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Socio-Technical Analysis Applied to Computer Operations Organizations

by

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ABSTRACT

The organization and design of computer operations units has been largely left to historical accident and evolution. These organizational arrangements are often outmoded for accomodating to present employee values, and are frequently inflexible to the demands placed on the organization. The problems of low employee morale caused by these inappropriate organizations are frequently addressed by human relations surveys or industrial engineering studies and meet with varying degrees of success. Sociotechnical systems, a recently developed method for designing organizations and one which has proven very effective in manufacturing firms, has been applied to a computer operations organization. This paper describes that application and the result of early experiences with it.

Socio Technical Analysis Applied to Computer Operations Organizations

GENERAL INTRODUCTION

The present challenge of management in scientific support units, including computer operations organizations, has its roots in the larger issue of technological change. The continued change in technology, from simple technique of modifying or transforming a material by human effort with the use of elementary tools, to the present increasing application of automated, computer-aided systems, has provided driving impetus during the past 150 years for changes in our society, its organizations, its occupations and its jobs. For reasons partly scientific and partly economic, the inexorable movement in the development of technology is from simple technique and tools to mechanization and eventually automation.

Mechanization is that state of development in which machines absorb the power and tool guidance components from men. Although many transformation tasks can be performed by machines, in mechanization the regulation activities are left to men. Such regulation tasks, performed by men, are inspection, feedback, decision, and change. In automation, routine activities are absorbed into the machine, and the machine can perform many if not all of the regulation activities: inspection, feedback, decision, and change under stable conditions. What strikes us most frequently is that most technologies are developed to an incomplete state, leaving some tasks - sometimes highly skilled ones but frequently simple "mechanical" tasks or parts of tasks - to be performed by "human elements of the machine." Some of these tasks are central to the transformation, and here the machine is the adjunct to the man. Too frequently it is sadly the other way around: the machine is central and man is the adjunct to the machine. Computer operations is a function which rests considerably beyond mechanization, but not yet fully within automation.

Characteristics of Current Organizations

Davis and Taylor (1976) emphasize the distinction between deterministic and stochastic technologies in order to aid in understanding the organizational effects of technology. The central property of industrial era technologies is that they are deterministic: what is to be done, how it is to be done, and when it is to be done are all specified. Most present organizations, regardless of their level of technology, are based to a large degree, on the "machine theory of organization" in which interdependence between tasks and between individuals is controlled by managerial arrangements, systems of payment, and related control mechanisms. Organizations, which have evolved from the design processes of allocating tasks to men and machines and developing a guiding and regulating superstructure, reflect both the deterministic technology and the values and beliefs of western industrial society. Such organizations have superstructures or hierarchies designed to coordinate the elements in which work is done, join them together, counteract variances arising both within the elements and within the socio-organizational links created by its members, and adjust the system to changes in input or output requirements. Furthermore, learning, planning, coordinating, and controlling are functions usually exercised within the superstructure, while transformation tasks, many of which are programmable, are performed at the worker levels. Under such organizational arrangements, management is reinforced in its beliefs that workers are unreliable, interested only in external rewards, and regard their work as a burden to be set aside at the first possible opportunity. Largely, this is a self-fulfilling prophecy. Today such organizations are usually not consciously designed. Instead they are imported from conventional wisdom or historical models; or, like Topsy, they "just grow'd." What saves the day is that the organizational system can continue to operate - as fragile as it may be - so long as the technology can continue to be seen as deterministic and social expectations for a humane quality of work-life are not too widespread.

The most striking characteristic of sophisticated, automated technology is that it absorbs routine activities into machines, creating a new relationship between the technology and its embedded social system. Workers in the new, emerging, automated systems are required to be interdependent components, responding to stochastic, not deterministic, conditions: they operate in an environment where "important events" are randomly occuring and unpredictable. Sophisticated skills must be maintained, although utilized only infrequently. This technological shift disturbs long-established boundaries between jobs and skills and between operations and maintenance.

Additionally, the new technology requires a high degree of commitment and autonomy on the part of workers in the automated production processes -- factors that derive from the role required of person-as-regulator of a work situation or system, and adjuster of difficulties. This role requires skills related to regulation -- skills in monitoring and diagnostics and skills in the adjustment of processes. In this sense, computer operators work takes on supervisory attributes in relations to machines and process, rather than to people. The operator is involved in transformation processes in the role as monitor of stochastic dislocations. The operator's contribution to the outcome is that of variance absorber, dealing with and counteracting the unexpected. These interventions are non-programmable. The relationship to the process shifts out of the mainstream; the operator is "on standby," and is concerned primarily with start-up operations and with reducing downtime by anticipating faults and developing strategies for corrective action. The required degree of autonomy really required in computer operations is in serious conflict with the assumptions and values held within the conventional bureaucratic technostructure.

