CHAPTER 33
Job and Team Design

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1. INTRODUCTION

1.1. Job Design

Job design is one of those aspects of managing organizations that is so commonplace that it often goes unnoticed. Most people realize the importance of job design when an organization is being built and production processes are being developed. Some even recognize the importance of job design when changes are taking place in organizational structures and processes. However, few people realize that job design may be affected when organizations grow, retrench, or reorganize, when managers use their discretion in the assignment of miscellaneous tasks on a day-to-day basis, or when the people in the jobs or their managers change. Fewer yet realize that job design change can be used as an intervention to enhance important organizational goals.

Many different aspects of an organization influence job design, including an organization's structure, technology, processes, and environment. A discussion of these influences is beyond the scope of this chapter, but they are dealt with in other sources (e.g., Davis 1982; Davis and Wacker 1982). These influences impose constraints on how jobs are designed. However, considerable discretion often exists in the design of jobs in many organizational situations. The job (defined as a set of tasks performed by a worker) is a convenient unit of analysis in developing new organizations or changing existing ones.

Several distinctions are useful to clarify the terminology in this chapter. One distinction is between a task and a job. A task is a set of actions performed by a worker who transforms inputs into outputs through the use of tools, equipment, or work aids. The actions of the task may be physical, mental, or interpersonal. On the other hand, a job is an aggregation of tasks assigned to a worker (Gael 1983; U.S. Department of Labor 1972). When the same set of tasks is performed by more than one worker, those workers are said to have the same job.

It is often useful to distinguish among positions, jobs, and occupations. A position is the set of tasks performed by one worker (e.g., the specific industrial engineering position held by employee X). A job is a set of similar positions (e.g., the industrial engineering positions in manufacturing in a particular company). The tasks performed in a given position are usually a combination of tasks that are common to all workers in that job and of tasks that are unique to that position. The unique tasks are sometimes a function of organizational requirements (e.g., different product or equipment) and sometimes a function of the disposition of the particular worker (e.g., different strengths or interests). An occupation is a collection of similar jobs (e.g., all industrial engineering jobs across companies). Job design usually focuses, by definition, on the job level. Differences in design between positions are assumed to be small and are often ignored. This may not be the case in all situations, however. And there can be great differences in design across jobs within an occupation.

Among the most prolific writers on job design in the industrial engineering literature over the last 35 years has been Louis Davis and his associates (Davis 1957; Davis et al. 1955; Davis and Taylor 1979; Davis and Valfer 1965; Davis and Wacker 1982, 1987). As he and his colleagues point out, many of the personnel and productivity problems in industry may be the direct result of the design of jobs. Job design can have a strong influence on a broad range of important efficiency and human resource outcomes:

- Productivity
- Quality
- Job satisfaction
- Training time
- Intrinsic work motivation
- Staffing
- Error rates
- Accident rates
- Mental fatigue
- Physical fatigue
- Stress
- Mental ability requirements
- Physical ability requirements
- Job involvement
- Absenteeism
- Medical incidents
- Turnover
- Compensation rates

As indicated by many of these outcomes, job-design decisions can influence other human resource systems. For example, training programs may need to be developed, revised, or eliminated. Hiring standards may need to be developed or changed. Compensation levels may need to be increased or decreased. Performance appraisal can be affected due to changed responsibilities. Promotion, transfer, and other employee-movement systems may also be influenced. Thus, aspects of many human resource programs may be dictated by initial job-design decisions or may need to be reconsidered following job redesign. In fact, human resource outcomes may constitute the goals of the design or redesign project. Research supporting these outcomes is referenced below during the description of the approaches.

Unfortunately, many people mistakenly view the design of jobs as technologically determined, fixed, and inalterable. However, job designs are actually social inventions that reflect the values of the era in which they were constructed. These values include the economic goal of minimizing immediate costs (Davis et al. 1955; Taylor 1979) and the theories of human motivation that inspire work designers (Steers and Mowday 1977; Warr and Wall 1975). These values, and the designs they influence, are not immutable but subject to change and modification (Campion and Thayer 1985).

The question is, what is the best way to design a job? In fact, there is no single best way. There are actually several major approaches to job design. Each derives from a different discipline and reflects different theoretical orientations and values. This chapter describes the various approaches and their advantages and disadvantages. It highlights the trade-offs and compromises that must be made in choosing among these approaches. This chapter provides tools and procedures for developing and assessing jobs in all varieties of organizations.

1.2. Team Design

This chapter also compares the design of jobs for individuals working independently to the design of work for teams of individuals working interdependently. The major approaches to job design usually focus on designing jobs for individual workers. In recent years, design of work around groups or teams, rather than at the level of the individual worker, has become more popular (Goodman et al. 1987; Guzzo and Shea 1992; Hollenbeck et al. 1995; Tannenbaum et al. 1996). New manufacturing systems and advancements in understanding of team processes have encouraged the use of team approaches (Gallagher and Knight 1986; Majchrzak 1988).

In designing jobs for teams, one assigns a task or set of tasks to a group of workers rather than to an individual. The team is then considered to be the primary unit of performance. Objectives and rewards focus on team, rather than individual, behavior. Team members may be performing the same tasks simultaneously or they may break tasks into subtasks to be performed by different team members. Subtasks may be assigned on the basis of expertise or interest, or team members may rotate from one subtask to another to provide variety and cross-train members to increase their breadth of skills and flexibility (Campion et al. 1994).

The size, complexity, or skill requirements of some tasks seem to naturally fit team job design, but in many cases there may be a considerable degree of choice regarding whether to design work around individuals or teams. In such situations, job designers should consider the advantages and disadvantages of the different design approaches in light of the organization's goals, policies, technologies, and constraints (Campion et al. 1993, 1996). The relative advantages and disadvantages of designing work for individuals and for teams are discussed in this chapter, and advice for implementing and evaluating the different work-design approaches is presented.

2. JOB DESIGN

This chapter is based on an interdisciplinary perspective on job design. That is, several approaches to job design are considered, regardless of the scientific disciplines from which they came. Interdisciplinary research on job design has shown that several different approaches to job design exist; that each is oriented toward a particular subset of outcomes for organizations and employees; that each has costs as well as benefits; and that trade-offs are required when designing jobs in most practical situations (Campion 1988, 1989; Campion and Berger 1990; Campion and McClelland 1991, 1993; Campion and Thayer 1985). The four major approaches to job design are reviewed below in terms of their historical development, design recommendations, and benefits and costs. Table 1 summarizes the approaches, while Table 2 provides detail on specific recommendations.

2.1. Mechanistic Job Design

2.1.1. Historical Background

The historical roots of job design can be traced back to the concept of the division of labor, which was very important to early thinking on the economies of manufacturing (Babbage 1835; Smith 1981). The division of labor led to job designs characterized by specialization and simplification. Jobs designed in this fashion had many advantages, including reduced learning time, reduced time

TABLE 1 Interdisciplinary Approaches to Job Design and Human Resource Benefits and Costs

APPROACH/Discipline Base (example references)	Illustrative Recommendations	Illustrative Benefits	Illustrative Costs
MECHANISTIC/Classic Industrial Engineering (Gilbreth 1911; Niebel 1988; Taylor 1911)	Increase specialization simplification repetition automation Decrease spare time	Decrease in training staffing difficulty making errors mental overload and fatigue mental skills and abilities compensation	Increase in absenteeism boredom Decrease in satisfaction motivation
MOTIVATIONAL/Organizational Psychology (Hackman and Oldham 1980; Herzberg 1966)	Increase variety autonomy significance skill usage participation feedback recognition growth achievement	Increase in satisfaction motivation involvement performance customer service catching errors Decrease in absenteeism turnover	Increase in training time/cost staffing difficulty making errors mental overload stress mental skills and abilities compensation
PERCEPTUAL-MOTOR/Experimental Psychology, Human Factors (Salvendy 1987; Sanders and McCormick 1987)	Increase lighting quality display and control quality user-friendly equipment Decrease information-processing requirements	Decrease in making errors accidents mental overload stress training time/cost staffing difficulty compensation mental skills and abilities	Increase in boredom Decrease in satisfaction
BIOLOGICAL/Physiology, Biomechanics, Ergonomics (Astrand and Rodahl 1977; Grandjean, 1980; Tichauer, 1978)	Increase seating comfort postural comfort Decrease strength requirements endurance requirements environmental stressors	Decrease in physical abilities physical fatigue aches and pains medical incidents	Increase in financial cost inactivity

Advantages and disadvantages are based on findings in previous interdisciplinary research (Campion 1988, 1989; Campion and Berger 1990; Campion and McClelland 1991, 1993; Campion and Thayer 1985).

TABLE 2 Multimethod Job Design Questionnaire (MJDQ)

(Specific Recommendations from Each Job Design Approach)

Instructions: Indicate the extent to which each statement is descriptive of the job, using the scale below. Circle answers to the right of each statement. Scores for each approach are calculated by averaging applicable items.

Please use the following scale:
(5) Strongly agree
(4) Agree
(3) Neither agree nor disagree
(2) Disagree
(1) Strongly disagree
( ) Leave blank if do not know or not applicable

Mechanistic Approach					
1. *Job specialization:* The job is highly specialized in terms of purpose, tasks, or activities.	1	2	3	4	5
2. *Specialization of tools and procedures:* The tools, procedures, materials, etc. used on this job are highly specialized in terms of purpose.	1	2	3	4	5
3. *Task simplification:* The tasks are simple and uncomplicated.	1	2	3	4	5
4. *Single activities:* The job requires you to do only one task or activity at a time.	1	2	3	4	5
5. *Skill simplification:* The job requires relatively little skill and training time.	1	2	3	4	5
6. *Repetition:* The job requires performing the same activity(s) repeatedly.	1	2	3	4	5
7. *Spare time:* There is very little spare time between activities on this job.	1	2	3	4	5
8. *Automation:* Many of the activities of this job are automated or assisted by automation.	1	2	3	4	5
Motivational Approach					
9. *Autonomy:* The job allows freedom, independence, or discretion in work scheduling, sequence, methods, procedures, quality control, or other decision making.	1	2	3	4	5
10. *Intrinsic job feedback:* The work activities themselves provide direct and clear information as to the effectiveness (e.g., quality and quantity) of job performance.	1	2	3	4	5
11. *Extrinsic job feedback:* Other people in the organization, such as managers and coworkers, provide information as to the effectiveness (e.g., quality and quantity) of job performance.	1	2	3	4	5
12. *Social interaction:* The job provides for positive social interaction such as team work or coworker assistance.	1	2	3	4	5
13. *Task/goal clarity:* The job duties, requirements, and goals are clear and specific.	1	2	3	4	5
14. *Task variety:* The job has a variety of duties, tasks, and activities.	1	2	3	4	5
15. *Task identity:* The job requires completion of a whole and identifiable piece of work. It gives you a chance to do an entire piece of work from beginning to end.	1	2	3	4	5
16. *Ability/skill-level requirements:* The job requires a high level of knowledge, skills, and abilities.	1	2	3	4	5
17. *Ability/skill variety:* The job requires a variety of knowledge, skills, and abilities.	1	2	3	4	5
18. *Task significance:* The job is significant and important compared with other jobs in the organization.	1	2	3	4	5
19. *Growth/learning:* The job allows opportunities for learning and growth in competence and proficiency.	1	2	3	4	5
20. *Promotion:* There are opportunities for advancement to higher level jobs.	1	2	3	4	5
21. *Achievement:* The job provides for feelings of achievement and task accomplishment.	1	2	3	4	5
22. *Participation:* The job allows participation in work-related decision making.	1	2	3	4	5
23. *Communication:* The job has access to relevant communication channels and information flows.	1	2	3	4	5

