated their own organization was the cause of 15 percent of the problems.

The designers and engineers also attributed some of the design problems to production, but not to the extent that had been anticipated. In all, they claimed about 75 percent of the PCRs were reasonable requests for changes that needed to be made. Nonetheless, 25 percent were unreasonable and it took more than half as much time to investigate and process "typical" unreasonable requests as compared to typical "reasonable" requests (4.6 hours/request compared to 8 hours/request). A more prevalent problem was lack of information in PCRs, reasonable or unreasonable. Over half (59 percent) of the PCRs written contained insufficient information to process the request. Of those requests without sufficient information, it took 7 hours on average to clarify the needed information.

Considering the large volume of engineering changes, clearly problems in the management of the design agents and coordination problems between design and production were major causes of inefficiency and excess cost. Characteristic of traditional organizations, integration internally and with the external environment was a weak link in the organization's effectiveness.

2. Internal Organization. Employees felt very negatively about many aspects of the internal environment of engineering. The most negatively evaluated dimensions are shown in Table 3. Employees were particularly critical of lack of feedback on how well they were doing their job (in general and from internal "customers" who use the results of their work), top-down information sharing about the company, employee involvement in changes that affected them, management's use of their input, and overall work planning and efficiency, pay, and job security.

(TABLE 3 ABOUT HERE)

Employees were discriminating in their evaluations; they did not simply go down the list and answer questions all positively or all negatively. For example, despite the negative evaluations of vertical communication and upward influence, employees did not see this as a human relations problem with their immediate supervisors. In fact, statements about their immediate supervisors were rated positively by a large majority of employees (e.g., supervisors treated them fairly, gave enough support and guidance, and had enough technical knowledge). If anything, pre-survey interviews and open-ended comments suggested there were too many supervisors with too small a span of control (e.g., "I feel that my present supervisor is listed over me only because the company requires that I be assigned to somebody"). These results suggest the problems reported were consequences of the highly bureaucratic culture and organization of the company, not the behavior of individual supervisors.

The issue of pay was a particular sore point because a recent salary study had compared salaries at U.S. Ship to comparable firms and found that for professional/technical employess salaries were below average. Six months after the salary study, the annual performance review was held and employees were given a cost-of-living increase with no merit raise or adjustment to realign salary levels. Management claimed the salary study was not well done technically and over stated the need for adjustments, but from the employee's perspective management had failed to act on their promises and provided no information about their inaction.

Job security was a concern to many employees as there were rumored cutbacks on the horizon (accurate rumors as it turned out). Those who felt particularly insecure about their future employment prospects were outside contractors (75 percent) and support staff (56 percent). Fewer managers, engineers, and designers were concerned (almost 30 percent). This corresponded roughly to the probability of being let go--outside contractors knew they would be the first to go.

3. Computer-Aided-Design. CAD was used by almost all designers. Virtually everyone who used CAD felt they could substantially improve their work if they had additional training and software and the system hardware was more reliable (e.g., didn't go down as much). A large majority felt their productivity would improve if they had better access to CAD terminals, preferrably through the addition of terminals rather than through new methods of allocating existing terminals.

There was general agreement that the efficiency ratings were poor measures of CAD performance. In departments where supervisors did *not* stress the ratings this was no problem. However, in one department where the supervisor did emphasize the ratings 71 percent of employees complained that management "pressured them to boost the rating" even though it was a poor performance measure. Though not necessarily detrimental to their work, this was annoying and a bit insulting. One designer complained: "The performance rating procedure of CAD is pure nonsense. This system is a tool. You use a tool when you need it. I consider myself professional enough to know when to use what tool and see to it I know how to use it properly."

Summary. Led by a newly hired chief engineer, the engineering task force's mission was, implicitly, to improve the engineering organization to resolve short-term problems and position engineering to help U.S. Ship adapt to the challenges of the 1980s and beyond. Data from a variety of sources, including the employee survey, confirmed the urgency of the need to change the engineering organization which was suffering from a number of problems that are symptomatic of traditional closed-system management. Yet, the chief engineer succumbed to the short-term pressures and cancelled all task force projects, destroying the momentum that had developed over many months. Was the engineering survey a potentially useful tool for change? Why did the overall effort fail? Each of these questions are considered below.