In operative systems, stochastic events have two characteristics: Unpredictability as to time and unpredictability as to nature. For economic reasons, they must be overcome as rapidly as possible, which imposes certain requirements on those who do the work. First, the workers must command a large repertoire of responses, because the specific intervention that will be required in any one instance is not known. Second, they cannot be dependent on supervision for direction because they must respond immediately to events that occur irregularly and without warning. Third, they must be committed to undertaking the necessary tasks on their own initiative.

These requirements create a very different world, in which the organization is far more dependent on the individual (although there may be fewer individuals). From the point of view of the organization, the chain of causation is:

1. If the production process collapses, the economic goals of the organization will not be met.
2. If appropriate responses are not taken to stochastic events, the production process will collapse.
3. If the organization's members are not committed to their functions, the appropriate responses will not be made.
4. Commitment cannot be forced or bought; it can only arise out of the experiences of the individual with the quality of life in his

working situation, i.e., with his job.

5. Therefore, automated industries tend to seek to build into jobs the characteristics that will develop commitment on the part of the individual. The major characteristics are those of planning, self-control, and self-regulation; that is of autonomy (Davis, 1966).

Socio-Technical System Design

Socio-technical (STS) system design is a fairly recent development in the quest for jobs and work roles which are both more satisfying to their occupants and more effective in meeting organizational requirements. This new technique is used for redesigning existing work systems as well as for new site design. STS design differs from other approaches to the problem of matching work to people by attending simultaneously to the technical and production requirements of the work and to the psychological and social aspects of individual and group requirements. It has the advantages of an operations management approach to a total work system which assumes the interdependence of diverse elements such as time constraints and control requirements; and takes them into account in addition to the individual job design programs. Unlike conventional operations management, however, which focuses on production system efficiency alone, work system design does consider human and social system requirements per se as central aspects of work and organizational design. It also recognizes the need for these human inputs and their self-regulation for the achievement of system flexibility.

STS design is not however a cure-all or panacea for any and all organizational ills. Recognition of twin assumptions is required before this sort of work system design can be considered. First, there must be a 'presenting problem', or concern of a productivity or mission oriented sort - the design is intended to meet some rather specific (and specified) organizational goal or end. Second, a certain broad threshold of minimum quality in wages, working conditions and human relations concern must be in place in management actions.

Every work system has a technical subsystem (the process of transforming input into output). Work systems also have a social subsystem (including intra-group, as well as superior-subordinate relationships) which operates to join disconnected jobs together and to coordinate among them, and which permits and directs the technical subsystem adaptation to environmental demands. Socio-technical analysis (STA) involves the identification of technical requirements and social requirements. The former are "key variances" in the technical throughput - the stochastic events which must be met for the system to survive. The latter are relationships among system members to bring about the appropriate responses to the key variances, and to provide individual development, support and quality of working life.

Socio-technical work system design operates to jointly optimize the requirements of the social subsystem, as well as the technical one, by starting with the total work system rather than a piece or pieces of the technical subsystem alone. Definition of this total work system begins with a determination of the boundaries within which the product is converted from a raw material to an end result. This constant focus on the product-in-becoming, or the primary mission of the system guarantees the joint optimization mentioned above since neither the technology nor the organization of employees is dominant over the other, or is ignored for the sake of the other.

Interest in STS design is currently high because of success in using those methods to solve organizational problems and to improve quality of working life and productivity. Experience in the United States with this more systemic approach to job design is still fairly limited, but it is growing. Managers and union officials are gradually turning away from the more simple and direct methods of industrial engineering and industrial psychology toward the more complex systems models of analysis and design. This general shift is usually attributed to dissatisfaction with the limited, and sometimes ephemeral, results derived from the application of the simple or single-element models.

STS studies have a remarkably consistent reputation for improving both the quality of working life of the employees for whom they are designed and organizational performance. One reason for this may be that these studies have resulted in more of what has been called workplace democracy. This includes dramatic changes in organizational structure, job descriptions and personnel rules, as well as some degree of employee participation in the overall process of change itself.

Over the last 10 years, younger employees, as well as women and minorities, have become more inclined to question the judgment of superiors and to take an active role in controlling their own work lives. These forces, coupled with public policy exhortations to give employees a greater voice, have, among other things, resulted in nonmanagement employees being invited to join the sociotechnical process earlier in the project and in greater numbers.

