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CHAPTER 14

JOB AND TEAM DESIGN

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14.1 INTRODUCTION

14.1.1 Job Design

Job design is an aspect of managing organizations that is so commonplace it often goes unnoticed. Most people realize the importance of job design when an organization or new plant is starting up, and some recognize the importance of job design when organizations are restructuring or changing processes. But fewer people realize that job design may be affected as organizations change markets or strategies, managers use their discretion in the assignment of tasks on a daily basis, people in the jobs or their managers change, the work force or labor markets change, or there are performance, safety, or satisfaction problems. Fewer yet realize that job design change can be used as an intervention to enhance organizational goals (Campion and Medsker, 1992).

It is clear that many different aspects of an organization influence job design, especially an organization's structure, technology, processes, and environment. These influences are beyond the scope of this chapter, but they are dealt with in other references (e.g., Davis, 1982; Davis and Wacker, 1982; see also Chapter 18). These influences impose constraints on how jobs are designed and will play a major role in any practical application. However, it is the assumption of this chapter that considerable discretion exists in the design of jobs in most situations, and the job (defined as a set of tasks performed by a worker) is a convenient unit of analysis in both developing new organizations or changing existing ones (Campion and Medsker, 1992).

The importance of job design lies in its strong influence on a broad range of important efficiency and human resource outcomes. Job design has predictable consequences for outcomes including the following (Campion and Medsker, 1992):

productivity
- quality
- job satisfaction
- training times
- 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

According to Louis Davis, one of the most prolific writers on job design in the engineering literature over the last 35 years, many of the personnel and productivity problems in industry may be the direct result of the design of jobs (Davis, 1957; Davis, Canter and Hoffman, 1955; Davis and Taylor, 1979; Davis and Valfer, 1965; Davis and Wacker, 1982, 1987). Unfortunately, people mistakenly view the design of jobs as technologically determined and inalterable. However, job designs are actually social inventions. They 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 theories of human motivation (Steers and Mowday, 1977; Warr and Wall, 1975). These values, and the designs they influence, are not immutable givens, but are subject to modification (Campion and Medsker, 1992; Campion and Thayer, 1985).

The question then becomes: What is the best way to design a job? In fact, there is no single best way. There are several major approaches to job design, each derived from a different discipline and reflecting different theoretical orientations and values. This chapter describes these approaches, their costs and benefits, and tools and procedures for developing and assessing jobs in all types of organizations. It highlights trade-offs which must be made when choosing among different approaches to job design. This chapter also compares the design of jobs for individuals working independently to the design of work for teams, which is an alternative to designing jobs at the level of individual workers. This chapter presents the advantages and disadvantages of designing work around individuals compared to designing work for teams and provides advice on implementing and evaluating the different work design approaches.

14.1.2 Team Design

The major approaches to job design typically focus on designing jobs for individual workers. However, the approach to work design at the level of the group or team, rather than at the level of individual workers, is gaining substantially in popularity, and many U.S. organizations are experimenting with teams (Guzzo and Shea, 1992; Hoerr, 1989; Majchrzak, 1988). New manufacturing systems (e.g., flexible, cellular) and advancements in our understanding of team processes not only allow designers to consider the use of work teams, but often seem to encourage 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 team of workers, rather than to an individual, and considers the team to be the primary unit of performance. Objectives and rewards focus on team, not individual, behavior. Depending on the nature of its 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 can be assigned on the basis of expertise or interest, or team members might rotate from

one subtask to another to provide variety and increase breadth of skills and flexibility in the work force (Campion and Medsker, 1992; Campion, Cheraskin, and Stevens, 1994).

Some tasks are of a size, complexity, or, otherwise seem to naturally fit 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 one organizes work around teams or individuals. In such situations, the designer should consider advantages and disadvantages of the use of the job and team design approaches with respect to an organization's goals, policies, technologies, and constraints (Campion, Medsker, and Higgs, 1993).

14.2 JOB DESIGN APPROACHES

This chapter adopts an interdisciplinary perspective on job design. Interdisciplinary research on job design has shown that different approaches to job design exist. Each is oriented toward a particular subset of outcomes, each has disadvantages as well as advantages, and trade-offs among approaches are required in most job design 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. Table 14.1 summarizes the job design approaches and Table 14.2 provides specific recommendations. The team design approach is reviewed in Section 14.3.