PROSPECTS FOR SURVEY-GUIDED CHANGE

Survey Insights. The survey provided the task force with new insights into their engineering organization. No formal study was made of management's perceptions of employee opinions before or after the survey. However, it appeared that they had *not* appreciated the extent of negative attitudes among the workforce or about which particular aspects of the organization employees felt most positive or most negative. The gap between expectations and reality was most vivid in management's beliefs that older designers were negative and resistant toward use of the CAD system. This is a particularly important management issue in light of the widespread transition from manual drawing to CAD throughout industry, and is therefore discussed in some detail here.

In the survey planning and development phase, the consultant suggested including questions on the relative advantage of CAD compared to manual drawing tools. This immediately raised a red flag. Engineering managers were concerned that such questions would simply beg for criticisms of CAD by those who were "resisting change," particularly the older employees who have used drafting tables for years and assume the old ways are the best ways.

Assessments of the relative merits of CAD versus manual drawing by forty users of CAD with varying levels of manual drawing experience are summarized in Table 4. Panel A summarizes the extent to which they felt their speed had changed after switching from manual drawing to CAD. The possible responses ranged from "CAD is more than three times slower than manual" to "CAD is more than three times faster." The results: *Not a single person reported that CAD was slower than manual drawing for entering new drawings from scratch or revising drawings already on the system.* Only two persons reported that they were about the same speed. The remainder all agreed that using CAD was at least twice as fast as manual drawing. Panel B shows similar results for ease of CAD versus manual. Users were unanimous in reporting that using CAD made drawing easier and users differed only in the degree of ease related. Panel C shows that all users agreed that CAD was *potentially* superior to manual drawing/drafting on speed and the overall effectiveness of their work. Thus, *there was no evidence of individuals with negative attitudes toward CAD.*

(TABLE 4 ABOUT HERE)

Further analysis shows that there were differences in assessments by years of manual experience (comparing less than eight years manual experience to eight or more years of manual experience[3]). This was particularly pronounced in the case of the speed and ease of entering new drawings from scratch (in these cases the differences were statistically reliable). However, the questions that asked about the *potential* of CAD to increase speed showed smaller differences by years of manual experience (not statistically reliable). The differences were a bit greater on the question of the potential of CAD to increase the "effectiveness" of the designer's work--more experienced designers were somewhat less optimistic about the potential of CAD to increase the effectiveness of their work.

These results suggest that there is some truth to the hypothesis that designers with greater manual experience were less favorable than less experienced designers in their assessments of CAD. However, there is no evidence of *negative* attitudes because of resistance to change. It seems equally plausible, based on these results, that those with more manual experience are simply better at manual drawing than the less experienced and, for them, CAD does not offer as large a relative advantage--*as skill levels at manual drawing increase, the relative advantage of CAD decreases, particularly when drawing a design from scratch.* The converse is also true. A separate analysis showed that those

[3]The eight-year cutoff was arrived at empirically. There was no discernable association between years of manual drawing and assessments within the group of users with less than eight years of experience or within the group with more than eight years of experience. This empirical approach biases the analysis toward finding differences that may be partly due to chance.

who used CAD most frequently rated the relative speed and ease of CAD most highly--*as skill levels at CAD increase, the relative advantage of CAD increases.*

This one example demonstrates the potential of survey data to provide insights that are contrary to management perceptions. This should not be surprising as sample statistics can be computed from surveys that managers can only estimate from experience. Years of psychological research show that people typically draw biased inferences from personal experience and feel overly confident in these inferences (Tversky and Kahneman,1974), particularly when it comes to assessing covariation. In general, people tend to see correlations as much larger than they really are, a generalization consistent with management's overstatement of the tendency of more experienced designers to feel negatively toward CAD. Hence, we conclude that *surveys have great potential for providing management with new insights into workforce attitudes and impediments to organizational effectiveness.*

Old and New Priorities. Regardless of whether the results were enlightening to any individual, it is clear that the survey results prompted discussion of issues that had not been thoroughly discussed in earlier task force meetings. These discussions, facilitated by the consultant, helped management develop a new set of priorities. The post-survey retreat provided an opportunity to compare the original priorities set by the task force prior to the survey to employees' priorities as indicated by the survey. No questions in the survey asked respondents to rank order priority areas for change; however, after a several-hour discussion of the survey results the committee developed a rank-ordered list of what the survey suggested were the biggest problem areas.[4] Non-CAD issues were ranked separately from CAD issues as the latter only applied to those employees who used the system.