The Redesign Project

The project involves a recent STS design as applied to the Computer Operations Division (COD) in a large scientific laboratory.* That division employs some 130 people, 100 of whom are operators. The present case is unique in several respects. It is the first/application of STS principles such known to us, although STS has been increasingly applied to service industries over the past several years. This case is also unique in the degree of its participative approach to the analysis and design process. Despite the fact that even more involvement of operator staff would be useful in future efforts, the results of using democratic principles for data gathering, decision making and communication is gratifyingly positive.

In essence the project was initiated when COD management choose to apply STS to the solution of some long standing personnel problems involving operator frustration with job competence and promotion opportunities, and culminating in a general apathy and high personnel turnover. At a time of laboratory and department growth, COD Management was concerned about their ability to maintain past service levels while functioning with a relatively untrained, young and increasingly alienated workforce. The project was approved in May, 1977, after a period of nearly six months during which COD Management discussed the potential costs and benefits of a STS design undertaken by their own employees and managers under the guidance of an external consultant. Such care in decision making and the time it took were typical of this case, not only in management action but in the deliberate approach taken by employees as well. This decision to use a participative yet struc-

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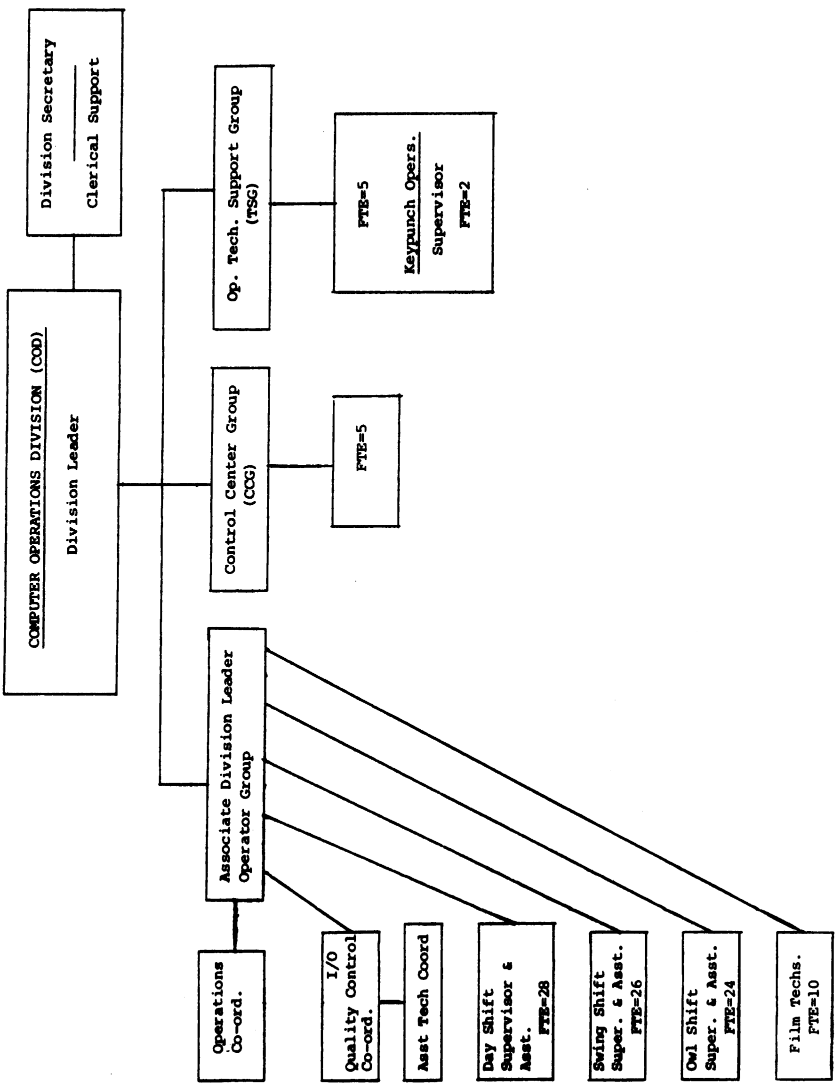
*A more complete description of this case is available as a monograph from the Center of the Quality of Working Life, UCLA. (Taylor, 1978) tured approach of analysis and design for organizational improvement was not taken without good reason.

Previous efforts to understand organizational problems in COD, by outside organizational experts, had not resulted in much change or improvement; rather they had left feelings of resentment and disrespect for such efforts. Likewise, the recommendations of internal committees had not been uniformly successful in dealing with COD problems and employees were frustrated at the lack of follow-through on such recommendations made.

