

JOINT OPTIMIZATION OF THE TECHNICAL AND SOCIAL ASPECTS
OF WORKPLACE DESIGN

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Submitted to the Alfred P. Sloan School of Management
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ABSTRACT

This thesis examines the factors underlying the necessity for organizations to consider concurrently both the technical and social aspects of work design, to insure their "joint optimization." It acknowledges that even in this era of growing technological sophistication, companies are prone to accept the technological aspects of the workplace as a given while treating the social aspects of the job as merely a secondary consideration.

The notion of "technological determinism," which is still quite prevalent in many organizations, holds that "technology evolves according to its own internally derived logic and needs, which are quite independent of the social environment and culture." It seems clear that as technology continues to evolve, the concept of technological determinism will have to yield in favor of systems which employ flexible technical design.

Therefore, organizations must acknowledge and implement their realization that there are alternative technological designs and approaches which can be utilized to help insure that employees' social and human needs are adequately met. Through the joint optimization of social and technical needs, known as sociotechnical design, an organization can provide its work force with working conditions which are highly motivational.

This study juxtaposes situations of successful sociotechnical design with a case study of a successful, scientifically oriented growth company which is still constrained by the impact of technological determinism. Through management interviews, the assumptions underlying the company's technological design imbalance are studied. Both specific and generic recommendations are made regarding those factors which employees look for in the optimally designed workplace. These factors include having some autonomy in the performance of their work; some role in the design of their particular jobs and the workplace as a whole; some variety in their work; some decision-making responsibility; and access to timely, relevant information about the company as a whole.

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Chapter 1

Basic Principles Underlying Optimum Workplace Design

1.1 Introduction

In this era of growing technological sophistication, we find all too often that we are designing our places of work to complement the attendant technology. We therefore increasingly find our work environments at the "cutting edge" technologically while severely lacking in terms of meeting the "human" needs of our employees. No matter how sound the technology, the ultimate product or service will suffer if the environment in which it is produced is not also designed to motivate and involve the employee.

Companies are prone to accept the technological aspects of the workplace as a given and then attempt, after the fact, to adapt the human needs to this technology. Treating the human aspects of the job as merely a secondary consideration is a self-perpetuating phenomenon, such that the needs of the worker are never quite given the attention they deserve. This notion of technological determinism says quite plainly that "technology evolves according to its own internally derived logic and needs, which are quite independent of the social environment and culture."¹ In time, this outdated notion of technological determinism will have to give way to methodologies which employ systems of flexible social design.

We need to acknowledge and implement the realization that there are alternative technological designs and approaches which can be utilized

to help insure that employees' social and human needs are adequately met. In order to accomplish this, the technological and social aspects of workplace design must be considered concurrently to insure their "joint optimization." When this balanced approach to workplace design is taken, the enterprise, which is taking full advantage of its internal capabilities, is best able to maximize and achieve its competitive advantage.

This notion of sociotechnical design rests basically on two premises. The first is that the social and technical aspects of the workplace are so inextricably interlocked that the success of the enterprise ultimately becomes a function of their joint operation. Second, there is a continual interchange between what transpires in an organization and what occurs in the environment.² Therefore, if an organization is going to successfully exist over a sustained period of time, it must be capable of keeping pace with evolving environmental conditions.³

There is a very common sense approach to meeting the social needs of the worker. Chronic workplace "disorders" such as high turnover, absenteeism, and antagonistic and apathetic attitudes among workers can be greatly mitigated by treating workers with respect and involving them in their work. Some of the approaches that have proven most successful in motivating and involving workers are: the use of autonomous work groups to perform most tasks; allowing workers to participate in the design of their own jobs; providing jobs that are not routine and provide some variety in the performance of the work; designing jobs from which employees can continue to learn; letting the employees determine

how a job is to be performed; providing jobs with some decision making aspects for the employee; providing jobs where employees receive timely, relevant information about the company's activities; and providing jobs where employees feel that they have a future. In short, these low-cost methods for meeting the social needs of the employee rest primarily on giving the employee autonomy in the performance of his work, the ability to participate in the design of his work, and the ability to experience personal growth through his work.⁴

This study begins with an examination of the parameters of successful sociotechnical design from a historical viewpoint. It looks at situations where sociotechnical design has been highly successful - notably Volvo's Kalmar plant in Sweden. Juxtaposed against this successful design is a case study of a highly profitable, scientifically oriented growth company, caught in the throes of technological determinism. Through management interviews, the assumptions underlying the technical design imbalance at this company are explored, and recommendations regarding basic employee social needs are addressed on both a specific and generic basis.

1.2 A Historical Perspective

Louis E. Davis and James C. Taylor talk in their book, Design Of Jobs, about the significant impact that the technology developed during the industrial era had on how work was designed. They point to a trend that commenced some 160 years ago and which resulted in the replacement of both human and animal sources of power. It was this trend that brought about the factory system and the integral notion of the "division of

labor."⁵

Davis and Taylor go on to point out that during this period a new kind of specialization of labor emerged where jobs were purposely "fractionated," thereby allowing them to be performed by the unskilled. Management began to believe in the self-fulfilling prophecy that workers thought of work as pure drudgery and were therefore only interested in their remuneration. As a result, management usurped most of the workers' sphere of planning and control, which resulted in workers indeed being less involved in their work and more reluctant to personally take responsibility.⁶

Davis and Taylor say that the automated technology of today has absorbed previously routine "people jobs" into the machines themselves. Workers have become "interdependent components" which are required to respond to "stochastic" events.

Since workers are often in an unpredictable environment, their commitment to their work must be even greater.⁷ This necessary commitment and concomitant competence level will not be achieved unless the requisite social support systems are present. Workers must therefore have the opportunity to be more involved both in the design and performance of their work.

In addition, we cannot view the development of technology as a phenomenon over which we have little control. Typically, there will be a choice between a range of techno-economically reasonable alternatives.⁸ When the appropriate technological alternative is

matched with the optimal social design, the organization can function at maximum efficiency.

1.3 Technological Determinism

For the past 160 years the doctrine of technological determinism has been utilized simplistically to explain why jobs were designed principally to complement the current technology. As previously stated, the doctrine maintains that "technology evolves according to its own internally derived logic and needs, quite independent of social environment and culture."⁹ The doctrine also says that in order to utilize the technology effectively, its "development and application must not be inhibited by any considerations other than those determined as relevant by its developers - the engineers or technologists."¹⁰ It is a doctrine that basically maintains that the technological aspects of the workplace are everything, while the social aspects are irrelevant and inconsequential. It sees the technology as the rudder that steers the organizational ship!

There are those who hide behind the notion of technological determinism as a means of explaining the "organizational and institutional status quo" usually associated with the industrial era.¹¹ It is as if technology were viewed as some predestined, inexplicable, supernatural force whose path was unalterable. It is rather a parochial explanation of the workplace which views the worker as merely a necessary appendage to the glorious machine, an appendage whose needs are always secondary to technological innovation, which occurs often for the sake of innovation itself.

Clearly, the notion of an unalterable prescribed form of technology is a painfully defeatist view of the situation.¹² By putting forth the one and only technological solution, the technical systems planners clearly do not thoroughly explore or recognize the impact which the technology will have on the social systems.¹³

It would be misleading to contend that technological determinism exclusively determines the design of technical systems. In fact, technical system designers do frequently incorporate social system choices, both intentionally and accidentally.¹⁴ What we see is a haphazard, casual approach to social system design issues, rather than an attempt to jointly optimize both the technology and the social systems so that there will be a complementary relationship.

1.3.1 The Petroleum Depot Example

A classic example of a situation where the social system effects were not considered in the design of a technical system is the case where a new technology for distributing petroleum products in Great Britain resulted in altering an existing depot network.

In the late 1960s, the maximum legal weight and permitted road speed for British trucks increased from 18 to 32 tons and from 20 MPH to the posted road maximum, respectively. These changes came at the same time as an increase in demand for petroleum products. As a result, many British petroleum distribution companies invested in larger, faster trucks.

The particular company in question also altered both the size and

location of its truck terminals. The company previously had a large number of small depots, servicing 20-30 drivers who in turn serviced customers in a radius of 15-20 miles from the depots. The new depots were utilized to service customers within a 75-mile radius by some 250 drivers.

From a bottom line and competitive point of view, the new vehicles, coupled with the new depot system, proved to be a more efficient and productive system. The actual manual jobs of the truck drivers changed very little as a result of the new configuration of trucks and terminals.

From the driver's vantage point, however, some very fundamental changes took place with regard to the quality and essence of his job. In the smaller depots the drivers tended to know the depot employees, chose to live nearby, and were therefore involved in the community. In the larger terminals these important relationships no longer existed. The informal relationships that had previously existed had been replaced by more formal controls. Therefore, the design of the workplace for the drivers had been substantially altered to their detriment.¹⁵ This new configuration must have impacted the degree of employee involvement in and satisfaction with their work.

Clearly, the managers, who were in the midst of technologically determined thinking, did not see that these adverse consequences would result from their actions. They must have had alternative choices with respect to the design of this distribution system,¹⁶ which would have had a more positive effect on the drivers.