TABLE 2 (*Continued*)

24. *Pay adequacy:* The pay on this job is adequate compared with the job requirements and with the pay in similar jobs.	1	2	3	4	5
25. *Recognition:* The job provides acknowledgement and recognition from others.	1	2	3	4	5
26. *Job security:* People on this job have high job security.	1	2	3	4	5
Perceptual/Motor Approach					
27. *Lighting:* The lighting in the workplace is adequate and free from glare.	1	2	3	4	5
28. *Displays:* The displays, gauges, meters, and computerized equipment on this job are easy to read and understand.	1	2	3	4	5
29. *Programs:* The programs in the computerized equipment on this job are easy to learn and use.	1	2	3	4	5
30. *Other equipment:* The other equipment (all types) used on this job is easy to learn and use.	1	2	3	4	5
31. *Printed job materials:* The printed materials used on this job are easy to read and interpret.	1	2	3	4	5
32. *Workplace layout:* The workplace is laid out such that you can see and hear well to perform the job.	1	2	3	4	5
33. *Information-input requirements:* The amount of information you must attend to in order to perform this job is fairly minimal.	1	2	3	4	5
34. *Information-output requirements:* The amount of information you must output on this job, in terms of both action and communication, is fairly minimal.	1	2	3	4	5
35. *Information-processing requirements:* The amount of information you must process, in terms of thinking and problem solving, is fairly minimal.	1	2	3	4	5
36. *Memory requirements:* The amount of information you must remember on this job is fairly minimal.	1	2	3	4	5
37. *Stress:* There is relatively little stress on this job.	1	2	3	4	5
Biological Approach					
38. *Strength:* The job requires fairly little muscular strength.	1	2	3	4	5
39. *Lifting:* The job requires fairly little lifting, and/or the lifting is of very light weights.	1	2	3	4	5
40. *Endurance:* The job requires fairly little muscular endurance.	1	2	3	4	5
41. *Seating:* The seating arrangements on the job are adequate (e.g., ample opportunities to sit, comfortable chairs, good postural support, etc.).	1	2	3	4	5
42. *Size differences:* The workplace allows for all size differences between people in terms of clearance, reach, eye height, leg room, etc.	1	2	3	4	5
43. *Wrist movement:* The job allows the wrists to remain straight without excessive movement.	1	2	3	4	5
44. *Noise:* The workplace is free from excessive noise.	1	2	3	4	5
45. *Climate:* The climate at the workplace is comfortable in terms of temperature and humidity, and it is free of excessive dust and fumes.	1	2	3	4	5
46. *Work breaks:* There is adequate time for work breaks given the demands of the job.	1	2	3	4	5
47. *Shift work:* The job does not require shift work or excessive overtime.	1	2	3	4	5
For jobs with little physical activity due to single workstation add:					
48. *Exercise opportunities:* During the day, there are enough opportunities to get up from the workstation and walk around.	1	2	3	4	5
49. *Constraint:* While at the workstation, the worker is not constrained to a single position.	1	2	3	4	5
50. *Furniture:* At the workstation, the worker can adjust or arrange the furniture to be comfortable (e.g., adequate legroom, footrests if needed, proper keyboard or work surface height, etc.).	1	2	3	4	5

Adapted from Campion et al. (1993). See reference and related research (Campion et al. 1996) for reliability and validity information. Scores for each preference/tolerance are calculated by averaging applicable items.

for changing tasks or tools, increased proficiency from the repetition of the same tasks, and the development of special-purpose tools and equipment.

A very influential person for this early perspective on job design was Frederick Taylor (Taylor 1911; Hammond 1971), who expounded the principles of scientific management, which encouraged the study of jobs to determine the "one best way" to perform each task. Movements of skilled workers were studied using a stopwatch and simple analysis. The best and quickest methods and tools were selected, and all workers were trained to perform the job in the same manner. Standards were developed, and incentive pay was tied to the standard performance levels. Gilbreth was also a key founder of this job-design approach (Gilbreth 1911). Through the use of time and motion study, he tried to eliminate wasted movements in work by the appropriate design of equipment and placement of tools and materials.

Surveys of industrial job designers indicate that this mechanistic approach to job design, characterized by specialization, simplification, and time study, was the prevailing practice throughout the last century (Davis et al. 1955; Davis and Valfer 1965). These characteristics are also the primary focus of many modern-day writers on job-design (Barnes 1980; Niebel 1988; Mundel 1985; also see Chapter 38). The discipline base is indicated as "classic" industrial engineering in Table 1. Modern-day industrial engineers may practice a variety of approaches to job design, however.

2.1.2. Design Recommendations

Table 2 provides a brief list of statements that describe the essential recommendations of the mechanistic approach. In essence, jobs should be studied to determine the most efficient work methods and techniques. The total work in an area (e.g., department) should be broken down into highly specialized jobs that are assigned to different employees. The tasks should be simplified so that skill requirements are minimized. There should also be repetition in order to gain improvement from practice. Idle time should be minimized. Finally, activities should be automated or assisted by automation to the extent possible and economically feasible.

2.1.3. Advantages and Disadvantages

The goal of this approach is to maximize efficiency, in terms of both productivity and the utilization of human resources. Table 1 summarizes some of the human resource advantages and disadvantages that have been observed in previous research. Jobs designed according to the mechanistic approach are easier and less expensive to staff. Training times are reduced. Compensation requirements may be less because skill and responsibility are reduced. And because mental demands are less, errors may be less common.

The mechanistic approach also has disadvantages. Too much of the mechanistic approach may result in jobs that are so simple and routine that employees experience less job satisfaction and motivation. Overly mechanistic work can lead to health problems from the physical wear that can result from highly repetitive and machine-paced work.

2.2. Motivational Job Design

2.2.1. Historical Background

Encouraged by the human relations movement of the 1930s (Mayo 1933; Hoppock 1935), people began to point out the unintended drawbacks of the overapplication of the mechanistic design philosophy in terms of worker attitudes and health (Argyris 1964; Blauner 1964; Likert 1961). Overly specialized and simplified jobs were found to lead to dissatisfaction (Caplan et al. 1975; Karasek 1979; Kornhauser 1965; Shepard 1970) and to adverse physiological consequences for workers (Frankenhaeuser 1977; Johansson et al. 1978). Jobs on assembly lines and other machine-paced work were especially troublesome in this regard (Salvendy and Smith 1981; Walker and Guest 1952). These trends led to an increasing awareness of the psychological needs of employees.

The first efforts to enhance the meaningfulness of jobs simply involved the exact opposite of specialization. It was recommended that tasks be added to jobs, either at the same level of responsibility (i.e., job enlargement) or at a higher level (i.e., job enrichment) (Ford 1969; Herzberg 1966). This job-design trend expanded into a pursuit of identifying and validating the characteristics of jobs that make them motivating and satisfying (Griffin 1982; Hackman and Lawler 1971; Hackman and Oldham 1980; Turner and Lawrence 1965). This approach to job design considers the psychological theories of work motivation (Mitchell 1976; Steers and Mowday 1977; Vroom 1964), thus this "motivational" approach to job design draws primarily from organizational psychology as a discipline base.

A related trend following later in time but somewhat comparable in content is the sociotechnical approach (Cherns 1976; Emory and Trist 1960; Rousseau 1977). It focuses not only on the work, but also on the technology itself. Interest is less on the job per se and more on roles and systems. The goal, and key concept, is the joint optimization of both the social and technical systems. Although

this approach differs somewhat in that it also gives consideration to the technical system, it is similar in that it draws on the same psychological job characteristics that affect satisfaction and motivation.

2.2.2. Design Recommendations

Table 2 provides a list of statements that describe the recommendations from the motivational approach. It suggests that jobs should allow the worker some autonomy to make decisions about how and when tasks are to be done. The worker should feel that the work is important to the overall mission of the organization or department. This is often done by allowing the worker to perform a larger unit of work or to perform an entire piece of work from beginning to end. Feedback on job performance should be given to the worker from the task itself, as well as from the supervisor and others. The worker should be able to use a variety of skills and have opportunities to learn new skills and personally grow on the job. Aside from these characteristics that make jobs meaningful from a task-oriented perspective, this approach also considers the social or people-interaction aspects of the job. That is, jobs should have opportunities for participation, communication, and recognition. Finally, other human resource systems should contribute to the motivating atmosphere, such as adequate pay, promotion, and job-security systems.

2.2.3. Advantages and Disadvantages

The goal of this approach is to enhance the psychological meaningfulness of the jobs, thus influencing a variety of attitudinal and behavioral outcomes. Table 1 summarizes some of the human resource benefits and costs from previous research. Jobs designed according to the motivational approach have more satisfied, motivated, and involved employees. Furthermore, job performance may be higher and absenteeism lower. Customer service may even be improved, in part because employees may take more pride in the work, and in part because employees can catch their own errors by performing a larger part of the work.

In terms of disadvantages, jobs that are too high on the motivational approach may have longer training times and be more difficult and expensive to staff because of their greater skill and ability requirements. Higher skill and responsibility may in turn require higher compensation. Overly motivating jobs may be so stimulating that workers become predisposed to mental overload, fatigue, errors, and occupational stress.

2.3. Perceptual/Motor Job Design

2.3.1. Historical Background

This approach draws on a scientific discipline that goes by many names, including human factors, human factors engineering, human engineering, man–machine systems engineering, and engineering psychology. As a field, it developed from a number of other disciplines, primarily experimental psychology, but also industrial engineering (Meister 1971; Meister and Rabideau 1965). Within experimental psychology, job-design recommendations draw heavily from knowledge of human skilled performance (Welford 1976) and the analysis of humans as information processors (Fogel 1976). The main concern of this approach is with the efficient and safe utilization of humans in human–machine systems, with emphasis on the selection, design, and arrangement of system components so as to take account of both people's capabilities and limitations (Pearson 1971). It is more concerned with equipment than is the motivational approach and more concerned with people's abilities than is the mechanistic approach.