Reasons for choosing a structured systemic approach were many. Previous attempts to change things in COD and in the larger computations department had been piecemeal as compared to the socio-technical approach of the present effort. For instance, new items of equipment were acquired by the department without consultation with COD and without examining their import on COD operations. Changes in organization structure throughout the department were likewise made without a thorough examination of their effects on technical effectiveness. Organizational changes for improvement of operator morale were frequently reactive to specific complaints and otherwise unrelated to COD effectiveness.

Management had decided to examine the entire COD as a system rather than isolating the problems of the computer operators group. Figure 1 presents the COD structure as it was in June, 1977. This system also includes a technical services programming group, a small keypunch unit, a control center group responsible for relations with vendors and users and a film lab which processes photographic output. The managers of these various COD functions had been a part of the early discussions.

FIGURE 1


COMPUTER OPERATIONS DIVISION (COD)
Division Leader
Division Secretary
Clerical Support
Op. Tech. Support Group (TSG)
FTE=5
Keypunch Opers.
Supervisor
FTE=2
Control Center Group (CCG)
FTE=5
Associate Division Leader
Operator Group
Operations Co-ord.
I/O Quality Control Co-ord.
Asst Tech Coord
Day Shift Supervisor & Asst.
FTE=28
Swing Shift Super. & Asst.
FTE=26
Owl Shift Super. & Asst.
FTE=24
Film Techs.
FTE=10

The next step for management was to introduce the idea of STS analysis and design to the remainder of COD. They approached the division supervisors separately. Supervisors' interests and concerns proved useful in leading the following steps of introducing the project to the operators and in forming the task force to do the work. The extent of their concerns, however, created an obstacle to further progress for a short period, as they requested several weeks time to meet among themselves. On the positive side, the supervisors finally suggested several things. Among these suggestions were, that they be involved in the selection of the members of a working group, that such a group be given team training, that the project be introduced with much fanfare and with promises to follow through on the results of the projects efforts. Finally all various interests should be represented in the group, and communication to those constituancies should be thorough and current. On the negative side, the supervisors said that they, as a group, would not be willing to accept in advance anything the working group came up with despite supervisory involvement in selection, their representative membership in the group and the planned connection between themselves and the group. COD management eventually disregarded this last condition, but followed the other advice of the supervisors.

A steering committee (7 members) composed of management and supervisory staff met shortly thereafter to set in motion the creation of the working group. A memo was issued to all COD employees and a series of meetings was held by management to describe the project and the combination election/selection process of forming the working group. Two project consultants were also available to answer employee questions when they arose.

By September 1977, representatives from each operator shift, and the other groups in COD, including a supervisor, had been selected. The unfortunately narrow term "analysis" instead of "analysis and design" had been used in the initial memos during that selection period, to describe the mission of the group. The working group in deciding on a name for itself took that distinction literally and choose "Socio-Technical Analysis Group" (STAG). This convenient acronym, in keeping the analysis/design distinction before the group was to prove a source of misunderstanding during the early days of the project.

The STAG began meeting once a week to set a schedule and clarify questions. They were authorized to take up to three days per week on the STS analysis and to work through January 1978. They were assigned two consultants (one from inside the lab, one from outside), and they had the memo from the division manager to COD which announced that the group would be looking at possible improvements in organizational systems and job structure. By late September, they had met with the division manager to ask some questions of scope and sanction. Among the questions were: could their time off the job really be justified without reducing manpower?; what about computer users if they were found to be a source of COD problems? The manager assured them that no jobs were jeoparized by the project and that nobody would be downgraded as a result. She confirmed that they had express permission to examine problems within the division as they were affected by users, but they could not propose changes for the users.

Other concerns by STAG included whether the results of their work would be realized and whether the project had the support of fellow employees. Those concerns were linked, they realized, and had to be met through frequent communications between themselves and COD personnel. They decided to issue weekly memos in addition to talking informally with othere during their two days/week back on the job.

STAG was given off-site training in socio-technical analysis and in team building. They returned to the lab to issue their first memo to COD in mid October announcing their readiness to begin their work.

STAG relations with the steering committee began under less than ideal conditions. Neither group had guidelines as to when to meet prior to the first of the analyses produced by STAG, and neither group had rules for control of joint meetings. STAG had been given the team training described above and acted more effectively as a group than the steering committee had done. This difference in team effectiveness was to create problems of who was steering whom when the two groups met. This led, first, to a reactive stance by the steering committee when STAG made the first overtones, and secondly, led in turn to absence of cooperative spirit between the two groups. Eventually, mistrust was engendered between the two groups.

In their initial meeting with the steering committee in late October 1977, STAG presented a paper for discussion which raised the issues of the STAG role in analysis, design and project implementation. The issues were discussed at the time and the steering committee announced, a few days later, that, in the long term, STAG's primary concern was to undertake the analysis, while some members of STAG would be retained for a design committee when the time came.