Technological determinism ruled with an iron fist through the 1960s. During the last decade and a half we have become increasingly aware of the relative importance of social systems. We now know that neither the social system nor the technical system can be optimal by itself, and we must therefore strive to find optimal joint sociotechnical systems.¹⁷

1.4 Sociotechnical System Defined

The initial use of the phrase "sociotechnical system" can be attributed to E. L. Trist (who studied the British coal mining industry in 1951), who used it to describe a way of looking at organizations that emphasizes the relationship between an organization and the environment in which it operates and the interrelationship between the technological and social systems within the organization.¹⁸ The perspective of the sociotechnical system is that organizations are comprised of people who produce either products or services utilizing some technology and that each person has an impact upon how well the technology works.¹⁹

The social system of an organization is usually defined as "relationships between people who interact with each other in a given environment for the basic purpose of achieving an agreed-upon goal,"²⁰ while the technical system of an organization is defined as "the tools, techniques, procedures, skills, knowledge and devices used by members of a social system to accomplish the tasks of the organization."²¹

Organizations which have been properly designed from a sociotechnical point of view are often referred to as "open" systems, which connotes their adaptability to both anticipated and unanticipated changes in the

external environment.²² This open system viewpoint points out why the technical and social systems must be designed not only in relation to each other but with respect to their environment as well.²³ Clearly, continuous environmental changes will also necessitate the capability to be able to study and, if necessary, modify the arrangement of both technology and people.²⁴ To attempt to live with one final socio-technical design over the long term would ultimately place the organization at a disadvantage.²⁵

The social system tends to be self-generating, while the technological system has more of an inanimate character and therefore tends to be reactive in nature (reactive to how the social system behaves).²⁶ "The problem of effectively relating the social system with the technological system is neither that of simply adjusting people to technology nor technology to people, but organizing the interface so that the best match can be obtained between both."²⁷

Sociotechnical system theorists believe that those who design the workplace tend to limit their technological options unnecessarily and as a result miss opportunities to design the technologies so that they satisfy the needs of the people.²⁸ If the technology and the work itself could be designed to meet the needs of the worker, then organizations could be more effective in meeting their goals.²⁹

Those who believe in sociotechnical systems reject technological determinism in favor of a system of joint optimization, where the technological and social systems are designed to meet their respective demands as well as those of the environment.³⁰ At the core of this

concept of joint optimization is the notion that the overall performance goals of the corporation cannot be thoroughly achieved without jointly optimizing the independent yet correlated social and technical systems.³¹

It is the joint optimization of the technical and social subsystems which helps insure that the overall workplace as well as individual jobs within the workplace are designed so as to maximize the output of the organization.³²

1.4.1 Principle of Organizational Choice

The principle of organizational choice, or "equifinality," suggests that there are multiple ways in which the workplace can be designed in order to achieve corporate goals.³³ This principle supports the concept that organizational designers must consider the entire range of technologies available and appropriate to perform the same process and achieve the same ultimate goals.³⁴ By recognizing the host of available technological alternatives, designers can strive to select and adapt a particular technology to the human needs of the workers.³⁵ To the extent that those who will actually be doing the work can be involved in the choice and design of the appropriate technology, they will be much more inclined to be committed to this technology and therefore to making it work for the company.³⁶

1.5 Intrinsic Social Needs

It is important that jobs and working conditions be designed to satisfy certain basic social needs of the work force. Systems in which the

technology has to be tailored to further these needs can truly achieve a state of joint optimization. Generally speaking, systems which dignify the worker's position by allowing him to work somewhat autonomously, participate in certain design decisions, experience variety in his work, receive peer and superior recognition, receive feedback on the quality of his work, and receive a continual flow of information about the workplace tend to result in more dedicated employee involvement and greater employee productivity. In situations where these basic needs are satisfied, there is often a corresponding decrease in absenteeism, turnover, industrial accidents, and grievances as well as a corresponding increase in productivity and cost savings.³⁷

Louis E. Davis in his book, Design of Jobs, highlights three general aspects of job design which should be present to help further the goals of the organization by improving the quality of work for the individual. He believes that these three categories are 1) autonomy, 2) personal growth, and 3) participation.³⁸ We shall look at the important roles of these three categories in meeting the social needs of the employee.

1.5.1 Autonomy

The notion of autonomy in the workplace has been demonstrated most successfully in autonomous work groups. Although no one group in any particular organization can be completely autonomous,³⁹ jobs can be organized so that the group plays a major role in planning and carrying out its ultimate responsibilities.⁴⁰ These groups have helped to deemphasize the concept of one man/one job in favor of the group as a whole taking collective responsibility for completing certain tasks and

to a certain extent "self-managing" these tasks.⁴¹ Through this self-regulation, these groups attempt to control key variances themselves, thereby reducing reliance on outside supervision.⁴²

Autonomous work groups are comprised typically of members possessing a wide range of skills who can therefore share and accomplish a variety of jobs.⁴³ The groups provide an environment where members can learn a great deal from one another.⁴⁴ Their capability to solve problems improves commensurate with the necessary cross-fertilization of skills that inevitably occurs.⁴⁵ It comes as no surprise that these groups have the greatest propensity for success when they have the support and backing of top management.⁴⁶

Louise E. Davis eloquently summarized the importance of autonomy when he said,

Studies indicate that when the attributes and characteristics of jobs are such that the individual or group becomes largely autonomous in the working situation, then meaningfulness, satisfaction, and learning increase significantly, as do wide knowledge of processes, identification with the product, commitment to the desired action, and responsibility for outcomes.⁴⁷

Key to the success of autonomous work groups is the concept of minimal critical specification. This concept states that no more of a particular task or job should be specified to the employee or group than is absolutely essential.⁴⁸ It is important to give individuals and groups as many options as possible with respect to how to perform their work.⁴⁹ It is best simply to tell the group what ultimately needs to be accomplished and let them determine the "best" way to do so.⁵⁰

Another important factor in maintaining autonomy is how the individual or group manages the boundaries between it and other groups. To the extent that the group can manage effectively its own activities, then the group's supervisor can spend more time on boundary management.⁵¹ Autonomous groups which become extremely skilled in controlling their own activities may be able to ultimately manage their boundaries as well.⁵¹

1.5.2 Personal Growth (Job Content)

Davis' second basic proposition is that individuals need to experience personal growth in their jobs.⁵³ Davis says that people need to have the opportunity to "learn" from their work environment and therefore continue to grow personally.⁵⁴ He underscores the notion of "self-actualization" which he believes to be essential if one is to be committed to and motivated by one's work.⁵⁵ Davis says that when the sociotechnical system is formulated to adapt to people's "intrinsic" personal needs, then successful corporate economic performance is often achieved.⁵⁶

A key element in achieving a feeling of personal growth in a job is that it contain an element of variety. It is clear that routine and repetitious jobs tend to lead to boredom and a lack of motivation.⁵⁷ It is important that workers be trained to react affirmatively to a variety of unanticipated occurrences that may occur in the workplace due to the evolving nature of the external environment.⁵⁸ Familiarity with a whole host of jobs within the confines of the working group itself helps prepare workers for such events.

There are two additional elements that should be present in the workplace for one to feel they are achieving real personal growth through their work. First is a degree of recognition for the work that the person is doing both individually and as a part of a group.⁵⁹ It is important to all of us that others, both peers and superiors, place a value on the quality of the work which we perform.⁶⁰ Second, we need to feel that our jobs will lead to some sort of desirable future within the organization.⁶⁰ This does not necessarily mean that each person aspires to be promoted through the ranks; it simply means that the workplace ought to be "rewarding" enough that we would wish to spend our futures in it.⁶²

1.5.3 Participation

Davis' third tenet is that the individual should feel that he is really participating in the decisions affecting his work.⁶³ In particular, people want to be given the opportunity to participate in the design of the actual jobs that they will ultimately be performing.⁶⁴ It is important for individuals to have input into the very content of their respective jobs.⁶⁵ It is particularly important for individuals to be able to participate in planning for anticipated changes in their work.⁶⁶ Clearly, the ability to participate in the actual design of one's job and the decisions affecting that job will result in extremely dedicated workers.

An additional factor in facilitating one's ability to participate fully and knowledgeably in performing one's work is timely access to comprehensive information about the company or about one's particular

job.⁶⁷ Information should be provided directly to the point where it needs to be acted upon.⁶⁸ The right type of information, provided in a timely fashion, can allow a group to anticipate events and better cope with variances that inevitably occur.⁶⁹

1.6 Conclusion

We have seen that technological determinism must continue to give way to the joint optimization of both the social and the technical systems. If designers can optimize these interrelated systems, the workplace output can be greatly enhanced. Social systems need to be devised to give the worker a sense of dignity and pride in his work. This can best be accomplished by extending the use of autonomous work groups, by providing jobs that give workers a sense of real personal growth, and by letting workers participate in the design of their jobs and the workplace as a whole.

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Chapter 2

Sociotechnical Studies That Worked: From Coal Mining to Kalmar

2.1 Introduction

Ever since the early studies of the British coal mining industry in 1951, we have seen examples of the successful joint optimization of the technical and social aspects of workplace design. Perhaps the most dramatic example of sociotechnical restructuring of the workplace is the redesign of Volvo's Kalmar plant, in Sweden, where the classic assembly-line system of automobile manufacturing has been replaced by a system which really involves the individual employee in the assembly process.

Whether it is car assembly or extracting coal from the mines, the basic notion of involving the worker personally in both the design of his workplace, and in having responsibility for producing a total quality product, is fundamental. People want to have a choice with regard to how they work. And they want to feel a vital and important part of the production process, not merely subservient to machines and automated production systems.¹ Very simply, people want to work in jobs and in a physical space that they can feel proud of. They don't want to become lost amidst a sea of impersonal machinery and complementary work rules and conditions.

Through the process of involving people in their work, listening to their opinions, and giving them some autonomy and real responsibility, we can improve the actual quality of the work as well as enhance

employee motivation and satisfaction. Chronic problems such as turnover, absenteeism, and apathy tend to be reduced substantially when workers are made to feel a part of the process.

2.2 Coal Mining Studies

Prior to the mechanization of coal mining in Great Britain, workers worked in small, self-regulated work teams (pairs of workers), in which each worker carried out the total task of mining.² This work was accomplished with a minimal amount of outside supervision or control by people outside of the team itself.³ While this method of work was quite demanding physically, the miners had the flexibility to adapt their work methodology to the variable physical configuration of the mine itself.⁴

As the methodology for mining became more mechanized, the conventional long-wall method of mining was adopted. This method, which had the attributes of a mass production system, utilized groups of 40-50 workers, each of whom would work on his own specific task.⁵ Three isolated groups, covering three different shifts, actually performed sequential parts of a single "whole" task.⁶ Each shift of workers was dependent on the previous group having performed their work successfully, and, naturally, outside supervision was necessary to try and consolidate the work of the different groups.⁷

Simply stated, this mass-production form of work design was inappropriately matched to the variable work conditions present in this changing, natural environment.⁸ As a result, workers found it difficult to regulate their work in concert with the work performed on other

shifts. Outside supervisors were also unsuccessful in remedying this situation.⁹ These coordination problems in turn led to hostility and other problems among the workers and between the workers and their supervisors.¹⁰ As a result, productivity was low, and turnover, absenteeism, and the incidence of accidents were quite high.¹¹

With assistance from researchers from the Tavistock Institute in England, a new form of work design was adopted for use in the mines. The composite long-wall method,¹² where tasks were interchanged, utilized relatively autonomous work groups who were responsible collectively for an entire task. This adaptive method allowed each group to accomplish the task in its own particular way.¹³ The composite system was designed to insure that each group possessed the necessary internal flexibility to be able to alter its work methodology, consistent with changes in the task requirements.¹⁴ As the groups adopted a "mutually supportive" relationship with one another,¹⁵ productivity rose, while absenteeism, turnover, and accident rates declined commensurate with decline in tension and conflict among the groups.¹⁶

The coal mining studies are considered to be the first concrete design change which exemplified the validity of applying sociotechnical principles to the design of the workplace.¹⁷ These studies also show the soundness and flexibility of autonomous work groups.¹⁸ The studies show that there are usually alternate choices with respect to the social configuration which can be chosen to match the current technology.¹⁹ In this situation, had the traditional mass production type of social configuration been perpetuated, the attendant technology would not have

proved beneficial.