The perceptual/motor approach received public attention through the Three Mile Island incident, after which it was concluded that the control room-operator job in the nuclear power plant may have created too many demands on the operator in an emergency situation, thus creating a predisposition to errors of judgment (Campion and Thayer 1987). Federal government regulations issued since that time require that nuclear power plants consider the ''human factors'' in their design (NRC 1981). The primary emphasis suggested by the title of these regulations is on perceptual and motor abilities of people. This approach is the most prolific with respect to recommendations for proper job design, with the availability of many handbooks giving specific advice for all types of equipment, facilities, and layouts (Salvendy 1987; Sanders and McCormick 1987; Van Cott and Kinkade 1972; Woodson 1981).

2.3.2. Design Recommendations

Table 2 provides a list of statements describing some of the most important recommendations of the perceptual/motor approach. They refer either to equipment and environments on the one hand or information processing requirements on the other. Their thrust is to take into consideration the mental capabilities and limitations of people, such that the attention and concentration requirements of the job do not exceed the abilities of the least-capable potential worker. The focus is on the limits of the least-capable worker because this approach is concerned with the effectiveness of the total system,

which is no better than its weakest link. Jobs should be designed to limit the amount of information workers must pay attention to, remember, and think about. Lighting levels should be appropriate, displays and controls should be logical and clear, workplaces should be well laid out and safe, and equipment should be easy to use (i.e., user friendly).

2.3.3. Advantages and Disadvantages

The goals of this approach are to enhance the reliability and safety of the system and to gain positive user reactions. Table 1 summarizes some of the human resource advantages and disadvantages found in previous research. Jobs designed according to the perceptual/motor approach have lower likelihoods of errors and accidents. Employees may be less stressed and mentally fatigued because of the reduced mental demands of the job. Like the mechanistic approach, it reduces the mental ability requirements of the job. Thus, it may also enhance some human resource efficiencies, such as reduced training times and staffing difficulties.

On the other hand, costs to the perceptual/motor approach may result if it is excessively applied. In particular, less satisfaction, less motivation, and more boredom may result because the jobs provide inadequate mental stimulation. This problem is exacerbated by the fact that the least-capable potential workerplaces the limits on the mental requirements of the job.

2.4. Biological Job Design

2.4.1. Historical Background

This approach and the perceptual/motor approach share a joint concern for proper person–machine fit. The primary difference is that this approach is more oriented toward biological considerations of job design and stems from such disciplines as work physiology (Astrand and Rodahl 1977), biomechanics (i.e., the study of body movements) (Tichaeur 1978), and anthropometry (i.e., the study of body sizes) (Hertzberg 1972). Like the perceptual/motor approach, the biological approach is concerned with the design of equipment and workplaces as well as the design of tasks (Grandjean 1980).

2.4.2. Design Recommendations

Table 2 provides a list of important recommendations from the biological approach. This approach tries to design jobs to reduce physical demands, and especially to avoid exceeding people's physical capabilities and limitations. Jobs should not have excessive strength and lifting requirements, and again the capabilities of the least-physically able potential worker set the maximum level. Chairs should be designed so that good postural support is provided. Excessive wrist movement should be reduced by redesigning tasks and equipment. Noise, temperature, and atmosphere should be controlled within reasonable limits. Proper work/rest schedules should be provided so that employees can recuperate from the physical demands of the job.

2.4.3. Advantages and Disadvantages

The goals of this approach are to maintain the comfort and physical well being of the employees. Table 1 summarizes some of the human resource advantages and disadvantages observed in the research. Jobs designed according to the biological approach require less physical effort, result in less fatigue, and create fewer injuries and aches and pains than jobs low on this approach. Occupational injuries and illnesses, such as lower back pain and carpal tunnel syndrome, are fewer on well-designed jobs. There may even be lower absenteeism and higher job satisfaction on jobs that are not physically arduous.

A direct cost of this approach may be the expense of changes in equipment or job environments needed to implement the recommendations. At the extreme, there may be other costs. For example, it is possible to design jobs with so few physical demands that the workers become drowsy or lethargic, thus reducing their performance or encouraging them to leave their workplace. Clearly, extremes of physical activity and inactivity should be avoided, and there may even be an optimal level of physical activity for various employee groups (e.g., male, female, young, old).

2.5. Conflicts and Trade-offs among Approaches

Although one should strive to construct jobs that are well designed on all the approaches, it is clear that there are some direct conflicts in design philosophies. As Table 1 illustrates, the benefits of some approaches are the costs of others. No one approach can satisfy all outcomes. As noted above, the greatest potential conflicts are between the motivational approach on the one hand and the mechanistic and perceptual/motor approaches on the other. They produce nearly opposite outcomes. The mechanistic and perceptual/motor approaches recommend designing jobs that are simple, easy to learn,

safe, and reliable, with minimal mental demands on workers. The motivational approach encourages more complicated, challenging, and stimulating jobs, with greater mental demands.

Because of these conflicts, trade-offs and compromises may be necessary in many practical situations. The major trade-offs will be in terms of the mental demands of jobs created by the alternative design strategies. Making the job more mentally demanding increases the likelihood of achieving the workers' goals of satisfaction and motivation. On the other hand, making the job less mentally demanding increases the chances of reaching the organization's goals of reduced training and staffing costs and errors. Which trade-offs will be made depends on which types of outcomes one wants to maximize. In most situations, probably a compromise strategy may be optimal.

Trade-offs may not be needed in all situations, however. Jobs can often be improved on one approach while still maintaining their quality on other approaches. For example, in a recent redesign study, the motivational approach was applied to a group of clerical jobs to improve employee satisfaction and customer service (Campion and McClelland 1991). The expected benefits occurred along with some expected costs (e.g., increased training and compensation requirements), but not all potential costs occurred (e.g., efficiency did not decrease).

One strategy for minimizing trade-offs is to avoid design decisions that influence the mental demands of jobs. An example of this strategy is to enhance motivational design by focusing on the social aspects (e.g., social interaction, communication, participation, recognition, feedback, etc.). These design features can be increased without incurring the costs of increased mental demands. Moreover, many of these design features are under the direct control of those who manage the job.

The independence of the biological approach provides another opportunity to improve design without incurring trade-offs with the other approaches. One can reduce physical demands without influencing the mental demands of a job. Of course, the cost of equipment may need to be considered.

Finally, the adverse effects of trade-offs can often be reduced by avoiding designs that are extremely high or low on any of the approaches. Alternatively, one might require minimally acceptable levels on each approach. Knowing all the approaches to job design and their corresponding outcomes will help one make more intelligent job-design decisions and avoid unanticipated consequences.

3. TEAM-DESIGN

3.1. Historical Background

The major approaches to job design, as discussed in Section 2, typically focus on designing jobs for individual workers; however, it is also possible to design jobs around work teams. In designing jobs for teams, one assigns a task or set of tasks to a group of workers rather than an individual and considers the group to be the unit of performance. Objectives and rewards focus on group, not individual, behavior. Depending on the nature of the tasks, a team's workers may be performing the same tasks simultaneously or they may break tasks into subtasks to be performed by individuals within the team. Subtasks could be assigned on the basis of expertise or interest, or team members might rotate from one subtask to another to provide job variety and increase the breadth of skills and flexibility in the workforce.

Some tasks, because of their size or complexity or for other reasons, seem to fit naturally into a team job design, whereas others may seem to be appropriate only at the individual job level. In many cases, though, there may be a considerable degree of choice regarding whether to organize work around teams or individuals. In such situations, the engineer should consider the advantages and disadvantages of the use of teams as the unit for job design with respect to an organization's goals, policies, technologies, and constraints.

Team-based approaches to organizing work have become very popular in the last two decades in the United States (Goodman et al. 1987; Guzzo and Shea 1992; Hollenbeck et al. 1995; Tannenbaum et al. 1996). Theoretical treatments of team effectiveness have predominantly used input–process–output (IPO) models, as popularized by such authors as McGrath (1964), as frameworks to discuss team design and effectiveness (Guzzo and Shea 1992). Many variations on the IPO model have been presented in the literature over the years (e.g., Denison et al. 1996; Gladstein 1984; Sundstrom et al. 1990).

Social psychologists have studied groups and teams for several decades, mostly in laboratory settings. They have identified problems such as social loafing or free riding, groupthink, decision-making biases, and process losses and inhibitions that operate in groups (Diehl and Strobe 1987; Harkins 1987; Janis 1972; McGrath 1984; Paulus 1998; Steiner 1972; Zajonc 1965). Some empirical field studies have found that the use of teams does not necessarily result in positive outcomes (e.g., Katz et al. 1987; Tannenbaum et al. 1996), while others have shown positive effects from the implementation of teams (e.g., Banker et al. 1996; Campion et al. 1993, 1996; Cordery et al. 1991). Given that so many organizations are transitioning to team-based work design, it is imperative that the design and implementation of teams be based on the increasing knowledge from team-design research.

3.2. Design Recommendations

Design recommendations are organized around the IPO model of work team effectiveness shown in Figure 1. The variables in the model are briefly described below. A more detailed explanation of each variable is contained in Figure 1.

3.2.1. Input Factors

Inputs are the design ingredients that predispose team effectiveness. There are at least four basic types of inputs needed to ensure that teams are optimally designed:

1. Design the jobs to be motivating and satisfying. The characteristics of jobs that make them motivating in a team setting are basically the same as those that make them motivating in an individual setting. Some of the key characteristics applicable in teams are listed below and described in Figure 1 in more detail. They can be used to evaluate or design the jobs in your client's organization.
   (a) Allow the team adequate self-management.
   (b) Encourage participation among all members.
   (c) Encourage task variety; all members should perform varied team tasks.
   (d) Ensure that tasks are viewed by members as important.
   (e) Allow the team to perform a whole piece of work.
   (f) Make sure the team has a clear goal or mission.
2. Make the jobs within the team interdependent. Teams are often formed by combining interdependent jobs. In other cases, the jobs can be made to be interdependent to make them appropriate for teams. For example, reorganizing a company around its business processes normally requires making the work interdependent. Listed below (and in Figure 1) are several ways jobs can be interdependent.