14.2.1 Mechanistic Job Design Approach

14.2.1.1 Historical Development

The historical roots of job design can be traced back to the idea of the division of labor, which was very important to early thinking on the economies of manufacturing (Babbage, 1835; Smith, 1776). Division of labor led to job designs characterized by specialization and simplification. Jobs designed in this fashion had many advantages, including reduced learning time, saved time from not having to change tasks or tools, increased proficiency from repeating tasks, and development of specialized tools and equipment.

A very influential person for this perspective was Frederick Taylor (Taylor, 1911; Hammond, 1971). He explicated the principles of scientific management which encouraged the study of jobs to determine the "one best way" to perform each task. Movements of skilled workmen 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 the same way. Standard performance levels were set, and incentive pay was tied to the standards. Gilbreth also contributed to this design approach (Gilbreth, 1911). With time and motion study, he tried to eliminate wasted movements 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 has been the prevailing practice throughout this century (Davis et al., 1955; Taylor, 1979). These characteristics are also the primary focus of many modern day writers on job design (e.g., Mundel, 1985; Niebel, 1988). The discipline base for this approach is early or "classic" industrial engineering.

14.2.1.2 Design Recommendations

Table 14.2 provides a brief list of statements which 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 assigned to different employees. The tasks should be simplified so 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.

14.2.1.3 Advantages and Disadvantages

The goal of this approach is to maximize efficiency, both in terms of productivity and utilization of human resources. Table 14.1 summarizes some human resource advantages and disadvantages that have been observed in 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. Disadvantages include the

Table 14.1 Advantages and Disadvantages of Different Job Design Approaches

APPROACH/Discipline Base (example references)	Illustrative Recommendations	Illustrative Advantages	Illustrative Disadvantages
MECHANISTIC/Classic Industrial Engineering (Gilbreth, 1911; Niebel, 1988; Taylor, 1911)	Increase in specialization simplification repetition automation Decrease in 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 in 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 staffing difficulty making errors mental overload and fatigue stress mental skills and abilities compensation
PERCEPTUAL-MOTOR/ Experimental Psychology, Human Factors (Salvendy, 1987; Sanders and McCormick, 1987)	Increase in lighting quality display and control quality user-friendly equipment Decrease in information processing requirements	Decrease in making errors accidents mental overload and fatigue stress training 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 in seating comfort postural comfort Decrease in strength requirements endurance requirements environmental stressors	Decrease in physical abilities physical fatigue aches and pains medical incidents	Increase in financial cost inactivity

Note: Advantages and disadvantages based on findings in previous interdisciplinary research (Campion, 1988, 1989; Campion and McClelland, 1991, 1993; Campion and Thayer, 1985). Table adopted from Campion and [illegible]

Table 14.2 Multimethod Job Design Questionnaire

(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.

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 co-workers, 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 co-worker 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

Table 1 (*Continued*)

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
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 work place 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. Work place layout: The work place 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

Table 14.2 (*Continued*)

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 work place 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 work place is free from excessive noise.	1	2	3	4	5
45. Climate: The climate at the work place 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 work station add:					
48. Exercise opportunities: During the day, there are enough opportunities to get up from the work station 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, foot rests if needed, proper keyboard or work surface height, etc.).	1	2	3	4	5

Source: Table adopted from Campion (1988). See supporting reference and related research (e.g., Campion and McClelland, 1991, 1993; Campion and Thayer, 1985) for reliability and validity information. Scores for each approach are calculated by averaging applicable items.