2.3 The First Manufacturing Experiment

A west coast manufacturer of small plastic medical appliances is reported to be the site of the first experimental situation where the configuration of an assembly-line production facility was altered.²⁰ The experiment was designed in order to examine the conditions pursuant to which productivity could be improved as a result of alterations in job content.²¹ The success of the study was evaluated by the "quantity and quality" of work output as well as "worker attitudes and satisfaction."²²

Two experimental job designs were utilized by way of comparison to the assembly-line method: 1) Group Job Design: The conveyor belt was eliminated, and workers rotated among nine individual stations utilizing a "batch" method of assembling the product. 2) Individual Job Design: All nine operations, as well as procuring the materials, and inspecting the final product were combined into a single job, which was performed by workers at individual work stations.²³

The results of the Group Job Design showed a drop in productivity and the incidence of defects and an improvement in product quality. After less than a week the results of the Individual Job Design were dramatic. Productivity rose above the original average, defects fell by 75%, and quality improved by 400%.²⁴

The experiment dramatically displays that when employees are given

greater responsibility for how and when the job is completed, while at the same time experiencing significantly greater variety in their work, the quality of their work improves, as does the level of productivity and general satisfaction.²⁵ This experiment served as a catalyst for scrutinizing the appropriateness of and preference for the conveyor belt system of manufacturing in many settings.

2.4 Industrial Democracy Project

The Norwegian Industrial Democracy project is well known for having confirmed the importance of employee participation in decisions affecting the design and performance of their jobs. The project, which took place in the early 1960s, was designed in response to Norwegian workers' demands for representation on boards of management.²⁶ It was apparently believed by the work force that such representation would bring them closer to management and get them more involved with the day-to-day operational aspects of their jobs.

The project was divided into two phases. The first phase involved interviews with Norwegian companies who had employees serving on their boards. The data showed that there was virtually no reduction in employee alienation or improvement in productivity as a result of such representation.²⁷ It was clear that such representation did not enhance the level of employee participation in the operations of the company.²⁸ Einar Thorsund and his associates summarize the results as follows:

Briefly, what we are suggesting is that two of the necessary conditions for the emergence of a higher level of participation are not present: these are that the individual should have more elbow-room within his job,

and second, greater responsibility for decisions affecting his job.²⁹

This first phase strongly supports the basic sociotechnical premise that employees must participate in the actual decisions affecting both the design and mode of performance of their work in order to have a vested interest in the quality of that work. It is through such participation that work can begin to take on personal meaning for an individual. This phase also supports the virtues of autonomous work group for stimulating employee involvement. Through such groups workers are able to adapt their "work methodology" to the appropriate environmental conditions. Groups also allow workers to regulate and inspect their own work product, thereby increasing their stake in the quality of the outcome. Such autonomy allows these groups to depend less upon outside supervision and more upon the strengths of the members within the group itself.

The second phase of the project involved a series of experiments in several different plants to determine the optimum conditions for greater individual participation in the operations of the company.³⁰ The results of these situations confirmed a direct correlation between employee involvement and a concomitant increase in productivity.³¹ When employees found themselves involved in the design of their jobs and the workplace itself, they felt more a part of the organization, and their level of dedication increased significantly.

2.5 The Lesson of Kalmar

The assembly-line manufacture of automobiles is a powerful example of "sociotechnical imbalance." While the assembly-line itself may be technologically a highly efficient means by which to assemble an automobile, it is a dehumanizing methodology for the people involved in the process. The assembly-line, by its very nature, isolates employees from one another, thereby nullifying any real possibility for group problem solving. The assembly-line breaks down the complex process of assembling an automobile into fractionalized tasks requiring a minimal level of skill.³² Essentially, it makes the job itself quite disinteresting and involves the worker as little as possible in participating in the "whole" task and in his individual role in accomplishing that task. It has to have a demotivational effect on the worker!

The story of Volvo's Kalmar plan is a shining example of effective sociotechnical design. It exemplifies the principle of how technology can be altered to meet the social needs of the people with a corresponding improvement in the quality of the final product. It shows that the participation of the employees in the design of the workplace and in the configuration of their actual jobs is essential to insure real employee commitment to the work process.

It is interesting to note that in the late 1920s Volvo used work groups which would work on a single automobile until it was completed.³³ By the 1950s, along with the rest of the automobile industry, Volvo had become highly mechanized. As a result, the group approach began to erode in favor of the fractionalized specialization of tasks that

accompanied the assembly-line process of building automobiles.³⁴ As was the case in many industries at the time, the human aspects of the production process became secondary to the technological and purely economic aspects.³⁵ But by the late 1960s, in response to increasing absenteeism, and turnover which exceeded the 50% mark, management became interested in the social aspects of the workplace.³⁶ In the 1970s an important outcome of this new interest in social issues was the advent of work councils. These councils, which still exist, are networks of employee-elected groups which function at a multitude of consultative levels within the corporation.³⁷

The Kalmar plant was initially designed to be a plant that would pay more attention to the human needs of the worker but would nonetheless be configured in a traditional assembly-line fashion.³⁸ The first pass of the design phase emphasized the notion that work be performed in groups, which would have some control over the speed with which they worked.³⁹ There was also an attempt to provide the most comfortable work space possible, which included the notion that the noise level be kept to a minimum.⁴⁰

The design really began to take on a "revolutionary" look as the result of a task force that was assembled to complete the design process. The task force recommended a move away from the traditional conveyor belt approach to separate group work stations which could be made stationary if the group desired. The concept was that each station would be manned by a work group comprised of about 15 workers and that the group would perform a variety of tasks and be responsible for the quality of its own

work.⁴¹ It is important to note that this major departure in design would probably not have been possible without the support that it had from the senior management of the corporation. Pehr Gyllenhammar,⁴² the President of Volvo, was deeply committed to the notions of personally involving each worker in the design of his job and of giving each worker the best working conditions possible. Support of top management is essential for such nontraditional but important innovations to succeed.

At the center of Kalmar's innovative design was the Kalmar carrier, which replaced the traditional conveyor belt.⁴³ The carrier is a low platform slightly larger than a car, on which the actual assembly takes place. The carrier, which is self-propelled, moves around the plant (at one MPH) in a pattern that is configured by the employees. The system is so flexible that the route of the carrier can be constantly modified, and groups can stop the carrier at their station for as long as is required to perform their work.⁴⁴

The basis of the Kalmar concept is not the carrier itself but the design and performance of the work group. Each group has clearly defined responsibilities in the manufacturing chain (e.g., steering, finish work, instrumentation, etc.).⁴⁷ Each group has its own work area on the shop floor as well as a separate rest area. The allocation of these specific areas helps to give the group its identity as well as making the individual members really feel a part of the group.⁴⁶ Each work team has the flexibility to design its own internal organization. Since most team members typically learn more than one job, the team has the

flexibility to determine how it will perform the work.⁴⁷ The only requirement imposed by the company itself is, for instance, that the team deliver a certain number of installed transmissions or finished paint jobs each day.⁴⁸

The teams typically choose to work in one of two ways: 1) The car carriers move into the team's work space while each team member performs a different task on the car. While somewhat similar to assembly-line work, workers at Kalmar can control the pace of the carriers and even stop them as required. 2) A more common scenario is for the team to divide itself into smaller groups of two or three, which carry out all of the tasks of the team on a particular carrier.⁴⁹

The Kalmar facility itself was designed to provide the best possible working conditions for the work groups.⁵⁰ The hexagonal design of the building allows each group to have its own space (one wall of the hexagon) while still being close enough to be able to interact and socialize with other work groups.⁵¹ The building was insulated in such a manner that the noise level is low enough to permit normal conversation, while in conventional auto plants workers often could not hear one another while shouting from just a few feet away. The work areas are bright and open with large windows looking out over the landscape.⁵² The individual group rest areas are carpeted and have full kitchen facilities, while a factorywide canteen provides the venue for socialization between groups.⁵³

In his book, People At Work, Gyllenhammar quite succinctly sums up the success of the Kalmar plant: "We could not succeed with the people

themselves until we succeeded with the technology for the people. As a result, we hope people will be motivated to reorganize their own work still further to suit themselves."⁵⁴ He also discusses the vital importance of workers participating in workplace design and change: "An organization that develops and changes at the instigation of its members, rather than its managers, has a better chance of renewing itself all the time, evolving to fit the true situation of its people."⁵⁵

As one would suspect, as a result of the design of work at Kalmar, turnover and absenteeism are lower than at Volvo's traditional plants, and workers really participate in decisions regarding their work as well as wanting to take responsibility for the quality of their work.⁵⁶ I believe that the Kalmar plant exemplifies most of the factors necessary for true worker involvement and pride in their jobs. When workers really feel that their involvement makes a difference as to the quality of the work performed, their level of commitment increases substantially.

FOOTNOTES

1. Gyllenhammar, p. 4.
2. Herbst, p. 3.
3. Cummings and Srivasta, p. 43.
4. Ibid.
5. Herbst, p. 3.
6. Cummings and Srivasta, p. 44.
7. Ibid.
8. Ibid.
9. Ibid.
10. Ibid.
11. Ibid.
12. This method was quite similar to the way workers mined prior to mechanization.
13. Cummings and Srivasta, p. 44.
14. Churchman and Verhulst, p. 89, Emery and Trist article entitled "Sociotechnical Systems."
15. Ibid.
16. Cummings and Srivasta, p. 44.
17. Ibid.
18. Ibid., p. 45.
19. Ibid.
20. O'Toole, p. 250, Davis and Trist article, "Improving the Quality of Work Life: Sociotechnical Case Studies."
21. Davis and Taylor, p. 166, Davis and Trist article, "Improving the Quality of Working Life: Sociotechnical Case Studies."
22. Ibid.

23. Ibid.
24. O'Toole, pp. 250-251, Davis and Trist article.
25. Ibid.
26. Cummings and Srivasta, p. 46.
27. Ibid., p. 47.
28. Ibid.
29. Ibid.
30. Ibid.
31. Ibid.
32. Davis and Taylor, p. 85, Davis article.
33. Gyllenhammar, p. 52.
34. Ibid.
35. Ibid.
36. Ibid., p. 53.
37. Ibid.
38. Ibid., p. 54.
39. Ibid.
40. Ibid.
41. Ibid., p. 55.
42. Author of People at Work.
43. Gyllenhammar, p. 56.
44. Ibid., p. 59
45. Ibid., p. 63.
46. Ibid., p. 65.
47. Ibid.
48. Ibid.