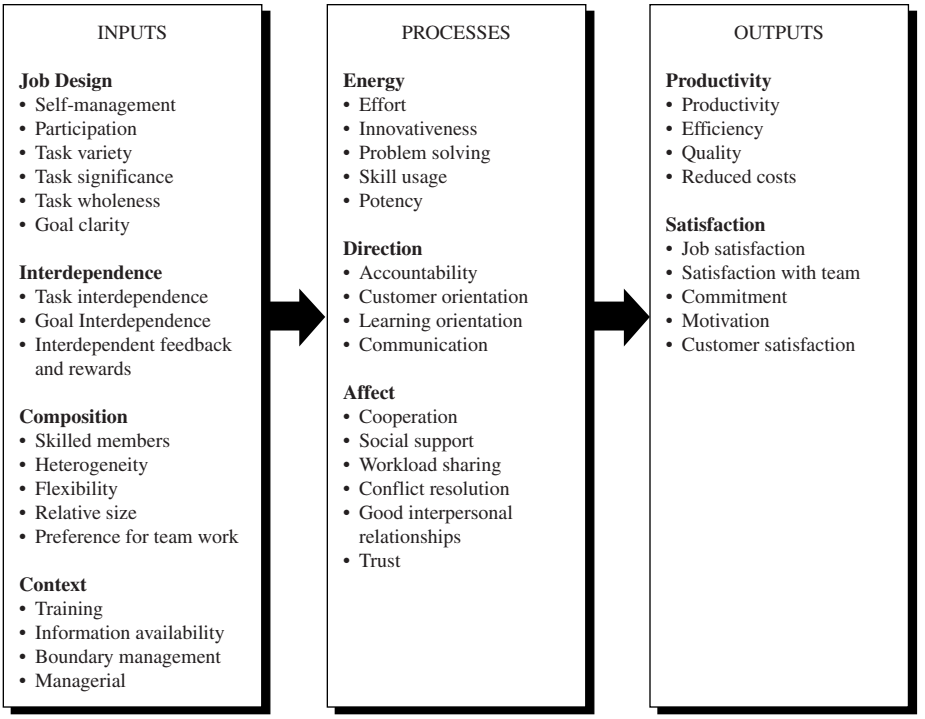

Figure 1 Model of Work Team Effectiveness.

(a) Make tasks interdependent; jobs must be linked or teams are not needed.
(b) Set interdependent goals for team members.
(c) Have interdependent feedback and rewards for team members, with both linked to team performance.

3. Compose the team of the right people. Properly selecting people for a team may be even more important than for individual jobs because a poor selection decision can affect the performance of the entire team. Staffing teams may also be more complex. Some of the key variables to consider are as follows.
   (a) Ensure that team members have a high level of skills.
   (b) Have varied team membership, especially in terms of complementary skills.
   (c) Staff the team with people who are flexible in terms of job assignments.
   (d) Ensure appropriate team size; just large enough (but not too large) for the work involved.
   (e) Select employees with a preference for working in teams.
4. Arrange the context to support teamwork. In order for a new work arrangement like teams to be effective, the organization must be arranged to enable or facilitate them. Following are several key examples.
   (a) Train the work teams in both team skills and task skills.
   (b) Make all necessary information available to the team.
   (c) Ensure proper boundary management by facilitating communication and cooperation between teams.
   (d) Provide managerial support for the team.

3.2.2. Process Factors

Process factors are intermediate indicators of effectiveness. (Note that ''team process,'' which refers to how the team operates, is different than ''business process,'' which refers to how the work flows through the organization to get accomplished.) There are at least three categories of team process indicators of effectiveness. Although these are intermediate outcomes, they can also be influenced through the design of the team or through encouragement, as indicated below.

1. Encourage a high-energy environment. This is the first indication that the team may be properly designed. It refers not just to working harder, but to heightened levels of interest and enthusiasm. Even if this is not forthcoming immediately, it can be encouraged in many ways, such as the following (also see Figure 1).
   (a) Create or encourage a high-effort norm within the team.
   (b) Create an environment that encourages innovation within the team.
   (c) Facilitate problem solving within the team.
   (d) Create opportunities for skill usage.
   (e) Encourage team spirit (potency).
2. Ensure that the team is properly directed. The higher energy of the team must be properly directed if it is going to enhance the attainment of organizational goals. There are a number of indicators that a team is properly directed. Key examples follow below. Each can also be encouraged by the management above the team or the consultant.
   (a) Encourage a sense of accountability and responsibility within the team.
   (b) Create or encourage a customer orientation in the team.
   (c) Create a learning orientation in the team.
   (d) Facilitate communication within the team.
3. Encourage proper affective and interpersonal behavior on the team. Not only is this important from a quality of work life point of view, but the long-term viability of the team depends on the members' willingness to work with each other in the future. Many key indicators of proper affect within the team should be present or encouraged, such as the following:
   (a) Facilitate cooperation within the team.
   (b) Encourage social support among team members.
   (c) Ensure the workload is shared appropriately among team members.
   (d) Facilitate the prompt resolution of conflict within the team.
   (e) Encourage good interpersonal relationships within the team.
   (f) Encourage trust within the team.

3.2.3. Output Factors

Outputs are the ultimate criteria of team effectiveness. The most important outcome is whether the teams enhance the business process. There are two basic categories of outputs. Both are central to the definition of team effectiveness as well as to effective business processes.

1. Effective teams are productive and efficient, and they may also improve quality and reduce costs, as explained in the first part of this chapter.
2. Effective teams are satisfying. This includes not only job satisfaction, but motivated and committed employees. Satisfaction also applies to the customers of the team's products or services. These outcomes were also explained in more detail in the first part of the chapter.

3.3. Advantages and Disadvantages

Work teams can offer several advantages over the use of individuals working separately. Table 3 lists some of these advantages. To begin with, teams can be designed so that members bring a combination of different knowledge, skills, and abilities (KSAs) to bear on a task. Team members can improve their KSAs by working with those who have different KSAs (McGrath 1984), and cross-training on different tasks can occur as a part of the natural workflow. As workers become capable of performing different subtasks, the workforce becomes more flexible. Members can also provide performance feedback to one another that they can use to adjust and improve their work behavior. Creating teams whose members have different KSAs provides an opportunity for synergistic combinations of ideas and abilities that might not be discovered by individuals working alone. Heterogeneity of abilities and personalities has been found to have a generally positive effect on team performance, especially when task requirements are diverse (Goodman et al. 1986; Shaw 1983).

Other advantages include social facilitation and support. Facilitation refers to the fact that the presence of others can be psychologically stimulating. Research has shown that such stimulation can have a positive effect on performance when the task is well learned (Zajonc 1965) and when other team members are perceived as potentially evaluating the performer (Harkins 1987; Porter et al. 1987). With routine jobs, this arousal effect may counteract boredom and performance decrements (Cartwright 1968). Social support can be particularly important when teams face difficult or unpopular decisions. It can also be important in groups such as military squads and medical teams for helping workers deal with difficult emotional and psychological aspects of tasks they perform.

Another advantage of teams is that they may increase the information exchanged between members. Communication can be increased through proximity and the sharing of tasks (McGrath 1984). Intrateam cooperation may also be improved because of team-level goals, evaluation, and rewards (Deutsch 1949; Leventhal 1976). Team rewards can be helpful in situations where it is difficult or impossible to measure individual performance or where workers mistrust supervisors' assessments of performance (Milkovich and Newman 1996).

Increased cooperation and communication within teams can be particularly useful when workers' jobs are highly coupled. There are at least three basic types of coupling, or sequencing of work: pooled, sequential, and reciprocal. In pooled coupling, members share common resources but are otherwise independent. In sequential coupling, members work in a series. Workers whose tasks come later in the process must depend on the performance of workers whose tasks come earlier. In reciprocal coupling, workers feed their work back and forth among themselves. Members receive both inputs and outputs from other members (Thompson 1967; Mintzberg 1979). Team job design would be especially useful for workflows that have sequential or reciprocal coupling.

Many of the advantages of work teams depend on how teams are designed and supported by their organization. The nature of team tasks and their degree of control can vary. According to much of the theory behind team job design, which is primarily from the motivational approach, decision making and responsibility should be pushed down to the team members (Hackman 1987). By pushing decision making down to the team and requiring consensus, the organization should find greater acceptance, understanding, and ownership of decisions among workers (Porter et al. 1987). The increased autonomy resulting from making work decisions should be both satisfying and motivating for teams (Hackman 1987).

The motivational approach would also suggest that the set of tasks assigned to a team should provide a whole and meaningful piece of work (i.e., have task identity) (Hackman 1987). This allows team members to see how their work contributes to a whole product or process, which might not be possible for individuals working alone. This can give workers a better idea of the significance of their work and create greater identification with a finished product or service. If team workers rotate among a variety of subtasks and cross-train on different operations, workers should also perceive greater variety in the work. Autonomy, identity, significance, variety, and feedback are all characteristics of jobs that have been found to enhance motivation. Finally, teams can be beneficial to the organization if team members develop a feeling of commitment and loyalty to their team (Cartwright 1968).

Thus, designing work around teams can provide several advantages to organizations and their workers. Unfortunately, there are also some disadvantages to using work teams. Whether or not teams are beneficial can depend on several factors particular to the composition, structure, and environment of teams and the nature of their tasks. Table 3 lists some of the possible disadvantages of designing work around teams.

For example, some individuals may dislike teamwork and may not have the necessary interpersonal skills or desire to work in a team. In addition, individuals may experience less autonomy and less personal identification when working on a team task than on an individual task. Designing work around teams does not guarantee individual team members greater variety, significance, and identity. If members within the team do not rotate among tasks or if some team members are assigned exclusively to less desirable tasks, not all members will benefit from team job-design. Members can still have fractionated, demotivating jobs. How one organizes work within the team is important in determining the effects of team job design.

Teamwork can also be incompatible with cultural norms. The United States has a very individualistic culture (Hofstede 1980). In addition, organizational norms, practices, and labor–management relations may be incompatible with team job design, making its use more difficult.

Some of the advantages of team design can create other disadvantages. Although team rewards can spur greater cooperation and reduce competition *within* a team, they may cause greater competition and reduced communication *between* teams. If members identify too strongly with the team, they may fail to recognize when behaviors that benefit the team detract from organizational goals. Competition between teams can be motivating up to a point, after which it can create conflicts that are detrimental to productivity.

Increased communication within teams may not always be task relevant. Teams may spend work time socializing. Team decision making can take longer than individual decision making, and reaching a consensus can be time consuming. The need for coordination within teams takes time and faulty coordination can create problems.

Team processes can also inhibit decision making and creativity. When teams become highly cohesive they may become so alike in their views that they develop ''groupthink'' (Janis 1972; Paulus 1998). When groupthink occurs, teams tend to underestimate their competition, fail to adequately critique fellow team members' suggestions, fail to survey and appraise alternatives adequately, and fail to work out contingency plans. In addition, team pressures can distort judgments. Decisions may be based more on the persuasive abilities of dominant individuals or the power of majorities than on the quality of information and decisions. Research has found a tendency for group judgments to be more extreme than the average of individual members' predecision judgments (Isenberg 1986; McGrath 1984; Pruitt 1971). This may aid reaching a consensus, but it may be detrimental if judgments are poor.