Table 1. Team Design Measure

Instructions: This questionnaire consists of 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

Table 14.3 (*Continued*)

Task Interdependence (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
Goal Interdependence (Goals)					
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 (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
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 experiences.	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 (Member 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 (Size)					
31. The number of people in my team is too small for the work to be accomplished. (Reverse scored)	1	2	3	4	5
Preference for Team Work (Team Work Preferences)					
32. If given the choice, I would prefer to work as part of a team rather than work alone.	1	2	3	4	5
33. I find that working as a member of a team increases 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

Table (Continued)

Training					
35. The company provides adequate technical training for my team.	1	2	3	4	
36. The company provides adequate quality and customer service training for my team.	1	2	3	4	
37. The company provides adequate team skills training for my team (communication, organization, interpersonal, etc.).	1	2	3	4	
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 (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 work in a team and 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 (Sharing the Work)					
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 the 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 within 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

Source: Table adopted from Campion, Medsker, and Higgs (1993). See reference and related research (Campion, Papper, and Medsker, 1995) for reliability and validity information. Scores for each preference/tolerance are calculated by averaging applicable items.

fact that extreme use of the mechanistic approach may result in jobs so simple and routine that employees experience low job satisfaction and motivation. Overly mechanistic, repetitive work can lead to health problems such as repetitive motion disorders.

14.2.2 Motivational Job Design Approach

14.2.2.1 Historical Development

Encouraged by the human relations movement of the 1930s (Hoppock, 1935; Mayo, 1933) people began to point out the negative effects on worker attitudes and health of the overuse of mechanistic design (Argyris, 1964; Blauner, 1964). Overly specialized, simplified jobs were found to lead to dissatisfaction (Caplan, Cobb, French, Van Harrison, and Pinneau, 1975) and adverse physiological consequences for workers (Johansson, Aronsson, and Lindstrom, 1978; Weber, Fussler, O'Hanlon, Gierer, and Grandjean, 1980). 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 employees' psychological needs.

The first efforts to enhance the meaningfulness of jobs involved the 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 trend expanded into a pursuit of identifying and validating characteristics of jobs that make them motivating and satisfying (Griffin, 1982; Hackman & Oldham, 1980; Turner & Lawrence, 1965) This approach considers the psychological theories of work motivation (e.g., Steers and Mowday, 1977; Vroom, 1964) thus this "motivational" approach 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 (Emory and Trist, 1960; Pasmore, 1988; Rousseau, 1977). It focuses not only on the work, but also on the technology itself and the relationship of the environment to work and organizational design. Interest is less on the job, and more on roles and systems. Keys to this approach are work system and job designs which fit their external environment and the joint optimization of both social and technical systems in the organization's internal environment. Though this approach differs somewhat in that consideration is also given to the technical system and external environment, it is similar in that it draws on the same psychological job characteristics which affect satisfaction and motivation. It suggests that as organizations' environments are becoming increasingly turbulent and complex, organizational and job design should involve greater flexibility, employee involvement, employee training, and decentralization of decision making and control, and a reduction in hierarchical structures and the formalization of procedures and relationships (Pasmore, 1988).

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 engineering and systems analysis. It is not necessarily certain that other specialists or line managers would adopt the same philosophies, especially in recent times. Nevertheless, there is evidence that even fairly naive job designers (i.e., college students in management classes) also adopt the mechanistic approach in job design simulations. That is, their strategies for grouping tasks were primarily the similarity of such factors as activities, skills, equipment, procedures, or location. 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 approaches to job design (Campion and Stevens, 1991).

14.2.2.2 Design Recommendations

Table 14.2 provides a list of statements which describe recommendations for the motivational approach. It suggests a job should allow a worker autonomy to make decisions about how and when tasks are to be done. A worker should feel his or her work is important to the overall mission of the organization or department. This is often done by allowing a 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 workers from the task itself, as well as from the supervisor and others. Workers should be able to use a variety of skills and to personally grow on the job. This approach also considers the

social, people-interaction, aspects of the job: 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.

14.2.2.3 Advantages and Disadvantages

The goal of this approach is to enhance psychological meaningfulness of jobs, thus influencing a variety of attitudinal and behavioral outcomes. Table 14.1 summarizes some of the advantages and disadvantages found in research. Jobs designed according to the motivational approach have more satisfied, motivated, and involved employees who tend to have higher performance and lower absenteeism. Customer service may be improved, because employees take more pride in work and can catch their own errors by performing a larger part of the work. In terms of disadvantages, jobs too high on the motivational approach require more training, have greater skill and ability requirements for staffing, and may require higher compensation. Overly motivating jobs may also be so stimulating that workers become predisposed to mental overload, fatigue, errors, and occupational stress.