49. Ibid.
50. Ibid., p. 60.
51. Ibid., p. 62.
52. Ibid., p. 63.
53. Ibid.
54. Ibid., p. 68.
55. Ibid.
56. Ibid., p. 71.

Chapter 3

Charles River Laboratories: A Case Study in the Effects of Technological Determinism

3.1 Introduction

Even progressive growth companies sometimes find themselves in the "throes" of technological determinism. They may not consciously decide to optimize technology to the detriment of the social aspects of the workplace; nonetheless, historical success with operating in this mode often supplies the momentum for continuing to do so. The Charles River Laboratories, a "quasi-high tech" supplier of high quality research animals and related services, is a classic example of the insidious self-perpetuating nature of technological determinism. The company, which provides its services to the biomedical research community worldwide, provides an interesting juxtaposition to the classic sociotechnical design that we see in Volvo's Kalmar plant. If the management of Charles River stopped to examine the imbalance that has naturally evolved between the technical and social aspects of the design of its workplace, it would easily see the virtues in restoring the balance. But the financial success of the company has "prevented" management from undertaking such self-scrutiny. Charles River is representative of perhaps the majority of American businesses which have become subservient to their own technology.

3.2 The Company

Charles River is the world's largest producer of high quality research

animals, specially bred for use in biomedical research. The company is highly profitable. In the last fiscal year that it was still a public company,¹ it showed after-tax margins of nearly 14%. The company has never experienced a "flat" or down quarter since 1968, when it first went public. The company breeds rats, mice, hamsters, guinea pigs, non-human primates, and a limited number of miniature swine. All of its rodent species are bred to be free of virtually all murine viruses and bacteria. The sophistication of the company's in-house quality control laboratories is such that the company is confident that its animals are the healthiest in the free world. The company prides itself not only on the high quality of its animals but also on the consistency of this quality, so that animals can be ordered virtually from any of the company's eleven worldwide production centers and used interchangeably in long-term research studies.

The company attempts to safeguard the quality of its products by producing them in specially designed facilities. The buildings are all concrete and, with one exception, are windowless to prevent access by wild rodents and other animals. The animals are bred in individual rooms,² which the company calls "barriers," which are totally autonomous in operation. Each barrier room has a separate environmental system whereby temperature, humidity, and filtration are controlled within close tolerances. The water is treated with ultraviolet rays prior to being provided to the animals, and the rooms are maintained under positive pressure to prevent unwanted materials from being introduced into the room inadvertently.

The company is committed to continuously improving and updating this technology so that its animals are produced under the most sophisticated conditions. The company believes that these barrier rooms are "optimally" designed from a technological point of view and are therefore quite effective in keeping the animals free of unwanted contaminants.

While the barrier rooms themselves³ seem to provide an efficient barrier to contaminants, it is the people in the rooms who actually present the greatest health threat to the animals. It is this factor which seems to play a key role in Charles River's design imbalance in favor of technology. Almost by definition, the company has had to design systems and policies to safeguard the animals from the people. The result has been highly restrictive policies which treat the employee as an appendage to the technology rather than as an integral and essential factor in the production process.

The company attempts to strengthen the "weak" human link in the production process by careful recruitment and selection parameters and by imposing certain operational policies and procedures. All prospective barrier room employees must pass a pre-employment physical to insure that they do not have any diseases which might have an adverse impact on the health status of the animals in the room.⁴ Employees also undergo a thorough orientation program, where the importance of maintaining the animals in a "healthy" state is emphasized.

The procedure for animal technicians to enter the barrier rooms was also designed to safeguard the health status of the animals. Each morning, employees must pass through a series of four electrically interlocked

entry rooms in order to gain access to the barrier room itself. In the first room outer garments are removed, and a noisy but safe aerosol device is activated which eliminates any flying insects which might have inadvertently entered the room as the door was opened to the outside. The employee next proceeds to the undress room, where all clothing is removed, prior to entering the third room in the series, where a head-to-toe shower is required to be taken. In the last room a pre-sterilized surgical outfit, including a face mask and gloves, is donned. The face masks are changed on an hourly basis to insure their efficacy.

The "showering in" procedure, while essential in safeguarding the health of the animals, is an extremely unpopular requirement among animal technicians. While some don't believe in the scientific validity of the requirement, others simply view it as an unwarranted invasion of their privacy. Employees go to great lengths to "beat" the shower system, either by standing in the corner of the shower to avoid getting wet or by rigging the electrically interlocked doors so that one can pass directly into the dress lock without showering. Notwithstanding these attempts to circumvent the shower requirement, all employees know that showering is considered to be essential. The penalty for failing to shower into an animal room is immediate discharge.

Animal technicians enter the animal rooms through the entry locks early in the morning and remain inside all day. There are no windows in the animal rooms, so employees literally have no sense of the outside climatic conditions. Employees eat and take their breaks in a small but adequately equipped kitchen within the barrier room. They must have

their lunch materials pre-sterilized prior to introduction into the rooms, and there are limitations on the types of foods that can be brought into the rooms (to insure that they are packaged in such a way to insure their sterility). The rooms tend to have high ammonia levels (especially on Monday mornings and humid summer days), which make them somewhat uncomfortable places in which to work. Other factors are the somewhat claustrophobic effects of wearing surgical masks all day as well as the somewhat irritating effects of peracetic acid, which is sprayed topically to disinfect certain materials prior to their entering the barrier room. Animal technicians work in groups of five to twelve employees, depending upon the size of the room and the species being bred inside. These work groups are required to service a certain number of cages regardless of absenteeism or vacations.

As a result of the isolated character of the barrier rooms, it is virtually impossible for employees to develop a real sense of community with respect to the company. It is therefore quite easy for them to adopt a we/they attitude with respect to management. The isolation of the rooms also leads inevitably to information being disseminated in an extremely slow and inefficient manner. This paucity of information only exacerbates the feeling of a lack of access to both management and basic information about the company. The feeling of isolation is further compounded by the fact that the personal contact rule (see subsection 3.3.2) also prevents socialization by many employee groups, and therefore the company cannot hold company-sponsored social events. This puts the company at a distinct disadvantage with other firms in the same labor market, as there is no question that a company-sponsored Christmas

party, picnic, or family outing can go a long way in fostering a genuine family feeling among employees at all levels.

Working conditions in the rooms are unusual as compared with other industries as well as being highly restrictive and regimented. There is an overriding element of confinement and isolation, from both the outside world and other company employees. On the other hand, each barrier room work force is an independent, tightly knit group whose members learn to depend on one another to accomplish the work. Work group members tend to become close friends and also develop an esprit de corps and competitive feeling vis-a-vis other barrier rooms.⁵ The company could do more with these groups by allowing them to work more autonomously. Such autonomy would help to place more emphasis on the social aspects of the workplace, which are currently of secondary importance.

3.3 Restrictive Company Policies

At the time of hire the importance of certain company policies is made known to new employees. In fact, employees sign a document indicating that they have read and understood the policies and that they will abide by them. Part of the orientation is explaining the link between following these guidelines and being able to maintain the high quality health status of the animals.

3.3.1 No Pet Policy

The company maintains a policy that employees may not own, at home, any pets (mice, gerbils, hamsters, etc.) which are of the same general species as the animals produced by the company. This is to help prevent

the possibility of an employee transmitting a disease which his pet might have to the entire population of a barrier room. Certain murine viruses and bacteria are extremely contagious and could therefore wipe out an entire colony of animals in a matter of days. Using this same logic, employees are prohibited from removing animals from the barrier rooms and taking them home as pets, as these animals can also become contaminated after leaving the pristine environment of a barrier room. Violating this rule is also punishable by immediate discharge.

3.3.2 Personal Contact Rule

By far the most pervasive and unusual of all of the company policies is its personal contact rule (see Exhibit 1). Essentially, the policy states that employees from a barrier room may not have any personal contact, either on or off company premises, with employees from any other barrier room. The policy is believed to be essential because different barrier rooms may have different viral profiles at any point in time.⁶ Therefore, contact with employees from a "diseased" room carries with it the propensity to contaminate the "clean" room. This is simply not a risk which the company has been willing to take under any circumstances! The policy is widely and repeatedly disseminated to employees, and it is clear that conscious violations of the policy are grounds for immediate discharge.

The company has deemed this pervasive policy to be essential to its ability to produce high quality animals. However, it is clear that this policy as well as the pet policy, entry lock system, windowless environment, and inability to leave the barrier room all day are all practices

which have evolved in support of and adjunct to the technological design of the barrier room. There seems to be little thought as to the real ramifications these policies and practices may be having on the motivation level and morale of the people. The company should weigh the relative merits of relaxing or modifying certain of these policies against the benefits of keeping them. It might find that the positive impact on employee morale, turnover, and dedication to work might well outweigh the apparent scientific necessity for perpetuating these requirements. The care required to produce these extremely high quality animals is testimony to the fact that greater attention should be given to the people who provide this care. It would seem that with relatively little effort and expense the barrier rooms could be designed to be more "inviting" and personal places within which to work.

The company continues to be the leader in its field, producing a product whose quality consistently surpasses that of its nearest competitor. This is in part due to the quality of its facilities and notwithstanding the fact that human labor has been used as an appendage to these facilities. People have always been a secondary focus in this process principally because the quality of the company's products and the service it renders have always been exemplary despite the relatively undesirable working conditions. The company is beginning to experience an increase in turnover and a corresponding inability to keep all jobs at certain plants adequately staffed. The company also has begun to experience increased competition with surrounding corporations (which clearly have more desirable working conditions) for workers. It is these growing pressures that have caused management to seriously begin to discuss how

working conditions can be improved and how certain long-standing policies and procedures should be carefully scrutinized to determine if they are still necessary and defensible.