A comparison of the original task force priorities and the rank-ordered list of survey priorities is shown in Table 5. The precise rank ordering of the survey items is clearly debatable; however, these issues were clearly areas which a large portion of the workforce strongly felt needed change. The comparison shows that several survey issues perceived as problematic by the workforce were not in the original list of priority projects developed by the engineering task force. Feedback, employee participation, employee development (e.g., training, education, and career development), pay, and job security, all social system issues, had not been addressed by the task force.

(TABLE 5 ABOUT HERE)

The social system issues that had been identified by the task force reflected their traditional management concerns with efficiency and control. For example, the engineering managers had focused on issues of downward control (e.g., organizational pecking order), and the employee survey revealed concern over lack of upward influence. Management was interested in the outside image of engineering (e.g., what executive management and production managers thought), while

[4]The data presented in Table 3 is a *partial* summary of the survey data on which the rank ordering for non-CAD issues was based.

employees wanted accurate feedback on the quality of their work from their customers and managers. The majority of social system issues identified in the survey did not fit into any of management's categories with the possible exception of the vague label employee "attitudes." Notice that this was not one of the areas on which the task force had begun to take action. Indeed, they had only begun to take action on two social system issues (i.e., "design agent management" and "pecking order").

There were also differences in priorities between the task force and system users for CAD improvement. Whereas engineering managers were most concerned with acquisition of system software/hardware and system control, users were also concerned with training and system features that would make their jobs easier (e.g., a bigger screen, better access to terminals). While there were points of convergence between managers on the task force and the survey results, there were also significant points of divergence.

As a result of the survey, management began to work on improving feedback to employees (though little progress had been made when the task force was disbanded) and training in CAD. As the survey results showed that the formal sources of help for CAD (e.g., the CAD manager, the data processing group, system help menus) were less helpful than informal networks of users,[5] management established a user group which began meeting each Friday.

These results indicate that, at least in a traditional management system, management and employees doing the work of the organization have different sets of priorities. Left to their own devices, traditional managers will tend to focus their efforts on technology and management systems that will have a direct bearing on efficiency of the system and provide them with greater control. Employees are more interested in changes that will directly improve their worklives--feedback on their performance, upward influence, communication with other units, individual development, pay, and job security. Employees are also interested in work planning and efficiency, but as it impacts the work they do, not to help their managers gain control. The engineering survey forced management to address employee concerns in the context of a planning retreat and in so doing to reconsider their priorities. Therefore, we conclude that *employee surveys, coupled with a carefully planned and executed planning process, can help management formulate organizational priorities that take into account a broader set of interests and perspectives.*

LIMITATIONS OF SURVEY-GUIDED CHANGE

Surveys and Organizational Change. Despite the new priorities of the task force, any changes they initiated were in an embryonic state when they disbanded. What might have happened had they continued is open to speculation. However, it appears unlikely that they would have dramatically transformed the work environment of engineering. As it was, the projects they had initiated were attacking a few individual symptoms--CAD training, feedback, and communications.

[5]Users reported most frequently going to knowledgeable co-workers for help, consistent with Allen's (1977) findings on the importance of informal "technological gatekeepers" for keeping up to date on technology.

There was no systematic effort to transform the organization from traditional to open-systems management. If past experience is a guide, attempts to attack the symptoms rather than the root cause are likely to fail.

A critical review of the process by which the task force sought to improve the organization suggests there was no comprehensive vision of where engineering was trying to go. In Nadler's (1981) words, the organizational change effort was not driven by a clear "purpose." Instead, the committee was more like a search and destroy mission in which individual problems were sought out and attempts were made to individually solve them. If the only purpose was to look for sources of inefficiency in the organization and streamline the process, then their original approach to identifying problems prior to the survey may have been adequate. On the other hand, if the purpose was to develop a shared vision of a new engineering organization that would help make U.S. Ship a more effective, competitive company and to develop a way to get to this new organization, the task force was clearly off course, even after the survey feedback. Developing a list of individual problems or conducting a survey will not lead to such a shared vision. There was some attempt at developing a shared vision in the futuring exercise at the planning retreat; however, this was simply too little, too late.

The survey was successful in creating dissatisfaction about certain aspects of the organization that needed change. These specific problems that had been hidden from the collective net that the task force had cast were now visible. However, without a clear vision of where engineering should be headed and a way to get there, these new problems were merely sources of dissatisfaction with the current system--a potentially destructive force. *Survey data alone do not change organizations. An effective organizational improvement effort must begin with a clearly defined purpose and a process which will move the organization toward its goals. Without this, surveys simply make public dissatisfaction with specific aspects of the current system.*

Top Management Involvement and Support. It has become axiomatic in management literature that top management support is crucial to the success of any far-reaching change efforts (Lawler,1986; Mirvis and Berg, 1977; Nadler, 1977; Nadler,1981). Clearly, the chief engineer and his task force lacked top management support. Top management was neither actively involved with, nor well apprised of the task forces activities. As mentioned above, the task force actually feared over involvement by top management who they believed might stop their activities. However, in the end the committee lacked the support to survive the cutbacks of "non-essential" activities.