Although evidence shows that highly cohesive groups are more satisfied with the group, high cohesiveness is not necessarily related to high productivity. Whether cohesiveness is related to performance depends on group norms and goals. If a group's norm is to be productive, cohesiveness

TABLE 3 Advantages and Disadvantages of Work Teams

Advantages	Disadvantages
Group members learn from one another	Lack of compatability of some individuals with group work
Possibility of greater workforce flexibility with cross-training	Additional need to select workers to fit group as well as job
Opportunity for synergistic combinations of ideas and abilities	Possibility some members will experience less-motivating jobs
New approaches to tasks may be discovered	Possible incompatibility with cultural, organizational, or labor–management norms
Social facilitation and arousal	Increased competition and conflict between groups
Social support for difficult tasks	More time consuming due to socializing coordination losses, and need for consensus
Increased communication and information exchange between team members	Inhibition of creativity and decision-making processes; possibility of groupthink
Greater cooperation among team members	Less powerful evaluation and rewards; social loafing or free-riding may occur
Beneficial for interdependent workflows	Less flexibility in cases of replacement, turnover, or transfer
Greater acceptance and understanding of decisions when team makes decisions	
Greater autonomy, variety, identity, significance, and feedback possible for workers	
Commitment to the group may stimulate performance and attendance	

TABLE 4 When to Design Jobs around Work Teams

1. Do the tasks require a variety of knowledge, skills, abilities such that combining individuals with different backgrounds would make a difference in performance?
2. Is cross-training desired? Would breadth of skills and work force flexibility be essential to the organization?
3. Could increased arousal, motivation, and effort to perform make a difference in effectiveness?
4. Can social support help workers deal with job stresses?
5. Could increased communication and information exchange improve performance rather than interfere?
6. Could increased cooperation aid performance?
7. Are individual evaluation and rewards difficult or impossible to make or are they mistrusted by workers?
8. Could common measures of performance be developed and used?
9. Would workers' tasks be highly interdependent?
10. Is it technologically possible to group tasks in a meaningful and efficient way?
11. Would individuals be willing to work in groups?
12. Does the labor force have the interpersonal skills needed to work in groups?
13. Would group members have the capacity and willingness to be trained in interpersonal and technical skills required for group work?
14. Would group work be compatible with cultural norms, organizational policies, and leadership styles?
15. Would labor–management relations be favorable to group job design?
16. Would the amount of time taken to reach decisions, consensus, and coordination not be detrimental to performance?
17. Can turnover be kept to a minimum?
18. Can groups be defined as a meaningful unit of the organization with identifiable inputs, outputs, and buffer areas that give them a separate identity from other groups?
19. Would members share common resources, facilities, or equipment?
20. Would top management support group job design?

Affirmative answers support the use of team work design.

will enhance productivity; however, if the norm is not one of commitment to productivity, cohesiveness can have a negative influence (Zajonc 1965; Stogdill 1972).

The use of teams and team-level rewards can also decrease the motivating power of evaluation and reward systems. If team members are not evaluated for their individual performance, do not believe that their output can be distinguished from the team's, or do not perceive a link between their own performance and their outcomes, free-riding or social loafing (Albanese and Van Fleet 1985; Cartwright 1968; Latane et al. 1979) can occur. In such situations, teams do not perform up to the potential expected from combining individual efforts.

Finally, teams may be less flexible in some respects because they are more difficult to move or transfer as a unit than individuals (Sundstrom et al. 1990). Turnover, replacements, and employee transfers may disrupt teams. And members may not readily accept new members.

Thus, whether work teams are advantageous or not depends to a great extent on the composition, structure, reward systems, environment, and task of the team. Table 4 presents questions that can help determine whether work should be designed around teams rather than individuals. The greater the number of questions answered in the affirmative, the more likely teams are to succeed and be beneficial. If one chooses to design work around teams, suggestions for designing effective work teams and avoiding problems are presented below.

4. IMPLEMENTATION ADVICE FOR JOB AND TEAM DESIGN

4.1. When to Consider Design and Redesign of Work

There are at least eight situations when design or redesign of work should be considered.

1. When starting up or building a new plant or work unit. This is the most obvious application of job design.
2. During innovation or technological change. Continual innovation and technological change are important for survival in most organizations. These changes in procedures and equipment mean there are changes in job design. This is not unique to manufacturing jobs. The introduction of

electronic equipment is changing many office jobs. Proper consideration of job design is needed to ensure that the innovations are successful.

3. When markets, products, or strategies change. Modern consumer and industrial markets change rapidly. To keep up with changing demands, organizations must often change marketing strategies and product line mixes. Such changes can affect many jobs throughout an organization and require redesign. For example, salespersons' territories, product line responsibilities, and compensation packages may need to be modified to reflect changing strategies. Production workers' jobs may also require redesign as styles and quantities of products change.
4. During reorganization. Reorganizations of management hierarchies and organizational units frequently mean changes in job assignments or responsibilities of many employees due to the creation and elimination of jobs. In order to ensure a successful reorganization, principles of proper job design must be considered.
5. During growth or downsizing. As an organization grows, new jobs are formed. These jobs are often designed haphazardly, reflecting a collection of tasks other employees do not have time to do. Likewise, during downsizing, jobs are eliminated and some tasks are included in other jobs. This can lead to unfavorable changes in the designs of the remaining jobs.
6. When jobs are needed for special positions or persons. Even existing organizations create new positions. Also, new persons may be hired to fill positions that have different backgrounds, skills, and capabilities than former employees. Both these situations may create a need to reevaluate job-design. For example, hiring handicapped workers may require that managers redesign jobs for them. Frequently, special jobs are also designed for newcomers to the organization, for special administrative assistants, or for temporary assignments.
7. When the workforce or labor markets change. Changing demographics, education levels, and economic conditions affecting employment levels can cause changes in the quality and size of the organization's labor force and labor markets from which the organization hires new workers. Jobs may need to be redesigned to fit a workforce whose average education level has increased over time, or physically demanding jobs may need to be redesigned to accommodate increasing numbers of older or female workers.
8. When there are performance, safety, or satisfaction problems. It is quite common for the employee to be blamed when there are problems with performance, safety, or satisfaction. In many of these instances, the job design is at least partly to blame. Several examples may illustrate this. Human error was named as the cause of the nearly catastrophic nuclear power plant incident at Three Mile Island noted previously, but the design of the operator's job might have been the actual cause. In a study of a wood products company (Campion and Thayer 1985), one sawmill job with multiple employees involved pulling two-by-fours off a moving belt and placing them in racks. The employees were described as lazy and apathetic. But examination of the job from a motivational design point of view revealed that it lacked variety and any significant skill requirements. It was unimportant, repetitive, and boring. It is no surprise that the employees were not motivated or satisfied. In that same study, a plywood plant required an employee to align strips of wood on a moving belt just before they entered the dryer. One time when dryer utilization was not up to standard, the supervisor concluded that the incumbent was negligent and gave her a written reprimand. But the job was very poorly designed from a biological perspective. The employee had to operate a foot pedal while standing and thus spent all day with most of the body weight on one foot. She also had to bend over constantly while extending her arms to adjust the strips of wood, resulting in biomechanical stresses on the back, arms, and legs. Everyone hated the job, yet the employee was blamed.

As a final example, the authors discovered that a personnel-recruiter job in a large company was in need of improved mechanistic design. The job involved running the engineering co-op program that consisted of hundreds of engineering students coming to the company and returning to school each semester. The recruiter had to match employees' interests with managers' needs, monitor everyone's unique schedule, keep abreast of the requirements of different schools, administer salary plans and travel reimbursement, and coordinate hire and termination dates. The job was completely beyond the capability of any recruiter. The solution involved having a team of industrial engineers study the job and apply the mechanistic approach to simplify tasks and streamline procedures.

It is clear that some types of jobs are naturally predisposed to be well designed on some job-design approaches and poorly designed on others. It may be in these latter regards that the greatest opportunities exist to benefit from job redesign. For example, many factory, service, and otherwise low-skilled jobs lend themselves well to mechanistic design, but the ideas of specialization and simplification of tasks and skill requirements can be applied to other jobs in order to reduce staffing difficulties and training requirements. Jobs can often be too complex or too large for employees,

leading to poor performance or excessive overtime. This is common with professional and managerial jobs, as was illustrated in the recruiter example above. Professional jobs are usually only evaluated in terms of the motivational approach to job design, but often they can be greatly improved by mechanistic design principles. Finally, if workload in an area temporarily rises without a corresponding increase in staffing levels, the mechanistic approach may be applied to the jobs to enhance efficiency.

Most managerial, professional, and skilled jobs are fairly motivational by their nature. Factory, service, and low-skilled jobs tend naturally not to be motivational. The latter clearly represent the most obvious examples of needed applications of the motivational approach. But there are many jobs in every occupational group, and aspects of almost every job, where motivational features are low. Application of motivational job-design is often limited only by the creativity of the designer.

Jobs involving the operation of complex machinery (e.g., aircraft, construction, and factory control rooms) are primary applications of the perceptual/motor approach. Likewise, many product-inspection and equipment-monitoring jobs can tax attention and concentration capabilities of workers. But jobs in many other occupations may also impose excessive attention and concentration requirements. For example, some managerial, administrative, professional, and sales jobs can be excessively demanding on the information-processing capabilities of workers, thus causing errors and stress. And nearly all jobs have periods of overload. Perceptual/motor design principles can often be applied to reduce these demands of jobs.

Traditional heavy industries (e.g., coal, steel, oil, construction, and forestry) represent the most obvious applications of the biological approach. Similarly, this approach also applies to many jobs that are common to most industries (e.g., production, maintenance) because there is some physical demands component. Biological design principles can be applied to physically demanding jobs so that women can better perform them (e.g., lighter tools with smaller hand grips). But there may also be applications to less physically demanding jobs. For example, seating, size differences, and posture are important to consider in the design of many office jobs, especially those with computer terminals. This approach can apply to many light-assembly positions that require excessive wrist movements that can eventually lead to the wrist ailment carpal tunnel syndrome. It should be kept in mind, however, that jobs designed with too little physical activity (i.e., movement restricted due to single position or workstation) should be avoided. Likewise, jobs that require excessive travel should be avoided because they can lead to poor eating and sleeping patterns.

4.2. Procedures to Follow

There are at least several general guiding philosophies that are helpful when designing or redesigning jobs:

1. As noted previously, designs are not fixed, unalterable, or dictated by the technology. There is at least some discretion in the design of all jobs and substantial discretion in most jobs.
2. There is no single best design for a given job, there are simply better and worse designs depending on one's job-design perspective.
3. Job design is iterative and evolutionary. It should continue to change and improve over time.
4. When possible, participation of the workers affected generally improves the quality of the resulting design and acceptance of suggested changes.
5. Related to number 4, the process aspects of the project are very important to success. That is, how the project is conducted is important in terms of involvement of all the parties of interest, consideration of alternative motivations, awareness of territorial boundaries, and so on.