<u>ANALYSIS</u>

The analysis itself began with an overview or scan of the COD system. This activity was completed within two weeks and a report was submitted to the steering committee for concurrance. That brief report defined the product of COD (transformed data to user specification), the scope of the analysis (the entire COD), the objectives of COD (user satisfaction and COD employee satisfaction), and COD current problems (poor co-ordination, communication, co-operation, inconsistent supervision, inadequate training and inappropriate rewards). This report was met with silence by the steering committee who requested time to digest it and report back. The document was subsequently accepted with minor revision.

Apart from the STAG definition of the COD product (which was a departure), the content of the report was predictable by most individual steering committee members. Although these steering committee members had not thought of COD as a data transforming system, and saw most of their efforts measured by machine availability, these managers were able to accept the different point of view presented by STAG.*/*This difference in organizational perspective illustrates the distinction made above, between machines serving man versus man serving machines./ What was probably more disruptive to those attending that meeting was the difficulty they all had in coping with leadership of the meeting. The steering committee did not lead because they were being presented with the report. STAG did not lead, beyond distributing the report and asking for questions, because they were just doing as management had requested. The result was the continued reactive stance by the steering committee. Although the leadership issue was never resolved during the analysis phase, and the steering committee remained reactive, the interchange was usually cordial.

TECHNICAL ANALYSIS. With the scope of the project affirmed STAG proceeded, under the guidance of their consultants, to examine the key technical variances in the throughput of the production system. Throughput in this case was the conversion of user needs, object data and the I/O supplies for the creation of "transformed data". The key technical variances were selected from a list STAG had produced, based on their impact on quality of the finished product and to a lesser extent on quantity and costs of production. These key variances included user related variances in user instruction, in job priority, in quality of object data, and in time of day the job is requested. Other key variances more involved in process were, different job turnaround times, different media for object data, and the volume of work per given time. It was noted that some of these variances required good systems and hardware maintenance, and that was well provided for.

Further analysis noted that the remainder of these key variances were being met only minimally by COD staff and room for improvement remained. Although all of COD was seen as involved in some degree with the control of key variances, the operator group was by far the most centrally engaged in this activity. Among the COD mechanisms for controlling key variances cited as needing improvement, were intershift coordination and cooperation, individual operator motivation, improper or inadequate operator assignment, inadequate technical training and knowledge by those doing the work, and incomplete communications between users and operators for improved clarity and quality. It was evident that computer operations was treated as a deterministic technology while maintenance was seen as stochastic.

To this point in the analysis process STAG had been within schedule of meeting their January deadline. However, management turnover in COD delayed the process for the month of December. The division manager transferred from the lab and left STAG and the project without personal top management support. By the time STAG resumed work on the technical analysis it was early January and COD had an interim division manager. STAG found that their project was supported by the larger department management although that body knew little about their activities. An attempt by STAG to communicate the results of their technical analysis to department management was premature in terms of STAG's own comfort with the material and was probably best left untried. A subsequent report of the technical analysis was approved in principle by their steering committee but delayed in full acceptance until it could be polished and made somewhat clearer.

During this time communications by STAG back to their co-workers had been persistent and well meaning. They found that their weekly summaries were informative in terms of accounting for time spent, but, the content of the periodic reports was not well understood by co-workers. The appearance of a phantom critic who threatened to circulate sarcastic annotations to STAG's reports made STAG's communication efforts more stressful but also more carefully prepared.

SOCIAL ANALYSIS. During January, 1978 interviews were developed by STAG, with the assistance of the consultants, and were administered to all COD employees. The content of the interviews was designed to examine work related interaction among COD members as well as to obtain attitudes and feelings about those interrelationships and other work aspects. The steering committee became more involved in STAG activities at this time and one of their members joined STAG for the interview development. Relations between the two groups improved during this period as they worked more closely together.

The interview data were analysed and summarized during February, 1978. The results showed that most COD employees liked their work because of variety and latitude. The issues of week-end work, cooperation, recognition and supervisory style generated some of the strongest negative feelings. Few people were clear about COD organization or effective channels of influence. Many felt left out of the goal-setting process in the division and also felt a lack of goal clarity. Hardware maintenance, the stochastic process was seen as well coordinated and attended to by management. Support of operating activities by management and supervision was reported as lacking throughout COD, which suggests it was seen as deterministic.

These results were presented in a report which was drafted in March, 1978. The steering committee and STAG met frequently together during this period but the relations between them were somewhat strained. For STAG, achieving the balance desired by the steering committee, of not staying too close to the data, yet not making sweeping generalizations, was difficult and the reactive posture of the steering committee made it more so. A compromise was reached in which a detailed listing of data tabulations was attached to the summary report.