It is not surprising that top management did not see the importance of the task force's activities, as they had not been adequately informed of how negative engineering attitudes were toward the work environment nor of the extent of commitment the chief engineer had made to employees to improve the work environment. Hence, top management did not have the information to assess the costs in employee morale of stopping the new initiatives. On the other hand, the chief engineer, who was well aware that the morale of his people would sink even lower if no action was taken, was caught between pleasing his bosses or pleasing his subordinates. Should he stick his neck out for the sake of employee morale (and uncertain improvements in the long-term effectiveness of engineering) and risk management wrath for wasting resources on "non-essential" activities?

These results support Lawler's (1986) observation that: *Participative islands will not stay afloat as they lack top management support. While participative islands may survive in times of slack resources, under short-term pressures for belt-tightening and increased productivity, unwavering top management support is essential to keep organizational improvement efforts alive and functioning.*

Hierarchically-Integrated Planning and Sub-System Change. Planning and problem solving by the task force was both insulated and isolated from a broader company plan. Task force members had all experienced frustrated attempts to change engineering in the past, but felt optimistic about the present effort because their new chief engineer was in a "honeymoon" stage. Top management had given him considerable latitude. Unfortunately, this apparent act of faith in his capabilities inadvertently pushed the new chief engineer out on a limb. He was given a license, but it was not clear how the license was intended to be used or what the rules were governing its use.

Since there was no clear direction for the company as a whole, it was not clear in what direction engineering should be moving. For example, at the time it was unclear whether engineering would continue to focus their efforts on fixing designs done by outside agents or whether they would shift responsibility for original design in house, a decision with implications for virtually all aspects of the organization (e.g., staffing, education, technology, job design, organization design). It was not within the authority of the chief engineer to decide the extent to which original engineering was done in-house, a major strategic decision at the company level. This effectively paralyzed any serious long-range planning the chief engineer could do at the engineering subsystem level.

Participative management is not the same as management by abdication. Top management, by allowing the chief engineer a free hand to change engineering, was abdicating responsibility for developing a vertically integrated plan for the company. This placed the burden of responsibility on the chief engineer without giving the chief engineer the direction he needed to effectively steer his organization. Yet, task force members were looking to the new chief engineer for direction. To save face, he had to act as though he knew where to lead engineering. The new chief engineer faced a classic "double-bind" (Bateson,1972), a no-win situation in which the rules of the game are undiscussable.

To be effective, an organizational change effort should be hierarchically integrated. Managers of an individual sub-system cannot effectively plan and change their organizational unit in isolation from a broader set of company goals.

Surveys and Personal Change. Major changes in organizations require changes in people. For example, an organization does not become participative unless managers and employees within the system have the skills and motivation to be participative. Surveys can provide information to managers on their current style of management. However, managers do not change deeply held attitudes or habitual behavior merely because a survey says their subordinates find them autocratic. Psychological research has shown that beliefs are highly resilient, even in the face of discrediting data (Ross,1980). At best, such information can influence "espoused theories," that is, what people say in public. However, Argyris (1982) finds that to change how people actually behave (their "theories in use") requires a much more intensive learning process in which there is an interaction between behavior in real situations and appropriate patterns of reinforcement over extended periods of time.

The managers on the task force were espousing participative management, but for years had been acting in an autocratic or at best consultative mode. They had made a commitment to acting in a participative mode within the context of the task force, yet they had developed a list of priorities without any substantial involvement of subordinates. In fact, within the committee itself there was a continual tension between its espoused philosophy of consensus decision-making and its leader's need for control. Ultimately, when the chips were down, the leader made a unilateral decision to disband the task force.