As noted previously, surveys of industrial job designers have consistently indicated that the mechanistic approach represents the dominant theme of job design (Davis et al. 1955; Taylor 1979). Other approaches to job design, such as the motivational approach, have not been given as much explicit consideration. This is not surprising because the surveys only included job designers trained in engineering-related disciplines, such as industrial engineers and systems analysts. It is not necessarily certain that other specialists or line managers would adopt the same philosophies. Nevertheless, there is evidence that even fairly naive job designers (i.e., college students taking management classes) also seem to adopt the mechanistic approach in job-design simulations. That is, their strategies for grouping tasks were primarily similarity of functions or activities, and also similarity of skills, education, difficulty, equipment, procedures, or location (Campion and Stevens 1989). Even though the mechanistic approach may be the most natural and intuitive, this research has also revealed that people can be trained to apply all four of the approaches to job design.

4.2.1. Procedures for the Initial Design of Jobs or Teams

In consideration of process aspects of conducting a design project, Davis and Wacker (1982) have suggested a strategy consisting of four steps:

1. Form a steering committee. The steering committee usually consists of a group of high-level executives that have a direct stake in the new jobs. The purpose of this committee is fourfold: (a) to bring into focus the objective of the project, (b) to provide resources and support for the project, (c) to help gain the cooperation of all the parties affected by the project, and (d) to oversee and guide the project.
2. Form a design task force. The task force may include engineers, managers, job-design experts, architects, specialists, and others with knowledge or responsibility relevant to the project. The purpose of the task force is to gather data, generate and evaluate design alternatives, and help implement recommended designs.
3. Develop a philosophy statement. The first goal of the task force is to develop a philosophy statement to guide the many decisions that will be involved in the project. The philosophy statement is developed with considerable input from the steering committee and may include such factors as the purposes of the project, the strategic goals of the organization, assumptions about workers and the nature of work, process considerations, and so on.
4. Proceed in an evolutionary manner. The essential point here is that jobs should not be overspecified. With considerable input from eventual jobholders, the designs of the jobs will continue to change and improve over time.

4.2.2. Procedures for Redesigning Existing Jobs or Teams

According to Davis and Wacker (1982), the process of redesigning existing jobs is much the same as that of designing original jobs with two additions. First, the existing job incumbents must be involved. Second, more attention needs to be given to implementation issues. Most importantly, those involved in the implementation must feel ownership of the change. They should believe that the redesign represents their own interests and efforts. This is important not only so that they will be emotionally committed to the change and willing to put in the effort to make it happen, but also so that they will understand the details of the redesign so as to reduce inherent uncertainty.

Along with steps related to the process issues discussed above and in the previous subsection, a redesign project would also include the following five steps:

1. Measure the design of the existing job or team. A questionnaire methodology may be used as well as other analysis tools such as job analysis, time and motion study, and variance analysis. The goal is to gain a measure of the job as it currently exists.
2. Diagnose potential job- and team-design problems. Based partly on the measures collected in step 1, the job is analyzed for potential problems. The job/team-design task force and employee involvement are particularly important at this step. Focused group meetings are often a useful vehicle for identifying and evaluating potential problems.
3. Determine job- and team-design changes. These changes will be guided by the goals of the project, the problems identified in step 3, and one or more of the theoretical approaches to job and team design. Often several potential changes are generated and evaluated. Evaluation of alternative changes may consist of a consideration of the costs and benefits identified in previous research (see Table 1) and the opinions of engineers, managers, and employees. This may be the point when trade-offs become the most apparent.
4. Make the job- and team-design changes. Implementation plans should be developed in detail along with back-up plans in case there are a few difficulties with the new design. Communication and training are keys to successful implementation. Consideration might also be given to pilot testing the changes before widespread implementation is undertaken.
5. Conduct a follow-up evaluation of the new design. Evaluating the new design after implementation is probably the most neglected component of the process in most applications. Part of the evaluation might include the collection of job and team-design measurements on the redesigned job or team using the same instruments as in step 1. Evaluation may also be conducted on the outcomes from the redesign, such as employee satisfaction, error rates, and training times (e.g., Table 1). And it should be noted that some of the effects of job and team design are not always easy to demonstrate. Scientifically valid evaluations require experimental research strategies with control groups. Such studies may not always be possible in ongoing organizations, but often quasiexperimental and other field research designs are possible (Cook and Campbell 1979). Finally, the need for iterations and fine adjustments is identified through the follow-up evaluation.

4.3. Methods for Combining Tasks

In many cases, designing jobs or teams is largely a function of combining tasks. Generally speaking, most writing on job design has focused on espousing overall design philosophies or on identifying those dimensions of jobs (once the jobs exist) that relate to important outcomes, but little research has focused on how tasks should be combined to form jobs in the first place. Some guidance can be

gained by extrapolating from the specific design recommendations in Table 2. For example, variety in the motivational approach can be increased by simply combining different tasks into the same job.

Conversely, specialization from the mechanistic approach can be increased by including only very similar tasks in the same job. It is also possible when designing jobs to first generate alternative combinations of tasks, then evaluate them using the design approaches in Table 2.

A small amount of research within the motivational approach has focused explicitly on predicting the relationships between combinations of tasks and the design of resulting jobs (Wong 1989; Wong and Campion 1991). This research suggests that the motivational quality of a job is a function of three task-level variables.

1. Task design. The higher the motivational quality of the individual tasks, the higher the motivational quality of the job. Table 2 can be used to evaluate the individual tasks, then motivational scores for the individual tasks can be summed together. Summing is recommended rather than averaging because it includes a consideration of the number of tasks (Globerson and Crossman 1976). That is, both the motivational quality of the tasks and the number of tasks are important in determining the motivational quality of a job.
2. Task interdependence. Interdependence among the tasks has been shown to have an inverted-U relationship with the motivational quality of a job. That is, task interdependence is positively related to motivational value up to some moderate point; beyond that point, increasing interdependence leads to lower motivational value. Thus, when tasks are being combined to form motivational jobs, the total amount of interdependence among the tasks should be kept at a moderate level. Both complete independence among the tasks and excessively high interdependence should be avoided. Table 5 contains the dimensions of task interdependence and provides a questionnaire that can be used to measure interdependence. Table 5 can be used to judge the interdependence of each pair of tasks being evaluated for inclusion into a particular job.
3. Task similarity. Some degree of similarity among tasks may be the oldest rule of job-design (as discussed previously) and seems to have little influence on the motivational quality of the job. But beyond a moderate level, it tends to decrease the motivational value. Thus, when motivational jobs are being designed, high levels of similarity should be avoided. Similarity at the task pair level can be judged in much the same manner as interdependence by using a subset of the dimensions in Table 5 (see the note).

Davis and Wacker (1982 1987) have provided a list of criteria for grouping tasks into jobs. Part of their list is reproduced below. There are two points to notice. First, the list represents a collection of criteria from both the motivational approach to job-design (e.g., 1, 5, 9) as well as the mechanistic approach (e.g., 2, 8). Second, many of the recommendations could be applied to designing work for teams, as well as individual jobs.

1. Each set of tasks is a meaningful unit of the organization.
2. Task sets are separated by stable buffer areas.
3. Each task set has definite, identifiable inputs and outputs.
4. Each task set has associated with it definite criteria for performance evaluation.
5. Timely feedback about output states and feedforward about input states are available.
6. Each task set has resources to measure and control variances that occur within its area of responsibility.
7. Tasks are grouped around mutual cause–effect relationships.
8. Tasks are grouped around common skills, knowledge, or data bases.
9. Task groups incorporate opportunities for skill acquisition relevant to career advancement.

4.4. Individual Differences Among Workers

A common observation made by engineers and managers is that not all employees respond the same way to the same job. Some people on a given job have high satisfaction, while others on the very same job have low satisfaction. Some people seem to like all jobs, while others dislike every job. Clearly, there are individual differences in how people respond to their work.

There has been a considerable amount of research looking at individual differences in reaction to the motivational approach to job design. It has been found that some people respond more positively (e.g., are more satisfied) than others to highly motivational work. These differences were initially considered to be reflections of underlying work ethic (Hulin and Blood 1968), but later were viewed more generally as differences in needs for personal growth and development (Hackman and Oldham 1980).

TABLE 5 Dimensions of Task Interdependence

Instructions: Indicate the extent to which each statement is descriptive of the pair of tasks using the scale below. Circle answers to the right of each statement. Scores are calculated by averaging applicable items.

Please use the following scale:
(5) Strongly agree
(4) Agree
(3) Neither agree nor disagree
(2) Disagree
(1) Strongly disagree
( ) Leave blank if do not know or not applicable

Inputs of the Tasks					
1. *Materials/supplies:* One task obtains, stores, or prepares the materials or supplies to perform the other task.	1	2	3	4	5
2. *Information:* One task obtains or generates information for the other task.	1	2	3	4	5
3. *Product/service:* One task stores, implements, or handles the products or services produced by the other task.	1	2	3	4	5
Processes of the Task					
4. *Input–output* relationship: The products (or outputs) of one task are the supplies (or inputs) necessary to perform the other task.	1	2	3	4	5
5. *Method and procedure:* One task plans the procedures or work methods for the other task.	1	2	3	4	5
6. *Scheduling:* One task schedules the activities of the other task.	1	2	3	4	5
7. *Supervision:* One task reviews or checks the quality of products or services produced by the other task.	1	2	3	4	5
8. *Sequencing:* One task needs to be performed before the other task.	1	2	3	4	5
9. *Time sharing:* Some of the work activities of the two tasks must be performed at the same time.	1	2	3	4	5
10. *Support service:* The purpose of one task is to support or otherwise help the other task be performed.	1	2	3	4	5
11. *Tools/equipment:* One task produces or maintains the tools or equipment used by the other task.	1	2	3	4	5
Outputs of the Tasks					
12. *Goal:* One task can only be accomplished when the other task is properly performed.	1	2	3	4	5
13. *Performance:* How well one task is performed has a great impact on how well the other task can be performed.	1	2	3	4	5
14. *Quality:* The quality of the product or service produced by one task depends on how well the other task is performed.					

Adapted from Wong and Campion (1991). The task similarity measure contains 10 comparable items (excluding items 4, 6, 8, 9, and 14 and including an item on customer/client).

Using the broader notion of preferences/tolerances for types of work, the consideration of individual differences has been expanded to all four approaches to job design (Campion 1988; Campion and McClelland 1991). Table 6 provides a set of rating scales that can be used with job incumbents to determine their preferences/tolerances. These scales can be administered in the same manner as the questionnaire measures of job design discussed previously.