During March, STAG was also rewriting the report of the technical system analysis for steering committee acceptance. Both reports were finally approved for distribution by early April.

Once the analyses were accepted by the steering committee, STAG was officially disbanded. The new permanent division manager had been selected and took charge of COD at that same time.

The socio-technical analysis presented an image of COD as a service organization meeting a wide variety of requests for work by a large number of users, many of whose requests came in at the end of the day shift, and with high priorities, using data stored in one of a number of technical media. Volume of work, variety in quality of user requests, and quality of work produced, were all considered key variances in addition to the above. Acceptable work was thus produced by division employees, operating in groups in which minimal loyalty was shared. Employees felt ill trained to handle the many requirements of the job, and little respected or valued by their managers and supervisors. Compulsory weekend working was an important irritant to operators.

The new manager endorsed the socio-technical project and sanctioned its continuation as planned. STAG had recommended that the steering committee be disolved and merged into a design team with members of STAG. The new manager, coming from outside COD, saw the steering committee as a useful advisory body to himself during the period of transition. Thus, the steering committee was re-formed of the COD manager, several supervisors and unit managers and some ex-STAG members, for a total of 11. The design committee was formed from seven ex-members of STAG and three new members from management and supervision.

THE DESIGN

The design team had clearly learned something of contracts from its predecessor STAG. In its first meetings in mid April, it drafted statements of expectation for its consultants, for the steering committee, and for itself. These expectations were modified with input from the consultant, steering committee and division manager. The design team met three days a week for design work and one day weekly for discussion with the steering committee.

In addition to that weekly meeting, the steering committee sat with the design committee for the first 30 minutes to hear the previous day's work. The steering committee thus maintained closer contact with the design committee than with the STAG. The design committee issued memos to the COD employees on a "as needed" basis (roughly weekly for a month), in which ideas and proposals were presented and suggestions were sought. No actual shift-wide or divisional meetings were held to discuss the redesign proposal as it was being developed.

The initial design process itself was a succession of different cuts at the same target, all of which eventually converged on the initial proposal. The second process was that of multiple, overlapping discussions among COD employees, over the course of several weeks. Among the various initial design perspectives used by the design committee, were the joint optimization of the social and technical requirements, as identified in the analyses, the use of a list of 12 principles of design (Cherns, 1976) against which to test any proposals, a set of ideal proposals for COD changes generated by individual design team members, and a list of specific change areas to address such problems as working environment, training, days-off scheduling, and so forth. The design team worked on one or another of these perspectives for three weeks, frequently working on a number of them at once, by dividing the labor up among themselves. A proposal, including alternatives, for division redesign was distributed to the division (several copies to each work group) by early May. For three weeks, discussions were held in the division, and in the end the design group collected all the reactions and suggestions to assemble an interim proposal for circulation.

During June the division manager and the steering committee continued to review the interim proposal and to make suggestions to the design team. The manager, for instance, was able to tell the design team what he wanted changed and why. He changed little of the proposal, but made his personal objections quite plain. By early July the design team was writing the proposal for a final time for submission to the steering committee and division manager on July 20th. The manager considered the alternatives proposed and made his final decisions on what was to be. The proposal was distributed to COD (several copies to each group). A hallmark of the design was its development within the principle of "minimum critical specification" which forces the design team always to describe what was necessary, but only what was necessary. This guiding principle was paramount among those applied to the design process and was manifest in its effects, through to the final design.

The design proposal although discussed and modified from its original form in the preliminary version of early May, was basically the same in July. Everyone interested in doing so had a chance to comment on it. In the main, those comments resulted in better understanding for the questioners, and better justification for those answering. Although the steering committee's comments were more specific, they were also mainly editorial improvements and matters of consistency, rather than fundamental changes. The division manager suggested some major changes to the proposed redesign during the period May-July, and spent much time developing and discussing these with the design committee, steering committee, and division personnel. In the end he accepted the design in principle, and took responsibility for implementing the project.

After the division manager took it on, the resulting design was still clearly rooted in the socio-technical analysis, and specifically justified in those terms in the final proposal document. The design was clearly intended to attack the issue of greater morale and motivation by reorienting the management of COD, not merely to system maintenance as a stochastic process, but to a highly variable user service/operation as well.

The analysis had characterized operators as responsible for controlling many key variances in the process of transforming data to user requirement, and they had previously been managed as doing a deterministic, programmable task. It follows that operators would sense this mismatch and would leave to find jobs in which they could be important contributors, or stay in COD and define themselves as unimportant, replaceable elements among the managers, programmers and control clerks who were really the important ones.