Autocratic cultures select and reinforce leaders who have a high need for control and hence propogate single-loop learning. The organizational environment neither encourages nor supports double-loop learning. The survey uncovered consequences of this management style--employees who felt powerless to change the work environment. The paradox is that, if managers in the system had the personal flexibility or organizational autonomy to change in response to survey data, it is unlikely that their employees would ever have reported the problems they did. Indeed, even after the planning retreat, several managers on the committee maintained that there was very little difference between their original list of priorities and the employee's priorities as revealed in the survey. Therefore, the conclusion is that *survey data alone will not transform individual attitudes or behavior. Indeed, managers who need to change most will be least equipped to change in response to the survey results. Moreover, individual attitudes and behavior are developed and reinforced by a broader organizational environment and are unlikely to change in ways that run counter to the prevailing culture.*

Hardened Organizations and Soft Data. An underlying assumption of traditional organizations is that employees act in their own narrowly defined personal interest and do not know what is good for the organization as a whole. By acting as though that assumption were true, it indeed becomes true. If individual employees are not kept informed about the bigger picture, have no influence over shaping their work environment, and are assigned a highly specialized job, each will see the organization only as it affects his/her narrowly defined role (Lawler,1986). As such, managers in traditional organizations will feel justified in taking employee feedback with a grain of salt. Why make serious, costly changes to the organization based on biased data from an unreliable source?

At U.S. Ship, employees were telling management via the survey that there were some very serious problems affecting their ability to be effective. Yet, the fact that the engineering task force was viewed as expendable suggests management was not seriously moved to action by employee opinions. Hence, *traditional organizations place limited value on employee opinions because it is assumed employees are concerned only with their own limited self-interest. By acting on this assumption, traditional organizations create a culture in which employees are unaware of and uncommitted to the broader goals of the organization sealing a self-reinforcing loop.*

Do it Right or Don't Do it At All. When the task force decided to conduct an employee survey, they made a "psychological contract" with employees to act on the results (Lorsch,1979). This implicit contract was made explicit by meeting with employees to ensure them that this would not simply be another survey without action. The earlier salary study had not led to action, but management was asking for another chance.

Failure to act on survey results is clearly costly in terms of employee morale, a wound managers can hope will heal with time. However, the consequences can go much farther and even lead to organized action against management. As Lawler (1986: p. 75) writes:

> "When the organization shares the survey data results with the workforce, it gives people, often for the first time, a collective sense of how other people feel about working for the organization. This can provide additional power, since it may inform them that there is general dissatisfaction with issues that they personally have been concerned about. In this respect, it can awaken them to the potential of forming a coalition around certain issues. This may be one of the real "sleeper" effects of using the survey-feedback approach--an effect that some managers correctly fear because it can lead to concerted collective action (for example, unionization) unless corrective measures are taken."

There was no indication of collective action against management, and this appears unlikely given the relatively conservative tendencies of engineers (Badawy,1971; Ritti,1971). However, employees will not forget management's failure to follow-up on their promises. While no systematic data on employee attitudes was collected after the task force was disbanded, informal reports suggest that morale was seriously damaged and employees were angry. Inaction reinforced employees' image of management as inconsistent and unreliable--promises that the work environment would improve were followed by a tightening of control and pressure for more output. It does not seem likely that the task force will be able to pick up where it left off after short-term pressures for production have subsided. By abusing the goodwill of their employees, engineering management depleted a valuable resource--the ideas and energy of the workforce they agree are their major asset.

CONCLUSIONS

When management seeks to change their organization, conducting an employee survey appears to be a sensible idea. Why not collect all data that might help to make sound decisions? We have seen the potential benefits of survey data. The survey provided some new insights into the attitudes of the engineering workforce and potentially useful data on real impediments to organizational effectiveness (e.g., what was needed to improve utilization of the CAD systems). The survey brought to light social-system issues that the managerial task force had neglected in favor of technical efficiency and organizational control issues. Most importantly, the survey data, in combination with a facilitated goal-setting process, raised the priority of these neglected social-system issues so that the task force was forced to begin to address them.

The limitations and potential costs of conducting a survey were also clear. The task force was stopped short by management pressures to deal with the short-term concern of completing their main ship production contract on schedule. Moreover, it is not clear that the actions the task force had taken prior to dissolving would ever address the fundamental defiencies of traditional, closed-system thinking that were the source of the problems. The problems U.S. Ship is having in adapting to a changing environment are characteristic of closed-system thinking as described by Katz and Kahn (1978: p. 101):

> "A serious deficiency in closed-system thinking...is over concentration on principles of internal functioning...Internal moves are planned without regard for their effects on the environment and the consequent environmental response. The effects of such moves on the maintenance inputs of motivation and morale tend not to be adequately considered. Stability may be sought through tighter integration and coordination when flexibility may be the more important requirement. Coordination and control become ends in themselves, desirable states within a closed system rather than means of attaining an adjustment between the system and its environment."