3.3.3 Has the Policy Gone too Far?

An example of how the personal contact policy has been pushed to its very outer limits is seen in its application to the wedding of two employees. The situation involves two barrier room employees (one of whom was the group leader in the room) who approached the Director of Human Resources to seek an exemption from the policy in order that they could invite certain people from other barrier rooms to their wedding. One of the intended invitees was slated to be their best man. The couple had given their request a great deal of thought and in this regard had even presented a plan so that the timing of the wedding would comply with the company's "cleanup policy."⁷

The bride was a loyal six-year employee with a superior work record. She was clearly a "company employee." The request went all the way up through the supervisory ranks of the production organization and ultimately came to the attention of senior management (although the final decision was properly left to the production organization itself). This situation was the "acid test," where the true essence of the policy, and its potential for interpretive flexibility, were truly being put to the test. Both the official and unofficial employee "grapevines" were waiting eagerly for the company's position. If management relaxed the rule, it would display its ability to make reasonable exceptions to legitimate policies but could at the same time be criticized for

maintaining this policy merely as "window dressing" to create the illusion of the importance of no personal contact. On the other hand, if it stuck by the rule, it would further support the importance of the policy but would be criticized for being punitive and inflexible and trespassing needlessly into people's personal lives. It was clearly a decision of essential importance in attempting to achieve a balance in meeting the social needs of the employees.

There was considerable and lengthy debate among management regarding the resolution of this situation. Some felt the precedent-setting nature of this situation was so significant that the policy could not be relaxed regardless of the particular circumstances. It was felt that this would lead to widespread disregard for not only this policy but for others as well. Further, the company had, just two weeks prior to this request, reemphasized in writing to all employees the essential importance of this policy. The memo underscored the important role the policy played in preserving the health status of the animals and also reiterated the penalty for violating the policy. Therefore, certain parties felt that the timing also made any concessions on the company's part difficult.

There was also considerable sentiment among some members of management that it should strive to develop a justifiable and supportable rationale for allowing an exception to the policy under these unusual and persuasive circumstances. It was felt that, as the bride herself argued, there are always situations so unique that they justify a deviation from an established policy without any lingering precedent-setting effect. This faction of management believed that by denying the request there

was an enormous potential to alienate not only the people in question but other employees as well, who would perceive the company's actions as lacking even the most basic degree of understanding.

The management of the production department decided ultimately that the company simply could not deviate from the established policy. It was felt that, due to the timing of the recent memorandum on the subject, coupled with the potential eroding effect it could have upon employee adherence to company policies in general, the company had to stand by the policy. It was felt that this particular policy was at the center of the scientific "fabric" which helped to safeguard animal health. The company was concerned that by relaxing this policy it would start to unravel this fabric.

A senior member of the production organization personally told the couple that an exception could not be made and reiterated the scientific risks that would be associated with deviating from the policy. While it is difficult to assess the extent of the impact which the company's actions had on employee morale, it is known that the intended best man terminated his employment over the incident and that other employees within his barrier room were critical vocally of the company's actions. It is safe to say that the bride is probably no longer a "company" employee!

Without second-guessing the wisdom of the decision from a technical point of view, it would be safe to say that the social impact was and continues to be significant! The company, even in these unique and compelling circumstances, chose to support the technology at the expense of

those who make the technology work. The obvious impact that this would have on morale and motivation generally, not to mention the impact on the six-year group leader and her new husband, was really not considered in sufficient depth. The company has always been extremely successful despite its treating the employee population as being of secondary importance to the success of the overall operation. This continued success would appear to be at risk if the human aspects of the workplace are not given the attention they deserve.

Perhaps the most serious aspect of this policy, which this situation vividly displays, is its "long arm" with respect to intruding into employees' personal lives. The invasive nature of this policy, no matter how justifiable operationally, must ultimately work to the detriment of the company from a morale point of view. It is difficult enough to maintain real positive employee relations under the best of circumstances. But extending the workplace into the private lives of employees, even to the extent of disrupting someone's wedding day, is playing with an operational time bomb. It would seem that the company should do everything in its power to prevent these kinds of intrusions. The potential adverse impact of continuing to enforce these rules would seem to outweigh the real, but minimal, potential risk of contamination.

3.4 Conclusion

It is clear that Charles River is a highly profitable company with quality products and is a leader in its field. It has masterfully managed and developed, often internally, the technology required to maintain its leadership position. It has continuously made the

necessary significant degree of capital investment in its business which its smaller competitors are unable to make and its larger competitors⁸ were unwilling to make. It is constantly striving to be at the "cutting edge" technologically. But at what price?

The company's profitable situation and leadership position have lulled it into a sense of noncommitment to its employees. It has a history of believing that employees at the animal technician level are expendable and easily replaced.⁹ Therefore, employees were required to adapt to the technology or leave.

Substantial competition for workers, growing turnover levels, and more vocal employees have begun to change the company's perspective on the role of the worker. There is a growing recognition that worker involvement and workplace comfort can help to insure that the company's leadership position is maintained. Workers who are motivated by and involved in their work tend to insure high levels of product quality and overall productivity.

FOOTNOTES

1. Charles River was acquired by Bausch & Lomb, Inc. on February 16, 1984.
2. On average, animal rooms are about 2,200 square feet.
3. Built at a cost of approximately \$150/square foot.
4. The loss of an average animal room due to contamination would result in an immediate inventory loss of about \$150,000 and would take some 8-10 weeks to restock and get up to full production, with no revenue being generated during this period.
5. This competition has recently been heightened by the advent of "Group Leader of the Year Awards," given to group leaders whose barrier rooms perform up to the highest standards.
6. The presence of disease may not be visually discernible, and even health monitoring techniques may not uncover a contamination in time, due to the "lag time" in receiving results.
7. If 48 hours has elapsed following personal contact, then, for certain necessary operational reasons, employees are deemed to have undergone a sufficient cleanup period and can therefore return to their rooms with a minimal degree of risk.
8. Both Becton Dickensen and Ralston Purina were competitors of Charles River but exited the industry because they were unwilling to make the necessary financial commitment.
9. For many years the company believed that high turnover was a positive, as it kept overhead costs down. In these years turnover levels exceeded 100% for animal technicians.

Exhibit 1

Personal Contact Policy

As a Charles River Production employee, you are a member of a team of well-trained employees who, together, produce the finest research animals available to the biomedical research community. As an essential part of this team, you play a vital role in helping to keep our animals free of viruses and bacteria which cause animal diseases.

We ask you to follow certain operational policies which are necessary to safeguard the health of our animals. One of these policies is our Personal Contact Policy. It is timely that we restate both the specifics and importance of this policy.

The Personal Contact Policy states that employees from one barrier room may not have personal contact, either on or off the premises, with employees from a different barrier room. Contact with employees from barrier rooms other than your own, risks contaminating the animals, since each room has its own individual health profile. This policy also includes travel to and from work as part of a carpool which is specifically prohibited by those who work in different barrier rooms.

The no personal contact rule is so important in maintaining the integrity of the barrier system, that violations are grounds for IMMEDIATE DISCHARGE. This is because there is clear scientific evidence that through personal contact there is a risk of contaminating the "Barrier".

If you have any questions regarding the procedures to be followed in our Personal Contact Policy, please discuss them with your Production Supervisor.

Your role as a Production employee in helping to raise our animals is an important one in insuring that researchers receive the highest quality animals available. As an important member of the Charles River team, we expect you to follow all Company policies, such as the Personal Contact Policy, in order to safeguard the health of our animals.

Chapter 4

Charles River Interviews

4.1 Interview Results and Discussion

In an effort to ascertain the assumptions underlying the way the workplace is designed at Charles River and the reasons therefor, I developed an 11-question interview. The following seventeen members of the company's management were interviewed:

President and Chairman

Executive Vice President (with responsibility for marketing, sales, and development)

Executive Vice President (with responsibility for overseeing worldwide operations)

Senior Vice President, European Operations (a Frenchman with responsibility for four European production facilities)

Vice President, Scientific Activities (with responsibility for scientific oversight worldwide)

Vice President, Marketing

Vice President, Engineering

Vice President, Asian Operations (a Japanese national, overseeing the company's Japanese operations, which are part of a 50/50 joint venture with the Ajinomoto Company, Inc.)

Managing Director, Charles River U. K.

Director, North American Production (oversees animal production for all U. S. and Canadian operations)

Director, Veterinary Services (oversees animal health issues worldwide; is also liaison with Charles River Japan)

Domestic Controller

Director, Human Resources

Production Manager, Government Operations (oversees production for all U. S. government contracts)

Senior Project Engineer (mechanical engineer with design input on all Heating, Ventilation, and Air Conditioning systems worldwide)

Plant Manager, Wilmington, Massachusetts facility

Production Manager, Wilmington, Massachusetts facility

The interview questions were designed to bring out the assumptions of this diverse group of managers with respect to the actual process of designing barrier room space, how "well" the rooms are actually designed, and how "well" certain attendant policies and practices were working. The questions were intended to be wide open enough to let the interviewees take the answers in any direction they pleased. The questions were also designed so that the assumptions of the interviewer were not explicit. However, the interviewer, in explaining the nature of the study, did indicate that Charles River was an example of a technological imbalance in workplace design, and this may have colored the responses somewhat.

At the outset of each interview, it was explained that the interview was part of a thesis on sociotechnical design. I then explained that the goal was to optimize both the technical and social aspects of such design simultaneously. I then indicated how the company might take more care in taking the social needs of its employees into account when undertaking the design process. I explained to each interviewee that his comments would be treated anonymously, that there was no "right" answer to any question, and that I therefore did not care what his answer was. I believe that people gave candid, honest answers to the

questions.

All of the interviews were done in person, with the exception of the Managing Director, U. K., whose interview was done through the mail by tape. In addition, all of the interviews, with the exception of the Vice President, Asian Operations, were done without any prior knowledge of the questions by the respondents. In this case, due to the language barrier, the questions were submitted to him in advance to facilitate the interview process.

The interviewee population was chosen in an effort to assemble a diverse group of high level managers who had participated in workplace design from a variety of different vantage points. Seven of the interviewees had served on a task force to design a state-of-the-art production facility in Raleigh, North Carolina, currently under construction. They were asked, when applicable, to respond to the questions specifically with regard to the design of this plant. The Vice President, Asian Operations, was likewise asked to respond to the questions specifically with regard to his new plant in Osaka, which was under construction at the time of the interview. All other interviewees were asked to respond to the questions with regard to their knowledge of the barrier room workplace design generally.

I will list each question asked, followed by a summary of the responses and an analysis of the apparent underlying assumptions.

1. TELL ME ABOUT THE DESIGN OF THE BARRIER ROOMS. WHICH DEPARTMENTS PROVIDE THE PRINCIPAL INPUT WITH RESPECT TO THEIR DESIGN?

The majority of the respondents indicated that the Engineering and Production departments were the principal players with respect to both the design of new barrier room space as well as the renovation of existing space. While there were differences of opinion with regard to the respective roles of the two departments on a percentage basis, it was almost unanimously agreed that these two departments, to the exclusion of all others, made these determinations. There was no mention of the Human Resources department playing any role in the design process whatsoever. In fact, several respondents who were obviously sensitive to this "omission" volunteered that Human Resources is not consulted in such matters.