The STS design addressed the control of key variances and the development and maintenance of operator staff as a valued and necessary resource. The design achieved these aspects in balance with COD managements' sense of appropriate delegation of authority.

The Design The STS design involved a reorganization of COD and some physical relocation of hardware, and personnel. Figure 2 shows the new structure. This reorganization included a formally recognized training function, and an operations oriented line-management hierarchy, divided into two sections, "I/O" and "mainframe", each with its own senior supervisor reporting to the COD manager. This separation of operations into two was intended to provide both enough stability and fixed jobs to promote operator competence, and enough difference to enhance operator sense of variety. Operators would be able to transfer to another unit after attaining competence in one.

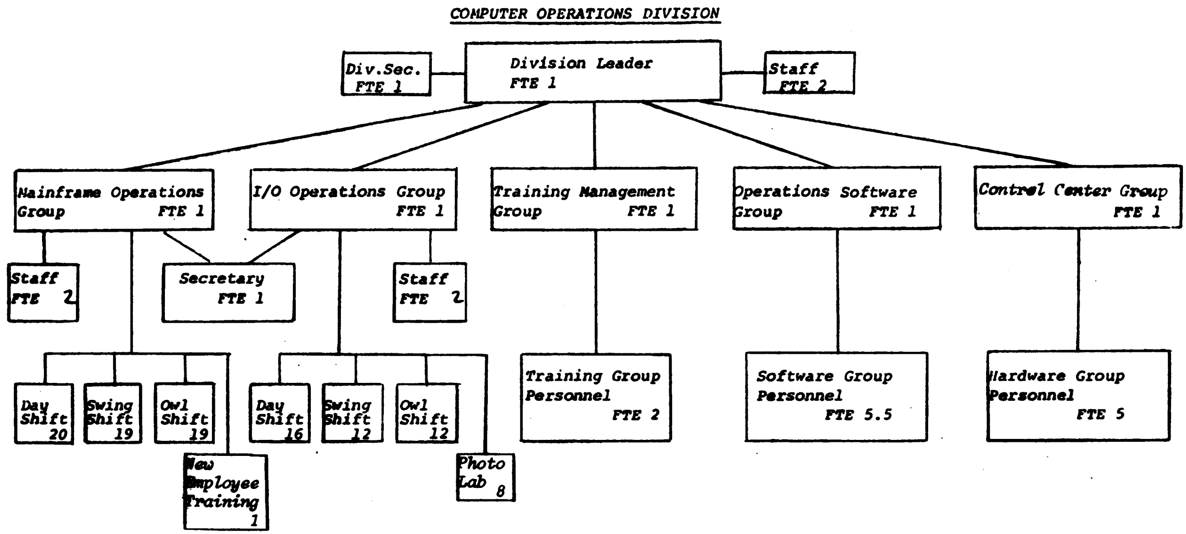

COMPUTER OPERATIONS DIVISION
Div.Sec. FTE 1
Division Leader FTE 1
Staff FTE 2
Mainframe Operations Group FTE 1
I/O Operations Group FTE 1
Training Management Group FTE 1
Operations Software Group FTE 1
Control Center Group FTE 1
Staff FTE 2
Secretary FTE 1
Staff FTE 2
Training Group Personnel FTE 2
Software Group Personnel FTE 5.5
Hardware Group Personnel FTE 5
Day Shift 20
Swing Shift 19
Owl Shift 19
New Employee Training 1
Day Shift 16
Swing Shift 12
Owl Shift 12
Photo Lab 8

FIGURE 2

Another important aspect to the design were suggestions for reducing weekend working either to all weekends on overtime or to 2/3 weekends off. The design also included suggestions that the style of management become more participatory, more direct in communication, and more involved in employee development. The two senior supervisors' work week was set at four ten-hour days to permit joint coverage of one supervisor for the other and to permit both time to visit with employees on all three shifts. Improvements in the communications with users were also recommended and a device to route such communications directly to where they were needed within COD was proposed. Improvements in environmental aspects of use of industrial chemicals, noise, lighting, and ventilation were also proposed.

IMPLEMENTATION

The task of putting the COD design in place has been partially completed (February, 1979). The process of doing so, however, has proceeded from the time of the final proposal in July, 1978, when the division manager decided on a process of improving the supervisory and management functioning, in which all COD employees would be permitted to bid for the new leadership roles created by the design. Furthermore the implementation process is not presently complete and will not be complete until the training positions and training organization have been staffed and charged with responsibility, sometime in 1979.