What Katz and Kahn refer to as "closed-system" thinking has more recently been discussed in management literature as integral to a traditional "corporate culture" (Ouchi, 1981; Schwartz and Davis,1981). A culture refers to a relatively stable pattern of norms, values, and beliefs of an organization that have been developed over time and are actively maintained by the organization. Originally, the engineering task force as a developing social group was a microcosm of the traditional culture of their company as a whole. The set of projects and priorities developed by the task force prior to the survey reflected an emphasis on tighter "coordination and control" of personnel and technical systems. The high priority of a proper "pecking order" is a case in point. Over time, as the task force began to form more fully as a group, meeting outside the routine structure of staff meetings, they began to develop norms, values, and beliefs that were incongruent with the prevailing culture of U.S. Ship. The survey results and planning retreat reinforced and developed further this new incompatible culture. This was explicitly recognized by members when they decided to avoid "over involvement" by top management. However, the very act of blocking out top-management influence reinforced the group's self-conception as a counterforce to top management--a group of rebels. This placed the chief engineer in a precarious position, caught in the middle between allegiance to top management and allegiance to his task force. In a sense, top management's order to curtail non-essential activity provided a way out of this dilemna for the chief engineer.

This case illustrates the paradox of using surveys to change a traditional management culture. If managers in the system had the personal flexibility or organizational autonomy to change in response to survey data, it is unlikely that their employees would have reported the problems originally. We have seen that "resistance to change" in this case was not a problem of individual employees, it was a problem of the management culture. The challenge of change was monumental from the start. The prospects for change were diminished by lack of top management support, lack of a broader company plan, and lack of team building and training of task force members to nurture an effective group process. Overall, this experience of U.S. Ship demonstrates that surveys should *not* be viewed as a "guiding force," but rather as one possible input to a broader organizational change process. The survey without a well-designed and orchestrated change process is likely to lead to a change in the wrong direction--a decline in employee morale and trust in management.

It would be easy to attempt to assign blame to individuals at U.S. Ship for the dissappointing accomplishments of the change effort. Was top management to blame for failure to develop a more complete company plan to help guide the change effort? Was the task force to blame for failing to involve top management? Was the chief engineer to blame for completely disbanding the task force under pressure from top management? This paper has argued that all of these instances of action or inaction are consequences of a broader culture referred to by contemporary management theorists as "traditional management." If so, then how does one change a traditional management culture to a more "open-systems" approach? Is it desirable or necessary to attempt such an organizational transformation given the strong possibility of failure?

Unfortunately, past experience in successfully changing existing traditional organizations to open-systems organizations are rare. By and large, so-called "new-design" organizations which incorporate open-systems principles have been new organizations set up at greenfield sites. Nonetheless, the many cases of organizational transformation described in recent publications (Lawler,1986; Kilmann,1987), suggest some general guidelines on pitfalls to avoid and requirements for success, some of which were illustrated by the case of U.S. Ship. A complete discussion of these lessons learned is beyond the scope of this paper, but several points are particularly applicable to this case. First, and foremost, we have seen the importance of top management involvement in planning and support for change. While there have been documented cases of organizational transformation that have started at lower levels and successfully worked there way up (Lawler,1986), this seems to be the exception, not the rule. Second, we have seen the importance of subordinating any data collection to a well designed and orchestrated planning process. Nadler's (1981) approach is an example of one methodology to develop a clearly stated purpose and goal-setting process which can then be informed by appropriately collected data. Third, we have seen the costs of proceeding without adequate commitment or preparation. The long-term consequences, if any, of such "false starts" at organizational transformation are not clear. One could argue that with the passing of time the task force can pick up where it left off and benefit from the data already collected and the experience gained working together as a group. However, a more likely scenario is that considerable effort will be needed simply to reinstate the trust that was diminished by this first major attempt at organizational change. More research is needed to understand the long-term costs of failed attempts at organizational change and develop strategies for minimizing their costs and moving on to proactive organizational improvement.