The situation is different in France as the result of laws which require worker participation in such design issues. There is a worker committee, called the Committee for Hygienic Problems and Safety, which must be consulted whenever present working conditions are modified or new space constructed.

In Japan, a task force comprised of people from all of the relevant disciplines is established to undertake a new facility design. A special subcommittee is also established to look at the human aspects of the design. In this process the subcommittee would solicit the input of both the group leaders and hands-on employees with respect to the design. Most often, the group leader will hold meetings with his/her barrier room staff to insure that their input is provided and that the

barrier room technicians have really had time to think about the issues involved.

The responses of the domestic managers are clear evidence that workplace design is very much technology-driven at Charles River. The workplace is designed to insure maximum efficiency in terms of animals produced and associated dollars generated per square foot. The company never stops fine-tuning its caging systems or air handling systems, but its people systems remain unchanged virtually from year to year. While several of the respondents attached no significance to the fact that workplace design was technologically driven, most displayed a sense of almost "embarrassment" that the human issues appear to have been overlooked. I believe that for many of them it simply was not an issue which they had to face previously, and therefore they were just carried along with the historical momentum with respect to these design issues.

2. WHAT FACTORS ARE TAKEN INTO CONSIDERATION IN THE DESIGN OF BARRIER ROOM SPACE?

The majority of the people interviewed indicated that the most important factors are a design that will prevent the entry of contaminants into the room, that will maintain a stable environment free from pathogenic organisms, and that will be efficient from both an operational (in terms of energy) and a production (in terms of numbers of animals produced) point of view. In short, the goal seems to be the production of a maximum number of healthy animals per square foot.

A few people did say that an important factor was that the work space

(i.e., width of the aisles between rows of cages) be comfortable and convenient so as to facilitate servicing the room. It is clear that the human factor is taken into consideration in this regard principally to insure that production efficiency is enhanced. An example of this use of human labor to insure efficiency is evidenced by the company's recent decision to make rows of cages for certain species 8 or 9 high rather than 6 or 7. While this dramatically increases the productive capacity of the room, workers are required to service more cages within the same time period, with greater physical hardship in terms of the risk of falling or of backstrain from reaching and lifting.

In developing its evolving design criteria, the company appears to put a disproportionate weight on the factors which protect its products from outside influences and which insure maximum productivity. Human factors are considered principally with regard to their ability to enhance the production technology. There is little scrutiny of the human factors with an eye toward designing a workplace where people are more involved with how the products are maintained and how their efforts can positively impact the quality and consistency of these products.

3. WHAT LEVEL OF EMPLOYEE IS CONSULTED IN DEVELOPING DESIGN CRITERIA?
DOES THE COMPANY CONSULT THE HANDS-ON EMPLOYEE IN THIS REGARD?

While there seemed to be some confusion in this area, the majority of respondents concurred that people at levels "below" the plant managers and production supervisors are rarely consulted with respect to design issues. Whatever limited input is derived from the hands-on people themselves seems to come indirectly through the supervisors. There

seems to have been some consensus that the barrier room people should be more directly and intimately involved in the design process, perhaps through a representative committee structure.

As stated previously, in France the hands-on employees are consulted through the worker committee to gain their input with respect to proposed design modifications. In Japan, workplace design and work methodology are discussed almost on a daily basis between the group leader and barrier room technicians. These ideas surface later in group leader meetings which are held periodically to scrutinize the workplace.

Several respondents expressed their belief that it was a major oversight that the hands-on worker population is not involved more routinely in these decisions. Again, there was a sense, even among the production managers, that they had never really considered involving these people in such decisions on a regular basis. At the same time, there was a clear acknowledgement that such involvement made a great deal of sense in the design process.

4. CAN THE COMPANY IMPROVE UPON ITS USUAL DESIGN PROCESS? IF SO, HOW?

The majority of the respondents indicated that the process could indeed be improved. While it is reasonable to assume that the respondents were "led" to their answers as a result of the prior three questions, I believe that they were nonetheless committed to their responses. Most of the people indicated that the process could be improved by consulting with the hands-on barrier room employees. Some suggested that a committee representing a cross-section of barrier room employees be

established for this express purpose. Most of the respondents also indicated that they believed that the Human Resources department should play a significant role in the design of barrier room space. Most felt that the process was too "engineering oriented" and that the human aspects of the workplace needed to be given greater emphasis.

5. WHAT OTHER FACTORS, IF ANY, SHOULD BE CONSIDERED IN THE DESIGN OF THE BARRIER ROOMS?

The majority of the responses to this question were similar to the responses to the previous question. Most people said that more consideration should have been given to the human resource related aspects of the workplace. They said that employee comfort should be a principal consideration. With regard to employee comfort, several people said that a reduction in the ammonia levels should be vigorously pursued. Others said that the system was driven too much by production efficiencies, which resulted in people being overworked (i.e., cage height). One of the respondents attempted to quantify the factors which contributed to the design of the barrier rooms. He said that 70% of the design related to the economic factors of the business, 20% to the welfare of the animals, and 10% to the welfare of the people servicing the room. While I think that the estimate with respect to insuring the quality of the animals is low, I believe that the percentage of the design input attributable to people comforts is accurate.

While it took some prompting to have people focus upon the importance of the human aspects of design, they appear to believe that this area deserves considerably greater attention. There was general concurrence

that the design should be premised more upon the input of the hands-on worker, with an eye toward making their work environment more personal.

6. HOW COULD THE BARRIER ROOMS BE DESIGNED TO BE MORE COMFORTABLE PLACES IN WHICH TO WORK WITHOUT JEOPARDIZING THE HEALTH STATUS OF THE ANIMALS? SPECIFICALLY, WHICH COMPANY PRACTICES, PROCEDURES, OR POLICIES COULD BE MODIFIED OR ABOLISHED? WHAT CHANGES IN THE PHYSICAL DESIGN OF THE ROOM ITSELF COULD BE MADE?

This question opened up a deluge of responses. Many people said that the personal contact rule should simply be abolished. They said that this would allow for a much more "normal" workplace for purposes of recruitment, retention, and improved morale while on the job. They said that the elimination of this rule would permit the company to cease interfering with people's personal lives. In addition, it would allow people to leave the barrier room for lunch, therefore helping to ease the isolation aspects of the job. This thought process led to the related issue of a company cafeteria, which is currently not possible. It was agreed that such a common dining facility would help to build a sense of community among the barrier room work force. The only caveat was that this freedom to associate would only be permissible at facilities where all of the barrier rooms had the same viral profiles, which is a condition that the company is fast approaching.¹ It was agreed that in the eventuality of a contamination in a particular room under these circumstances, the employees from that room would have to be quarantined from the rest of the facility until the health status was rectified.

Most people believed that the uniforms were necessary, both from an appearance point of view and as a protective measure for the animals. There was considerable difference of opinion as to whether the face masks were actually functional in terms of protecting the animals. In any event, most people felt that the uniforms could be more comfortable as well as more "relatable" as articles of clothing. It was pointed out that the uniforms were "sexless" and gave people no feeling of identity and individuality. If one observed the animal room from the viewing window, virtually all employees looked the same. There were some suggestions that the uniforms be more fitted and colored (or patterned). It was also suggested that some sort of patch or insignia be sewn on the uniforms to designate length of service or seniority. In short, there was general agreement that the uniforms could actually be construed as positive aspects of the animal room environment in that they could provide people with a sense of distinction.

There was general consensus that both the entry locks and kitchens could be more spacious and comfortable. It was suggested that the showers within the locks have soap dishes and shampoo receptacles for each person. It was also suggested that the company consider three shower-heads in each shower (similar to the situation in Japan). In situations where the employees in a barrier were all of the same sex, then showering in and out at lunchtime could be greatly facilitated by such a design.

With regard to the kitchens, it was felt that they could be larger (since this is where people spent all of their non-work hours during the

day), better equipped, and more colorful. One respondent pointed out that at one of the company's facilities the employees within each room had been able to choose a mural motif to be painted in the lunchroom. This practice, which for some reason has not yet been extended to other plants, gave people a sense of the outdoors, thereby lessening the isolation phenomenon. Virtually all respondents agreed that the lunchrooms should contain windows so that employees could have some notion of outside conditions.

Several respondents once again raised the issue that while productivity had been improved, morale had suffered as a result of the company increasing the number of tiers of cages. It was generally felt that the company would be better off to forego this increased production or else compensate with an increase in the size of the staff in each room.

What is most dramatic about the responses to this question is that there was general agreement by most of the senior management that many of the current operational policies and practices could be either eliminated or modified substantially. This was true even among members of the production department's management, who have to enforce infractions of these policies daily, even to the extent of infringing upon people's personal lives (i.e., the wedding scenario). Thus, it is clear that on an off-the-record basis, almost without exception, management believes that many of its policies and practices are unnecessary, dehumanizing, and unreasonable.

By the same token, everyone appears to be "clutching" at many of these practices because they have always worked well. There is a real fear

that if the company begins to "relax" its age-old ways, then the entire system will begin to collapse. There is a concern that overall discipline and respect for the quality of the animals will dissipate and that the quality of the company's products will suffer. I believe that these fears are unfounded and that the company would actually experience a corresponding increase in employee morale and motivation. If a sense of community could be developed, then employees would feel more involved and feel that they had a personal stake in maintaining the quality of the products (like workers at the Kalmar plant, who take pride in the quality of each car built).

7. UNDER WHAT CIRCUMSTANCES COULD THE FOLLOWING BE RELAXED OR MODIFIED:
A) PERSONAL CONTACT RULE; B) CLOTHING REQUIREMENTS (MASKS, GLOVES, ETC.); C) LACK OF WINDOWS IN BARRIER ROOMS; D) INABILITY TO LEAVE BARRIER ROOM FOR LUNCH?

This question was intended to specifically focus respondents' attention on certain issues which they might not have focused upon in the previous question, although virtually all of these issues were covered in respondents' answers to that question. To reiterate, most respondents felt that the personal contact rule could be abolished as long as all barrier rooms on a site had the same viral profile. In this regard, most felt that it would be permissible to leave the barrier for lunch as long as workers could return to the room in a timely fashion. Most people felt that windows in the kitchens would provide a substantial psychological boost for the employees and that the isolation factor would be greatly minimized. The gut reaction of most people was to

maintain the clothing requirement, although some admitted that it was principally "window dressing." Some felt that the scientific need for each item of clothing should be reviewed again.