Although a consideration of employee differences is strongly encouraged, in many situations there are limits to which such differences can be accommodated. As examples, many jobs have to be designed for groups of people that may differ in their preferences/tolerances, often jobs need to be designed without knowledge of the future workers, and the workers on a job may change over time. Fortunately, even though the cumulative evidence is that individual differences moderate reactions to the motivational approach (Loher et al. 1985) the differences are of degree, not direction. In other words, some people respond more positively than others to motivational work, but very few respond negatively. It is likely that this also applies to the other approaches to job design.

TABLE 6 Preferences/Tolerances for Types of Work

Instructions: Indicate the extent to which each statement is descriptive of the job incumbent's preferences and tolerances for types of work on the scale below. Circle answers to the right of each statement. Scores are calculated by averaging applicable items.

Please use the following scale:
(5) Strongly agree
(4) Agree
(3) Neither agree nor disagree
(2) Disagree
(1) Strongly disagree
( ) Leave blank if do not know or not applicable

Preferences/Tolerances for Mechanistic Design					
I have a high tolerance for routine work.	1	2	3	4	5
I prefer to work on one task at a time.	1	2	3	4	5
I have a high tolerance for repetitive work.	1	2	3	4	5
I prefer work that is easy to learn.	1	2	3	4	5
Preferences/Tolerances for Motivational Design					
I prefer highly challenging work that taxes my skills and abilities.	1	2	3	4	5
I have a high tolerance for mentally demanding work.	1	2	3	4	5
I prefer work that gives a great amount of feedback as to how I am doing.	1	2	3	4	5
I prefer work that regularly requires the learning of new skills.	1	2	3	4	5
I prefer work that requires me to develop my own methods, procedures, goals, and schedules.	1	2	3	4	5
I prefer work that has a great amount of variety in duties and responsibilities	1	2	3	4	5
Preferences/Tolerances for Perceptual/Motor Design					
I prefer work that is very fast paced and stimulating.	1	2	3	4	5
I have a high tolerance for stressful work.	1	2	3	4	5
I have a high tolerance for complicated work.	1	2	3	4	5
I have a high tolerance for work where there are frequently too many things to do at one time.	1	2	3	4	5
Preferences/Tolerances for Biological Design					
I have a high tolerance for physically demanding work.	1	2	3	4	5
I have a fairly high tolerance for hot, noisy, or dirty work.	1	2	3	4	5
I prefer work that gives me some physical exercise.	1	2	3	4	5
I prefer work that gives me some opportunities to use my muscles.	1	2	3	4	5

Adapted from Campion (1988). See reference for reliability and validity information. Interpretations differ slightly across the scales. For the mechanistic and motivational designs, higher scores suggest more favorable reactions from incumbents to well designed jobs. For the perceptual/motor and biological approaches, higher scores suggest less unfavorable reactions from incumbents to poorly designed jobs.

4.5. Some Basic Decisions

Hackman and Oldham (1980) have provided five strategic choices that relate to implementing job redesign. They note that little research exists indicating the exact consequences of each choice and that correct choices may differ by organization. The basic decisions are given below:

1. Individual vs. group designs for work. A key initial decision is to either enrich individual jobs or create self-managing work teams. This also includes consideration of whether any redesign should be undertaken and its likelihood of success.
2. Theory-based vs. intuitive changes. This choice was basically defined as the motivational (theory) approach vs. no particular (atheoretical) approach. In the present chapter, this choice may be better framed as choosing among the four approaches to job design. However, as argued earlier, consideration of only one approach may lead to some costs or additional benefits being ignored.
3. Tailored vs. broadside installation. The choice here is between tailoring the changes to the individual employee or making the changes for all employees in a given job.
4. Participative vs. top-down change processes. The most common orientation, and that of this chapter, is that participative is best. However, there are costs to participation, including the

time commitment involved and the fact that incumbents may lack needed broader knowledge of the business.

5. Consultation vs. collaboration with stakeholders. The effects of job-design changes often extend far beyond the individual incumbent and department. For example, the output from the job may be an input to another job elsewhere in the organization, and the presence of a union always constitutes another interested party. Depending on many considerations, participation of stakeholders may range from no involvement to consultation to full collaboration.

4.6. Overcoming Resistance to Change

Resistance to change can be a problem in any project involving major change. Failure rates of implementations demonstrate a need to give more attention to the human aspects of change projects. It has been estimated that between 50% and 75% of newly implemented manufacturing technologies in the United States have failed, with a disregard for human and organizational issues considered to be a bigger cause of failure than technical problems (Majchrzak 1988; Turnage 1990). The number one obstacle to implementation was considered to be resistance to change (Hyer 1984).

Guidelines for reducing resistance to change include the following (Gallagher and Knight 1986; Majchrzak 1988; Turnage 1990):

1. Involve workers in planning the change. Workers should be informed in advance of changes and involved in the process of diagnosing problems and developing solutions because resistance is reduced when workers participate and feel the project is their own.
2. Top management should visibly support the change. When workers feel managers are not committed, they are less likely to take a project seriously.
3. Create change that is consistent with workers' needs and existing values. Resistance is less if change is seen to reduce burdens, offer interesting experience, and not threaten workers' autonomy or security. Workers need to see advantages to them of their involvement in the change.
4. Create an environment of open, supportive communication. If participants experience support and trust, there will be less resistance. Misunderstandings and conflicts should be expected as natural to the innovation process. Adequate provision should be made for clarification and communication.
5. Allow for flexibility. Resistance is reduced if a project is open to revision and reconsideration based on experience.

5. MEASUREMENT AND EVALUATION OF JOB AND TEAM DESIGN

5.1. Using Questionnaires to Evaluate Job and Team Design

One easy and versatile way to measure job design is by using questionnaires or checklists. Job design can then be defined from an operational point of view as "a set of dimensions of jobs that can be used to describe all jobs, regardless of job content, which influence a wide range of benefits and costs for both the organization and the employee." This method of measuring job-design is also highlighted because it has been used widely in research on job design, especially on the motivational approach.

Several questionnaires exist for measuring the motivational approach to job design (Hackman and Oldham 1980; Sims et al. 1976). Only one questionnaire has been developed that measures all four approaches to job design. A version of that questionnaire is presented in Table 2. It is called the multimethod job-design questionnaire (MJDQ) because of its interdisciplinary emphasis. It yields an evaluation of the quality of a job's design based on each of the four approaches. Table 2 also includes a rating scale so that it can simply be copied and used without being retyped.

Table 7 presents a scale that can be used to measure team-design characteristics. It can be used to evaluate input and process characteristics of teams. Background information and examples of the use of this measure can be found by Campion et al. (1993 1996).

Questionnaires may be used in several different contexts:

1. When designing new jobs. When a job does not yet exist, the questionnaire is used to evaluate proposed job descriptions, workstations, equipment, and so on. In this role, it often serves as a simple design checklist.
2. When redesigning existing jobs. When a job exists, there is a much greater wealth of information. Questionnaires can be completed by incumbents, managers, and engineers. Questionnaires can be used to measure job design before and after changes are made and to evaluate proposed changes.

TABLE 7 Team-Design Measure

Instructions: This questionnaire contains statements about your team and how your team functions as a group. Please indicate the extent to which each statement describes your team by circling a number to the right of each statement.

Please use the following scale:
(5) Strongly agree
(4) Agree
(3) Neither agree nor disagree
(2) Disagree
(1) Strongly disagree
( ) Leave blank if do not know or not applicable

Self-Management					
1. The members of my team are responsible for determining the methods, procedures, and schedules with which the work gets done.	1	2	3	4	5
2. My team, rather than my manager, decides who does what tasks within the team.	1	2	3	4	5
3. Most work-related decisions are made by the members of my team rather than by my manager.	1	2	3	4	5
Participation					
4. As a member of a team, I have a real say in how the team carries out its work.	1	2	3	4	5
5. Most members of my team get a chance to participate in decision making.	1	2	3	4	5
6. My team is designed to let everyone participate in decision making.	1	2	3	4	5
Task Variety					
7. Most members of my team get a chance to learn the different tasks the team performs.	1	2	3	4	5
8. Most everyone on my team gets a chance to do the more interesting tasks.	1	2	3	4	5
9. Task assignments often change from day to day to meet the workload needs of the team.	1	2	3	4	5
Task Significance (Importance)					
10. The work performed by my team is important to the customers in my area.	1	2	3	4	5
11. My team makes an important contribution to serving the company's customers.	1	2	3	4	5
12. My team helps me feel that my work is important to the company,	1	2	3	4	5
Task Identity (Mission)					
13. The team concept allows all the work on a given product to be completed by the same set of people.	1	2	3	4	5
14. My team is responsible for all aspects of a product for its area.	1	2	3	4	5
15. My team is responsible for its own unique area or segment of the business.	1	2	3	4	5
Task Interdependence					
16. I cannot accomplish my tasks without information or materials from other members of my team.	1	2	3	4	5
17. Other members of my team depend on me for information or materials needed to perform their tasks.	1	2	3	4	5
18. Within my team, jobs performed by team members are related to one another.	1	2	3	4	5
19. My work goals come directly from the goals of my team.	1	2	3	4	5
20. My work activities on any given day are determined by my team's goals for that day.	1	2	3	4	5
21. I do very few activities on my job that are not related to the goals of my team.	1	2	3	4	5
Interdependent Feedback and Rewards					
22. Feedback about how well I am doing my job comes primarily from information about how well the entire team is doing.	1	2	3	4	5
23. My performance evaluation is strongly influenced by how well my team performs.	1	2	3	4	5
24. Many rewards from my job (pay, promotion, etc.) are determined in large part by my contributions as a team member.	1	2	3	4	5

TABLE 7 (*Continued*)