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Table 1
Traditional Compared to Open-Systems Organizational Models

	Traditional Model	Open-Systems Model
Inputs (Supply Systems)		
Selection	Minimum cost	Multiple hard & Soft Criteria
Time-Frame	Short-term contract	Long-term relationship
Quality Control	Incoming inspection	Quality management of supplier
Transformation (Internal Systems)		
Planning Content	Technical system dominance	Joint social & technical systems
Planning Process	Top-Down, fragmented	Participative, integrated
Communications	Chain of command	Network structure
Job Design	Maximum task breakdown	Optimum task grouping
	Low autonomy	High autonomy
	Limited feedback	High feedback
Learning Systems	Job-specific training	Broad-based education
Control Systems	Extrinsic (carrot & stick)	Intrinsic (personal committment)
Job Security	Replaceable workers	Long-term investment in workers
Labor-managment	we-they	we-we
Outputs (Customer Systems)		
Strategic Focus	Reacte to market demand	Anticipate market needs
Orientation to Customer	Minimum compliance	Maximum service
Quality control	customer complaints	Ongoing customer interaction
Feedback Systems		
Timing	Outgoing inspection	In-process checking
Focus	Internal correction	Adaptation to environment
Use	Single-loop learning	Double-loop learning

Table 2

SURVEY DESIGN AND FEEDBACK PROCESS*

PHASE	U.S. Ship Process	Completion
Entry	Orientation	June 3,1986
Plan & Develop	Employee Meetings → Design Questionnaire Task Force Meetings → Design Questionnaire	June 23
Refine	Employee Pretest → Revise Questionnaire Task Force Review → Revise Questionnaire	June 30
Administer and Analyze	Collect Data Analyze Data Initial Feedback Report	August 4
Feedback and Plan	Feedback Data Interpret Data Project Prioritization	August 12
Action	Develop and Implement Plans	Aborted: November
Continuation	Resurvey Process	Unlikely

* This process is a modification of the Cyclical Planned Intervention Model developed by Bowditch and Buono (1982)

Table 3
Engineering Survey Results on Internal Organization[a]

	% Negative	% Neutral	% Positive	# Responses
Job Feedback				
Job Performance	63	31	6	86
Internal Customer[b]	56	18	26	85
Top-Down Information	58	35	7	86
Employee Participation				
Involvement in Change	54	35	11	85
Management uses Input	63	31	6	83
Work Planning and Efficiency	49	43	8	86
Pay	44	41	15	85
Job Security	40	49	11	80

[a] Answers based on a five-point scale rate the extent of agreement with various statements. (Negative = agree not at all or very little; Neutral = agree somewhat; Positive = agree very much or extremely). This is reversed in cases of negative statements about the organization. For most dimensions above responses to several items were averaged to form an index. Social Systems issues that were especially negatively rated are shown here.

[b] Amount of Feedback on performance from people at U.S. Ship who use the results of the respondent's work.

Table 4

Assessments of CAD Compared to Manual Drawing by Years of Manual Experience

A. CAD Speed vs Manual:[a]	Same	2x	3x	>3x	#Responses
New Drawings*					
<8 years	4%	21%	39%	36%	28
≧8 years	9%	73%	18%	0	11
Revise Drawings					
<8 years	3%	14%	45%	38%	29
≧8 years	0	36%	55%	9%	11

B. CAD Easier than Manual:	None Little	Somewhat	Very Much	Extremely	
New Drawings*					
<8 years	0	0	40%	60%	25
≧8 years	20%	40%	40%	0	10
Revise Drawings					
<8 years	3%	11%	25%	61%	28
≧8 years	0	20%	30%	50%	10

C. Overall Potential CAD:[b]	Adequate	Good	Very Good	Outstanding	
Speed					
<8 years	11%	11%	54%	25%	28
≧8 years	9%	45%	36%	9%	10
Effectiveness*					
<8 years	7%	14%	50%	29%	28
≧8 years	10%	60%	20%	10%	10

*Significant difference by years of manual experience ($p < .05$).

[a] How much has CAD changed your speed compared to manual drawing?

[b] What is the overall potential of CAD for improving the speed [or effectiveness] of your work?

Table 5

TASK FORCE PRIORITIES VERSUS SURVEY RESULTS

Original Task Force Priorities[a]	Survey Issue	Survey Priorities[b]
1. *Design Agent Management*	3	1. *Feedback*
2. Attitudes	1,2,4,6,7,8	2. Communications
3. Overtime	5	A. Vertical
4. Material Ordering Cycle		B. Horizontal
5. *Planning and Scheduling*	5	3. D.A. Management
6. *Computerization/CAD*	CAD	4. Employee Participation
7. Communication	2	5. Work Planning & Efficiency
8. *Design Standards*	5	6. Employee Development
9. Image/Respect for Engineering		7. Pay
10. Admin. Procedures & Responsibilities		8. Job Security
11. Production Dept. Interface	2	**CAD Issues**
12. *Paperflow/Correspondence*	5	
13. Physical Location		
14. Personnel Dept. Interface	2	
15. Duplication/Redundancy		
16. *Facilities & Security*	CAD	
17. Open door policy (with other depts.)	2	
18. *Organization (pecking order)*		
19. *Work hours*	5	
20. *New Shipbuilding Technology*	CAD	