8. HOW COULD JOB TASKS WITHIN THE BARRIER ROOM BE DESIGNED TO BE MORE INTERESTING, LESS REPETITIOUS, AND MORE DIVERSE?

The respondents indicated that the basic tasks of a barrier room technician are presently relatively diverse. Each employee is responsible for maintaining a certain number of cages. This includes feeding, watering, cleaning, and keeping count of the animals in each cage. While these tasks are quite basic, and therefore not really subject to much deviation, the respondents did suggest ways to make the work more diverse. Specifically, they suggested that employees be rotated among different barrier rooms to give them experience working with more than one animal species. It was also suggested that people be allowed to rotate among departments (i.e., laboratory, maintenance, etc.) for this same purpose. Animal technicians could also be given more recordkeeping responsibility (most of the records are currently maintained by the group leaders). Another interesting suggestion was for these technicians to be given basic scientific tasks to accomplish. They could be required, for instance, to monitor the body weight of a particular strain of animals on a new diet and record the results. Projects such as this would make the animal technicians feel more a part of the company's overall activities. Several respondents also suggested that animal technicians themselves be given the opportunity to answer this very question and to help to redesign their own jobs.

It is clear, from the nature of the responses, that there are indeed ways to involve employees in the design of their jobs and to provide tasks that are both interesting and diverse. Again, this is perhaps the first time that many of the respondents really focused upon the issue of making animal technician jobs more interesting. Management has basically been resigned to the notion that barrier room jobs are routine and boring, with little room for variation. By involving people in such alternative activities and making the possibilities truly interesting, there is little doubt that employees will feel substantially more involved in their work. This should help to lessen absenteeism and turnover.

9. IF ASKED, WHAT DO YOU THINK THE ANIMAL TECHNICIANS WOULD SUGGEST IN TERMS OF ALTERING EITHER THE PHYSICAL ENVIRONMENT OF THE BARRIER ROOMS OR THE WORK RULES AND POLICIES?

Virtually all respondents acknowledged that the employees would like to see the abolition of the personal contact rule and therefore be able to socialize both on and off the work site with employees from other barrier rooms. In this regard, respondents also felt that being able to leave the barrier rooms for lunch is a major desire of most employees. It was also felt that employees would like to see the ammonia problem adequately dealt with by still further improvements in the ventilation system. It was also noted that employees are desperately looking for more individual recognition as well as better companywide communications. It was generally felt that employees are basically looking for a more pleasant working environment (more color in the rooms, murals on

kitchen walls, windows in kitchens, and bigger kitchens and shower facilities).

Most of the anticipated employee desires correlate quite closely to the design and policy changes which the management suggested itself in response to question number 6. One would hope that through this mutual recognition that these changes are both necessary and possible and that they could be implemented. Most of these desires, including the fundamental need of employees to be recognized and communicated with, can be implemented with relatively little financial cost and potentially huge gain to the company in terms of morale. It is striking that the company really has the power to make these improvements in working conditions with no impact on the quality of the product. In fact, one can predict that the quality of the work by these employees would improve dramatically as a result of these basic operational changes.

10. WHICH OF THE COMPANY'S POLICIES, PRACTICES, AND DESIGN CRITERIA ARE OF SCIENTIFIC NECESSITY?

Virtually all respondents said that the act of "showering in" to the barrier room had true scientific merit in terms of protecting the animals. Most also feel that the sterilized clothing is scientifically supportable, as are the prohibitions against owning animals of the same species as the company breeds. No other policies or practices were mentioned!

This question was designed to get managers to commit to those practices which really could be justified and supported from a scientific point of

view. The results clearly demonstrate that only a few of the company's current procedures appear to be scientifically supportable. It is therefore arguable that the company could continue to produce a high quality product without the personal contact rule, with windows in the kitchens, and with employees leaving the barrier for lunch. Without such restrictive policies, the company could build a greater sense of community and thereby improve morale and employee commitment to their work. This could have a corresponding positive impact on levels of turnover and absenteeism as well as improve motivation. The company's success in Japan, without the personal contact rule, is some evidence of the fact that the health status of the animals can be maintained if the work force really cares and is committed to its work.

11. ARE THE COMPANY'S POLICIES AND DESIGNS WORKING IN TERMS OF ACHIEVING MAXIMUM PRODUCTIVITY PER EMPLOYEE?

There was agreement that the facility technology was so sophisticated that the maximum number of animals was actually being bred per square foot. At the same time it was felt that the people themselves could be more productive if they enjoyed what they were doing more and felt challenged by and involved in their work. It was felt that the quality of work, in terms of packing orders correctly, getting them to their proper destination, etc., could be improved substantially if working conditions were less restrictive and employees could be motivated to really care about their performance.

These responses also display management's understanding that the

technology of the workplace is efficiently designed but that the social aspects are not designed to complement this technology. In fact, the human design seems to work against the company's desire to accurately deliver quality animals to customers on a consistent basis. The people could better support the technology if they felt as if they were an important and integral part of the process. Again, the company's Japanese experience bears out the benefits of employee participation and commitment.

FOOTNOTES

1. At Charles River Japan there is no personal contact rule, and people leave the barrier rooms for lunch and dine in a common facility. This is possible because all of the rooms have always had the same viral profiles at this location.
2. This is the system utilized at Charles River Japan.

Chapter 5

Recommendations for Charles River

It is clear that the design of the workplace is still technologically driven at Charles River Laboratories. The company has made the financial commitment necessary to have the most sophisticated animal production facilities anywhere in the world. But these facilities are augmented by company policies and practices which often work to the detriment of employee morale and motivation. These policies are unnecessarily restrictive and don't provide the environment for a true workplace "community" to evolve. Employees feel estranged from the management and the company as a whole.

Notwithstanding this highly restrictive work environment, the company continues to produce animals of the highest quality and remains profitable. This historical success has perhaps given management a "false" sense of security with regard to its employee practices. There has been a feeling that these practices have always "worked" in the past, so why change them? There appears to be an underlying fear that the consequences of modifying certain policies are sure to lead to a potential irreversible breakdown in discipline and a general laxity in the care of the animals.

While this is a perfectly natural fear on the company's part, the management is now receiving signals which hopefully will lead them to reassess certain long-term policies and practices. With the upturn in the economy during the last few years, both potential and current

employees can be more selective with regard to where they work. They will therefore work where both the salary and working conditions are the best. Charles River is an average payor, and its working conditions are certainly less than desirable compared, for instance, with a software company or a typical office environment. In addition, the trend today is for companies to place greater emphasis on employee relations and employee involvement and recognition than was the case even a decade ago.

Charles River needs to recognize that recent increases in turnover, continued high absenteeism, and job requisitions which remain chronically unfilled are signals that improvements need to be made with regard to certain company practices. As the marketplace for workers becomes more competitive, those places with the most "human" work environments will attract and retain the best workers. The company needs to weigh the potential risk of contamination, due to the relaxation of certain policies, against the potential increase in morale, motivation, and the general quality of people's work. I contend that through a heightened commitment and interest in their work the incidence of contaminations will not increase. The company's success in Japan would seem to bear out this hypothesis.

I therefore believe that with minimal expense the company can modify certain current operational procedures and experience a corresponding improvement in employee retention, morale, and commitment. There would also be an environment in which a real sense of community could develop, with employees really feeling an integral part of the production

process. By feeling more involved in producing the product, employees would begin to take a greater degree of personal pride in both the quality and quantity of their work.

5.1 Change Agent/Top Management Support

In order for positive, productive changes to be implemented successfully at Charles River, they must have the backing of senior management. If there is not unequivocal support at the top, then such changes, which in some instances are contrary to successful historical methodologies, will not be taken seriously by middle and lower levels of management. Top management can also provide support to others if they begin to doubt the wisdom of the changes or if it appears that discipline is generally faltering as a result of such changes. They must be prepared to "ride out" the inevitable early effects of some employees seeing the changes as a message that the company is becoming "looser" in its animal care procedures and therefore attempting to take advantage of this apparent leniency. Once such a period passes, and employees see that the company still has a commitment to excellence as well as a renewed commitment to its employees, then they will no doubt be motivated in the performance of their work.

It is reasonable to believe that both this thesis and the interview process which was an integral part of it will act as catalysts for change. They should make management more aware of the importance of optimizing the social aspects of workplace design. There should be a tendency, for example, to henceforth include the human resources department in the design process. But if major fundamental philosophical changes are

going to take place with respect to age-old company policies and practices, then these must be generated from the very top of the organization. The Chairman himself and his direct reports must all embrace the basic necessity and importance of these changes. The changes should be made slowly but deliberately so that their benefits can be readily observed by all. With sufficient time, employee commitment can be heightened, while at the same time preserving the highest standards for the products produced.

5.2 Employee Involvement

The first place that the company can start is by giving employees a greater say in the design of their workplace and their own jobs. With such involvement comes a different and deeper level of commitment to the job than employees possess currently. Such involvement can come in a variety of ways. To begin with, the human resources department, as the intended representative of the employees, should have a more central role in workplace design and the makeup of individual jobs. It is this department that has the sensitivity and specifically mandated responsibility to insure that the needs of the employees are fully addressed with regard to design decisions. With such involvement, alternative but equally effective technical designs could be explored in order to make the workplace more people-oriented. In addition, policies could be adopted, modified, and interpreted to give the employee a more central role in the production process.

Allowing employees themselves to provide input into the design process would not only give the employees a sense of involvement but also most

assuredly enhance the process. There is little doubt that the hands-on employee has the greatest sensitivity to the need for certain legitimate operational changes. While virtually all of the production management organization were hands-on employees at one time, they have clearly lost touch with the daily realities of the job. Without input from the people actually in the animal rooms, the process takes on a dangerous design approach, based upon old memories and hearsay.

This input from hands-on employees can be derived from the establishment of an ongoing committee representing employees who perform the various functions within the room, who can participate directly in the design process. This committee could also be active simply to continuously fine-tune and humanize certain operational procedures, even when major design modifications were not under consideration. In addition to this specific committee, each group of barrier room employees should be encouraged, through regular open discussion, during working hours, to make suggestions to improve work conditions or operational deficiencies. Employees whose suggestions are adopted should be recognized and rewarded accordingly.

The very nature of the barrier rooms, each with its own autonomous work group, provides the optimal environment to instill a real sense of teamwork. The company should strive, through intraroom competition, to capitalize on this teamwork notion so that employees really pull together with a sense of pride and commitment.