Implementation took several forms. The design committee attempted to specify how their proposals should be carried out, but these attempts were frequently met with reminders by management and the consultants of the principle of Minimum Critical Specification (cf., Cherns, 1976). The design team eventually came to a position of suggesting several ways of proceeding with a particular recommendation, but leaving final decision to the parties specifically involved (including some who were yet to be appointed).

Implementation was also a product of choosing the senior supervisor for mainframe and I/O units. In this choice, the division manager confirmed the proposed management philosophy of participation and sensitivity to operating personnel. Together these two senior supervisors (selected in October, 1978) began the process of planning and implementing the remainder of the design of operations. Meetings were held between the two senior supervisors and the operators and shift supervisors every two weeks. These discussions covered current progress on the design and employees were also invited to take "pot shots" at past events and future possibilities. The division manager invited bidding on the new shift supervisory position and the senior supervisors interviewed all applicants. They were most interested in the applicants ability and interest in getting along with others, as well as the usual criterion of technical competence and ability to learn. Once the selections had been made (all from within COD), the senior supervisors invited operators to voice their functional operations choice (I/O and mainframe), and their choice of shift and/or supervisor. There was little problem in this phase of implementation and the groups self-selected in appropriate numbers without much external coordination. Implementation of supervisory changes also included finding work and creating useful jobs for those ex-supervisors who were counseled not to seek the new supervisory positions. Retention of staffing levels and job grades had been an original condition of STS project sanction, so equivalent jobs had to be found for these ex-supervisors. They have proven a benefit in staff positions to the senior supervisors in technical planning and STS design implementation.

The senior supervisors continued their bi-weekly meetings until January, 1979, when the shift supervisors actually took over the new two-function operations design. These meetings were perhaps more open and candid than anything previously in COD. The senior supervisors had not been previously engaged in either the STS analysis or design efforts. They reported that some employee comments made during their bi-weekly meetings were critical of the communications efforts during analysis and design, and some were critical of the design itself. A majority of employees, however, seemed to be reasonably content with the prior communications and satisfied that the design would be an improvement.

Several delays in implementation were created by slow or inconsistent policy interpretation by lab staff department units. In particular, the selection of shift supervisors was delayed (thus delaying operator self-selection of function, and COD supervisory training) nearly two months, by an unresponsive compensation system in lab personnel which would not initially allow new supervisors to be appointed at differing entry pay levels.

Training has been an important implementation device in the COD design, not only in what it has done (knit the new management team together in a December off-site session), and what it will do (in creating an excellence in operators' ability and enhanced self-esteem), but also in what it has not done. Strategic decisions by the division manager have left the staffing of the COD training function for later, and the effects of this decision are being felt only weeks into the full operation of the new design. After only two weeks on the job, shift supervisors were discovering that there was "...a hell of a lot more to supervision than they had originally thought", and there were some laments that training in human relations and team building, with the rest of the COD management, would be better sooner than later. More serious, however, was the shortage of trained operators within each of the two operations functions to manage all stochastic events as they occured. Within days of undertaking the new design, operators were being lent from one unit to another and being asked to work overtime to handle crises as they occured. Although operators are in general optimistic about the new design, there are protests from some as they continue to be interrupted in their own work to be borrowed by another unit. Training to bring all operators up to minimum competence levels for "normal" stochastic events is urgently required.

Implementation has also included the physical changes to move I/O equipment and facilities together in one area, and to rearrange management offices to be as close to the operating units as possible within space limitations. These changes spanned the period October, 1978-January, 1979. Implementation of environmental improvements, such as noise abatement have not yet been effected.

Results to Date

The senior supervisors report that the design, at this stage, is seen by COD personnel as a set of suggestions rather than dictates, and they feel that the flexible implementation strategy has been a real benefit for system ownership of the changes. These supervisors also see their roles and their staff resources as permitting a real long-range planning function with the larger computation department, which had never existed in the past. They are optimistic about the long run and pragmatic about the present short term limitations on operations flexibility because of the large proportion of under-qualified employees.

Operators themselves are pleased with the new work schedule, which permits them two out of three weekends off. This is the most visible benefit so far. Changes in the physical layout of COD are seen as yet incomplete, although generally in line with operator interests. Operators seem willing to try the new division structure and initial reactions to it are largely favorable, ignoring the temporary lack of internal resources to cope with stochastic events.

The division manager stated in October, 1978, (in a report to his department manager), that STS accomplished a completely open process of dealing with problems, and the delivery of a design proposal and implementation plan. It also provided for a better informed organization. Costs of the participative STS approach, on the other hand, were: higher expectations by employees than could be delivered, less than total employee commitment to the final product, and an inordinate amount of time to complete (10 months) plus a high internal labor input (over five man-years). In sum, the COD manager feels that the final product was well thought out and of high quality, and that it has a high potential for success.

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