Heterogeneity (Membership)					
25. The members of my team vary widely in their areas of expertise.	1	2	3	4	5
26. The members of my team have a variety of different backgrounds and experience.	1	2	3	4	5
27. The members of my team have skills and abilities that complement each other.	1	2	3	4	5
Flexibility					
28. Most members of my team know each other's jobs.	1	2	3	4	5
29. It is easy for the members of my team to fill in for one another.	1	2	3	4	5
30. My team is very flexible in terms of membership.	1	2	3	4	5
Relative Size					
31. The number of people in my team is too small for the work to be accomplished. (Reverse score)	1	2	3	4	5
Preference for Team Work					
32. If given the choice, I would prefer to work as part of a team than work alone.	1	2	3	4	5
33. I find that working as a member of a team increased my ability to perform effectively.	1	2	3	4	5
34. I generally prefer to work as part of a team.	1	2	3	4	5
Training					
35. The company provides adequate technical training for my team.	1	2	3	4	5
36. The company provides adequate quality and customer service training for my team.	1	2	3	4	5
37. The company provides adequate team skills training for my team (communication, organization, interpersonal relationships, etc.).	1	2	3	4	5
Managerial Support					
38. Higher management in the company supports the concept of teams.	1	2	3	4	5
39. My manager supports the concept of teams.	1	2	3	4	5
Communication/Cooperation between Work Groups					
40. I frequently talk to other people in the company besides the people on my team.	1	2	3	4	5
41. There is little competition between my team and other teams in the company.	1	2	3	4	5
42. Teams in the company cooperate to get the work done.	1	2	3	4	5
Potency (Team Spirit)					
43. Members of my team have great confidence that the team can perform effectively.	1	2	3	4	5
44. My team can take on nearly any task and complete it.	1	2	3	4	5
45. My team has a lot of team spirit.	1	2	3	4	5
Social Support					
46. Being in my team gives me the opportunity to provide support to other team members.	1	2	3	4	5
47. My team increases my opportunities for positive social interaction.	1	2	3	4	5
48. Members of my team help each other out at work when needed.	1	2	3	4	5
Workload Sharing					
49. Everyone on my team does their fair share of the work.	1	2	3	4	5
50. No one in my team depends on other team members to do their work for them.	1	2	3	4	5
51. Nearly all the members of my team contribute equally to the work.	1	2	3	4	5
Communication/Cooperation with the Work Group					
52. Members of my team are very willing to share information with other team members about our work.	1	2	3	4	5
53. Teams enhance the communications among people working on the same product.	1	2	3	4	5
54. Members of my team cooperate to get the work done.	1	2	3	4	5

Adapted from Campion et al. (1993). Scores for each preference/tolerance are calculated by averaging applicable items. Adapted with permission of Personnel Psychology, Inc.

3. When diagnosing problem jobs. When problems occur, regardless of the apparent source of the problem, the job-design questionnaire can be used as a diagnostic device to determine whether any problems exist with the design of the jobs.

The administration of questionnaires can be conducted in a variety of ways. Employees can complete them individually at their convenience at their workstation or some other designated area, or they can complete them in a group setting. Group settings allow greater standardization of instructions and provide the opportunity to answer questions and clarify ambiguities. Managers and engineers can also complete the questionnaires either individually or in a group session. Engineers and analysts usually find that observation of the job site, examination of the equipment and procedures, and discussions with any incumbents or managers are important methods of gaining information on the job before completing the questionnaires.

Scoring for each job-design approach is usually accomplished by simply averaging the applicable items. Then the scores from different incumbents, managers, or engineers are combined by averaging (Campion 1988; Campion and McClelland 1991). The implicit assumption is that slight differences among respondents are to be expected because of legitimate differences in viewpoint. However, the absolute differences in scores should be examined on an item-by-item basis, and large discrepancies (e.g., more than one point) should be discussed to clarify possible differences in interpretation. It is often useful to discuss each item until a consensus group rating is reached.

The higher the score on a particular job-design scale, the better the quality of the design of the job based on that approach. Likewise, the higher the score on a particular item, the better the design of the job on that dimension. How high a score is needed or necessary cannot be stated in isolation. Some jobs are naturally higher or lower on the various approaches as described previously, and there may be limits to the potential of some jobs. The scores have most value in comparing jobs or alternative job designs rather than evaluating the absolute level of the quality of job design. However, a simple rule of thumb is that if the score for an approach is smaller than three, the job is poorly designed on that approach and should be reconsidered. Even if the average score on an approach is greater than three, examine any individual item scores that are at two or one.

5.2. Choosing Sources of Data

1. Incumbents. Incumbents are probably the best source of information if there is an existing job. In the area of job analysis, incumbents are considered subject matter experts on the content of their jobs. Also, having input into the job design can enhance the likelihood that suggested changes will be accepted. Involvement in such work-related decisions can enhance feelings of participation, thus increasing motivational job design in itself (see item 22 of the motivational scale in Table 2). One should include a large number of incumbents for each job because there can be slight differences in perceptions of the same job due to individual differences. Evidence suggests that one should include all incumbents or at least 10 incumbents for each job (Campion 1988; Campion and McClelland 1991).
2. Managers or supervisors. First-level managers or supervisors may be the next-most knowledgeable persons about an existing job. They may also provide information on jobs under development if they have insight into the jobs through involvement in the development process. Differences in perceptions of the same job among managers should be smaller than among incumbents, but slight differences will exist and multiple managers should be used. Evidence suggests that one should include all managers with knowledge of the job or at least three to five managers for each job (Campion 1988; Campion and McClelland 1991).
3. Engineers or analysts. Engineers, if the job has not been developed yet, may be the only source of information because they are the only ones with insight into what the job will eventually look like. But also for existing jobs, an outside perspective by an engineer, analyst, or consultant may provide a more objective viewpoint. Again, there can be small differences among engineers, so at least two to five should evaluate each job (Campion and Thayer 1985; Campion and McClelland 1991).

5.3. Evaluating Long-Term Effects and Potential Biases

It is important to recognize that some of the effects of job design may not be immediate, others may not be long lasting, and still others may not be obvious. The research has not tended to address these issues directly. In fact, these effects are offered here as potential explanations for some of the inconsistent findings in the literature. The purpose is to simply put the reader on the alert for the possibility of these effects.

Initially when jobs are designed and employees are new, or right after jobs are redesigned, there may be a short-term period of positive attitudes (often called a ''honeymoon effect''). As the legendary Hawthorne studies indicated, often changes in jobs or increased attention given to workers tends to create novel stimulation and positive attitudes (Mayo 1933). Such transitory elevations in affect should not be mistaken for long-term improvements in satisfaction, as they may wear off over

time. In fact, with time the employees may realize that the job is now more important or bigger and should require higher compensation (Campion and Berger 1990). These are only examples to illustrate how dissipating and lagged effects might occur.

Likely candidates for costs that may lag in time include compensation, as noted. Stress and fatigue may also take a while to build up if a job's mental demands have been increased excessively, and boredom may take a while to set in after a job's mental demands have been overly decreased. In terms of lagged benefits, productivity and quality are likely to improve with practice and learning on the new job. And some benefits, like reduced turnover, simply take a period of time to estimate accurately.

Benefits that may potentially dissipate with time include satisfaction, especially if the elevated satisfaction is a function of novelty rather than basic changes to the motivating value of the job. Short-term increases in productivity due to heightened effort rather than better design may not last over time. Costs that may dissipate include the training requirements and staffing difficulties. Once the jobs are staffed and everyone is trained, these costs disappear until turnover occurs. So these costs will not go away completely, but they may be less after initial start-up. Dissipating heightened satisfaction but long-term increases in productivity were observed in a recent motivational job-redesign study (Griffin 1989).

Another potential effect that may confuse the proper evaluation of the benefits and costs of job-design is spillover. Laboratory research has shown that job satisfaction can bias employees' perceptions of the motivational value of their jobs (O'Reilly et al. 1980). Likewise, the level of morale in the organization can have a spillover effect onto employees' perceptions of job design in applied settings. If morale is particularly high, it may have an elevating effect on how employees view their jobs; conversely, low morale may have a depressing effect on employees' views. The term *morale* refers to the general level of job satisfaction across employees, and it may be a function of many factors, including management, working conditions, and wages. Another factor included that has an especially strong effect on employee reactions to job-design changes is employment security. Obviously, employee enthusiasm for job-design changes will be negative if they view them as potentially decreasing their job security, and every effort should be made to eliminate these fears. The best method of addressing these effects is to be attentive to their potential existence and conduct longitudinal evaluations of job design.

5.4. Example of an Evaluation of a Job Design

One study is briefly described here as an illustration of a job-redesign project (Campion and McClelland 1991). It best illustrates the evaluation component of redesign and the value of considering both potential benefits and costs, rather than the implementation and process components of redesign. The setting was a large financial services company. The unit under study processed the paperwork in support of other units that sold the company's products. Jobs were designed in a mechanistic manner in that separate employees prepared, sorted, coded, computer keyed, and performed other specific functions on the paper flow.

The organization viewed the jobs as perhaps too mechanistically designed. Guided by the motivational approach, the project intended to enlarge jobs by combining existing jobs. In so doing, the organization hoped to attain three objectives. First, larger jobs might enhance motivation and satisfaction of employees. Second, larger jobs might increase incumbent feelings of ownership of the work, thus increasing customer service. Third, management recognized that there might be potential costs of enlarged jobs in terms of lost efficiency, and thus every attempt was made to maintain (i.e., avoid decreased) productivity.

As indicated by the third objective, the study considered the consequences of the redesign in terms of all approaches to job design. It was anticipated that the project would increase motivational consequences, decrease mechanistic and perceptual/motor consequences, and have no effect on biological consequences (Table 1).

The evaluation consisted of collecting detailed data on job design and a broad spectrum of potential benefits and costs of enlarged jobs. The research strategy involved comparing several varieties of enlarged jobs with each other and with unenlarged jobs. Questionnaire data were collected and focus group meetings were conducted with incumbents, managers, and analysts. The study was repeated at five different geographic sites.

Results indicated that enlarged jobs had the benefits of more employee satisfaction, less boredom, better quality, and better customer service; but they also had the costs of slightly higher training, skill, and compensation requirements. Another finding was that all the potential costs of enlarging jobs were not observed, suggesting that redesign can lead to benefits without incurring every cost in a one-to-one fashion. Finally, the study revealed several improvements to the enlarged jobs.

5.5. Example of an Evaluation of a Team Design

This illustration demonstrates the use of multiple sources of data and multiple types of team-effectiveness outcomes. The setting was the same financial services company as in the job-design

evaluation above. Questionnaires based on Table 7 were administered to 391 clerical employees and 70 managers on 80 teams (Campion et al. 1993) and to 357 professional workers on 60 teams (Campion et al. 1996) to measure teams' design characteristics. Thus, two sources of data were used, both team members and managers, to measure the team-design characteristics.

In both studies, effectiveness outcomes included the organization's satisfaction survey, which had been administered at a different time than the team-design characteristics questionnaire, and managers' judgments of team effectiveness. In the first study, several months of records of teams' productivity were also used to measure effectiveness. In the second study, employees' judgments of team effectiveness, managers' judgments of team effectiveness measured three months after the first managers' judgements measure, and the average of team members' most recent performance ratings were also used as outcome measures.

Results indicated that all of the team-design characteristics had positive relationships with at least some of the outcomes. Relationships were strongest for process characteristics. Results also indicated that when teams were well designed according to the team-design approach, they were higher on both employee satisfaction and team-effectiveness ratings.

One final cautionary note regarding evaluation. Different sources (e.g., incumbents, managers) provide different perspectives and should always be included. Collecting data from a single source could lead one to draw different conclusions about a project than if one obtains a broader picture of results by using multiple sources of data.

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