Implicit in the notion of letting employees participate in the actual design of their own jobs is the responsibility on the company's part to

let them make their jobs more interesting and diverse. The company should specify the end product it desires in terms of number of animals of a certain sex and quality each week and then let the employees determine how this will actually be accomplished. The employees should be encouraged to divide the work load any way it deems appropriate as long as the work is accomplished. Management should also provide the opportunity for rotation both within the barrier room as well as among other rooms and departments. One way to motivate key employees is to give them exposure to other parts of the organization. This makes them more knowledgeable about, and makes them feel more a part of, the organization as a whole. It also keeps them stimulated and challenged and less likely to experience "burnout" on the job. A widespread program of rotation, as well as increased and more diverse responsibilities within the room, would help to decrease turnover and hopefully produce a greater degree of long-term commitment to the company by more employees.

5.3 Design Comforts

Two issues which surfaced often in the interviews should be addressed. These are ammonia levels and cage height. The ammonia odor is clearly an uncomfortable, pervasive annoyance which is the cause of a certain degree of employee dissatisfaction and turnover. It appears that substantial and costly improvements in the ventilation system would have to be made to reduce the problem. I would contend that, notwithstanding the cost implications, this should be made a priority over other contemplated environmental improvements. The corresponding increase in employee satisfaction and comfort would be recovered in improved work

quality by longer-term employees.

The company has recently increased the tiers of cages in many of its barrier rooms. This increase has resulted in a phenomenal increase in productivity per square foot, while at the same time adversely impacting employee morale. Employees are now asked to service more cages by standing on a ladder or platform to do so. The work is tiring and more physically demanding than when the tiers were lower. The propensity for injury is also greater. The company should consider increasing the staff of these rooms proportionately with the increase in the number of cages. If not, the adverse impact on morale will ultimately take its toll on production numbers and animal quality. There may even be appropriate compromise positions where, for instance, the tiers of cages are only increased by one level with slight additions to staff.

5.4 Kitchen/Lounge Area

As long as employees are required to remain in the barrier rooms all day, the design of the kitchen plays an important role in the feeling of the work environment. The kitchen is where coffee breaks and lunch are taken. It is the venue for the group to socialize, really get to know one another, and discuss operational issues. It is where people can literally "let their hair down," relax, and interact on a face-to-face basis with one another. The kitchen is where the individual barrier room community is built and maintained. Currently, most of the kitchens are small and windowless with all of the employees sitting around a small table. Some kitchens contain washers and dryers where employee uniforms are cleaned. While some kitchens now have microwave ovens,

most have only hot plates.¹

I would recommend that, in an effort to really reduce the isolation factor, the design of the kitchens be modified. They should become more comfortable lounge areas where employees really feel that they are in an environment separate and distinct from the barrier room itself. In order to achieve this feeling of a different atmosphere, the kitchens should be larger and less confining. I would suggest that they contain windows so that employees feel some connection with the outside world. They might also be painted a different color from the animal portion of the room and perhaps have a mural painted on one wall, the design of which could be selected by the employees themselves. I think that the company should accelerate its plans to equip each room with a microwave oven to help ease the process of food preparation. In order to create more of a lounge atmosphere, the company might want to consider carpeting the kitchens and furnishing them with couches and comfortable chairs. A company-supplied radio, in addition to the ones in the animal portion of the room, might also help enhance the feeling of a relaxed atmosphere.

With these sorts of modifications, the employees would actually feel that they were having lunch and taking their breaks outside of the animal rooms. This might also help to make the requirement that employees remain inside of the rooms all day less of an issue.

5.5 Uniforms

All barrier room employees currently wear the same one-piece, zip-on,

white nylon jump suit. They also wear white hats and surgical-style masks. All employees look the same regardless of seniority or sex so that their outward individuality has been replaced by a sense of sameness. I think that the uniforms, as long as they are required, could actually be made a "special" and positive part of the work requirements. I think the company should provide a selection of colored uniforms, including the head coverings, from which to choose. Uniforms could also be more fitted to give people more of a sense that they are clothing rather than simply sterilized coverings for the body. In addition, the company might want to consider giving merit badges for years of service which the employees could sew on their uniforms in designated places. In this way, the uniforms could actually become something that the employees are proud to wear.

5.6 Communication/Recognition

The autonomy of each barrier room creates a sense of isolation for employees who feel cut off from the "heart" of the company and its activities. Communication with barrier room employees is currently infrequent and slow. Employees receive a quarterly company newsletter and periodic memoranda regarding personnel policies. While the quality of these publications is quite high, they are not distributed frequently enough and are not detailed enough. Employees have complained on more than one occasion of reading about a significant corporate event in the public press prior to being apprised of it by their supervisor.²

The company should make a concerted effort to increase the frequency and quantity of information which is introduced into the barrier rooms. To

augment the newsletter, monthly or twice monthly write-ups of significant company happenings could be distributed to each employee, through the lock system, to be read during breaks and lunchtime. In addition, group leaders could be called together periodically to receive verbal updates from management. These updates ought to concern company happenings and policies in general. Employees should be encouraged to freely ask questions during these sessions. The group leaders could then go back and share this information with their barrier room colleagues. In addition, members of the human resources group should be encouraged to visit the barrier rooms as often as possible to answer questions regarding the company and thereby increase "management" visibility.

The lack of recognition is also an issue for animal technicians. This exacerbates the feeling of isolation in that employees feel that there are few opportunities to be rewarded for outstanding performance. Toward this end I would suggest that the company adopt awards for barrier room employees (i.e., animal technician of the month, etc.) which could be published, along with a picture of the employee, in its periodic newsletter. Such awards would greatly enhance employees' feelings of being appreciated and therefore would be a positive influence on morale.

5.7 Personal Contact Rule

The company should, on a trial basis, eliminate the personal contact rule. This could be done most readily at its new Raleigh, North Carolina plant, where the health profiles for all the rooms should be

the same. The fact that the plant is new and that this deviation is being tried on a trial basis would help eliminate the potential precedent-setting effect with respect to other locations. The simple fact that the company is even experimenting with this at one of its locations might be a morale boost for employees at other locations.

If the experiment were successful, then the company could expand the practice to other locations where the viral profiles of the rooms were consistent. This would allow employees to socialize with one another both on and off company premises, thereby allowing the company once and for all to cease intruding into people's private lives. It would also permit employees to enjoy the economic and social benefits of carpooling with other employees from the same plant. This relaxation of the rule would also allow the company to hold social events for all employees. Such social events, I feel, are fundamental in terms of creating a real sense of companywide community. In short, the abolition of this rule would allow the company to better compete in the marketplace for employees. It would be more of a "normal" place within which to work.

While the company would certainly not have to go immediately to the expense of constructing employee cafeterias at its various plants, it would have that option without the personal contact rule. In any event, if it could get over the operational difficulties of people getting in and out of the barrier room within an hour, the company could still allow employees to leave for lunch. They could either go to local restaurants or bring their lunches and eat outdoors when the weather was nice. While the operational aspects would have to be explored

carefully, this is an option which the company could implement if it were shown that the personal contact rule was indeed unnecessary.

The elimination of this rule would be the most significant move on the company's part toward "normalizing" its workplace and reducing the restrictive and confining atmosphere that currently prevails. The corresponding positive impact on employee morale and commitment is highly predictable. The company could eliminate this policy and make the other changes outlined above with minimal expense and potentially significant positive impact on the corporate culture. These proposed changes would really help the company achieve a situation where it was optimizing the social aspects of workplace design.

FOOTNOTES

1. The company intends to replace the hot plates with microwave ovens at such time as each barrier room is periodically renovated. This will take years.
2. Many employees read about the sale of the company to Bausch & Lomb in the public press prior to hearing about it internally.

Chapter 6

Conclusions

The Charles River case study shows how successful, growth companies can become engulfed in the historical tides of technological determinism. There is a tendency, as long as profits are temporarily high, to assume that the workplace has been designed in a comprehensive fashion that takes all "important" factors into consideration. Companies often feel that as long as they keep current with regard to the technology they possess the necessary tools to achieve their respective corporate endeavors. These companies overlook the vital importance of simultaneously optimizing the social aspects of workplace design. Addressing the social needs of the work force should not be a secondary consideration. It should be a process which is developed contemporaneously with the design of the technical systems.

Companies need to be flexible enough to adapt the technology, where necessary, to complement the basic social needs of the workplace. There are often several technical designs that will accomplish the task equally well but only one of which may satisfy the social concerns of the work force. In order to achieve this flexibility in design, the company must be in tune with the changing environmental and competitive conditions which surround it. By keeping attuned to the pulse of the external environment, the company can develop internal social systems which motivate its employees.

Optimal social design is a process which draws heavily upon common sense

principles of how we would all wish to be treated in the workplace. As the Kalmar story so aptly displays, it is a process of giving people a dignified, interactive work environment. Designing the workplace to satisfy most of the basic needs of the average worker is typically not an expensive process. It is a process which attempts to make the workplace an inviting and relateable atmosphere. By attending to the social needs and desires of the work force, chronic problems such as turnover, absenteeism, and poor morale can be improved upon. Employees simply want to feel that they are providing a necessary function which is recognized and rewarded by the management of the company!

The desires of most workers are quite basic. They want to have some autonomy in their work with regard to how it is accomplished and who will work together to accomplish it. They want the company to specify as little as possible about the actual format for performing the work. This notion also allows the employee to participate fully in the design of his own job. It is also essential that the hands-on worker be consulted with respect to overall design of the workplace, for it is these people who best know its operational nuances.

It is also essential that workers experience some variety in their work. It is the routine nature of many jobs which serves to lull workers into a state of demotivation and ultimately makes them feel as if they are unimportant in the production process. Implicit in this notion of variety is providing employees with a work environment in which they can continuously learn more about the company so that their particular job is always taking on a new meaning. If employees are permitted some

decision-making in their work, this will help enhance their feelings of really making a difference in helping to get a quality product out the door.

Employees need to feel in touch with the company as a whole and therefore must receive timely, relevant information. The information ought to be about the company as a whole as well as that which will help the employee perform his own job better. He must likewise be able to freely communicate upward, either directly or through his immediate supervisor. Employees must also receive the recognition that they deserve. This keeps employees motivated to continue to perform at the highest levels.

Basically, people want to feel that they are a vital and integral part of the production process. In these times of growing technological sophistication, employees are loathe to feel as if they are in secondary and subservient positions to the machines which surround them. They need to know that it is they who decide how to best utilize these machines to produce the ultimate product. As people feel really involved in their work, they take on a sense of pride which exhibits itself in the quality of the products produced.

By simultaneously optimizing both the technical and social aspects of the workplace and adapting them to one another, the company can operate at peak efficiency. Both the technology and the people who make it work can function in a fashion which is both complementary and satisfying to all concerned.

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