a These priorities were established by the task force through brainstorming and an individual voting procedure. *Items in italics were areas in which action teams/projects had been set up and were in process at the time of the survey.*

b Survey priorities are the issues that the task force determined were important to employees on the basis of the engineering survey. No questions in the survey specifically asked respondents to rank order issue areas, but the task force roughly ranked them according to overall survey results. Specific improvements to CAD were prioritized separately from organizational issues so a priority number for CAD is not shown here. *Items in italics were areas in which new action teams/projects had been set up and were in process as a result of the survey.*

c CAD Issues were prioritized separately as only a portion of the respondents used CAD.

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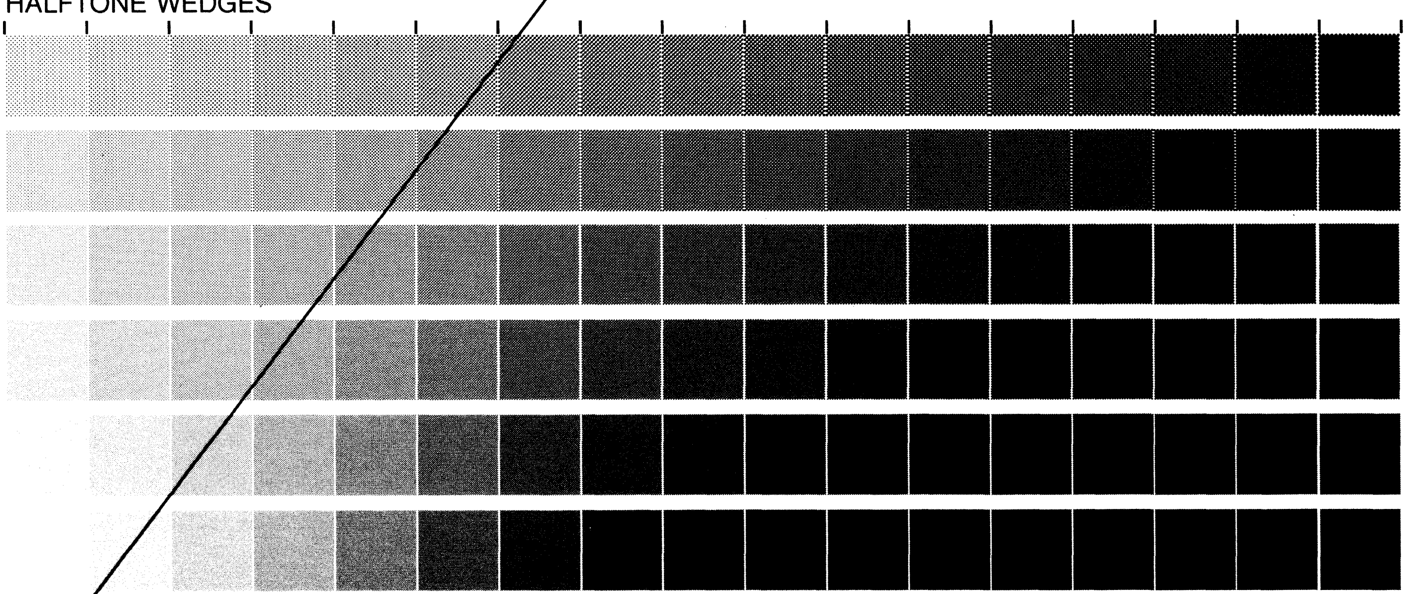

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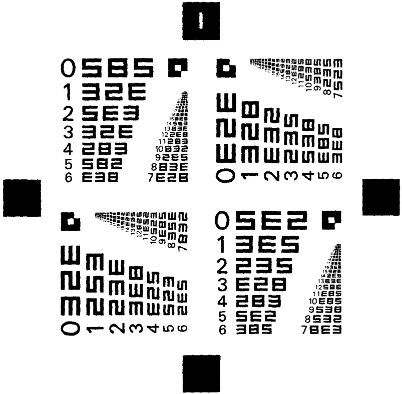
RIT ALPHANUMERIC RESOLUTION TEST OBJECT, RT-1-71



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