14.2.3 Perceptual/Motor Job Design Approach

14.2.3.1 Historical Development

This approach draws on a scientific discipline which goes by many names, including human factors, human factors engineering, human engineering, man–machine systems engineering, and engineering psychology. It developed from a number of other disciplines, primarily experimental psychology, but also industrial engineering (Meister, 1971). Within experimental psychology, job design recommendations draw heavily from knowledge of human skilled performance (Welford, 1976) and the analysis of humans as information processors (see Chapters 3–6). The main concern of this approach is on efficient and safe utilization of humans in human–machine systems, with emphasis on selection, design, and arrangement of system components to take account of both human abilities and limitations (Pearson, 1971). It is more concerned with equipment than psychology, and more concerned with human abilities than engineering.

This approach received public attention with the Three Mile Island incident where it was concluded that the control room operator job in the nuclear power plant may have placed too many demands on the operator in an emergency situation thus predisposing errors of judgment (Campion and Thayer, 1987). Government regulations issued since then require nuclear plants to consider "human factors" in their design (U.S. Nuclear Regulatory Commission, 1981). The primary emphasis of this approach is on perceptual and motor abilities of people. (See Chapters 20–22 for more information on equipment design.)

14.2.3.2 Design Recommendations

Table 14.2 provides a list of statements describing important recommendations of the perceptual/motor approach. They refer to either equipment and environment or to information-processing requirements. Their thrust is to consider mental abilities and limitations of humans, such that the attention and concentration requirements of the job do not exceed the abilities of the least capable potential worker. 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 and remember. Lighting levels should be appropriate, displays and controls should be logical and clear, work places should be well laid out and safe, and equipment should be easy to use. (See Chapters 56–61 for more information on human factors applications.)

14.2.3.3 Advantages and Disadvantages

The goals of this approach are to enhance reliability, safety, and positive user reactions. Table 14.1 summarizes advantages and disadvantages found in research. Jobs designed according to the perceptual/motor approach have lower errors and accidents. Like the mechanistic approach, it reduces mental ability requirements of the job, thus employees may be less stressed and mentally fatigued. It may also create some efficiencies, such as reduced training time and staffing requirements. On the other hand, costs from the excessive use of the perceptual/motor approach can include low satisfaction, low motivation,

and boredom due to inadequate mental stimulation. This problem is exacerbated by fact that designs based on the least capable worker essentially lower a job's mental requirements.

14.2.4 Biological Job Design Approach

14.2.4.1 Historical Development

This approach and the perceptual/motor approach share a joint concern for proper person–machine fit. The major difference is that this approach is more oriented toward biological considerations and stems from such disciplines as work physiology (see Chapter 10), biomechanics (i.e., study of body movements, see Chapter 9) and anthropometry (i.e., study of body sizes, see Chapters 8 and 23). Although many specialists probably practice both approaches together as is reflected in many texts in the area (Konz, 1983) a split does exist between Americans who are more psychologically oriented and use the title "human factors engineer," and Europeans who are more physiologically oriented and use the title "ergonomist" (Chapanis, 1970). Like the perceptual-motor approach, the biological approach is concerned with the design of equipment and work places, as well as the design of tasks (Grandjean, 1980).

14.2.4.2 Design Recommendations

Table 14.2 lists important recommendations from the biological approach. This approach tries to design jobs to reduce physical demands to avoid exceeding people's physical capabilities and limitations. Jobs should not require excessive strength and lifting, and again, abilities of the least physically able potential worker set the maximum level. Chairs should be designed for good postural support. 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 employees can recuperate from the physical demands.

14.2.4.3 Advantages and Disadvantages

The goals of this approach are to maintain employees' comfort and physical well-being. Table 14.1 summarizes some advantages and disadvantages observed in research. Jobs designed according to this approach require less physical effort, result in less fatigue, and create fewer injuries and aches and pains than jobs low on this approach. Occupational illnesses, such as lower back pain and carpal tunnel syndrome, are fewer on jobs designed with this approach. There may be lower absenteeism and higher job satisfaction on jobs which are not physically arduous. However, 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, costs may include jobs with so few physical demands that workers become drowsy or lethargic, thus reducing performance. Clearly, extremes of physical activity and inactivity should be avoided, and an optimal level of physical activity should be developed.

14.3 THE TEAM DESIGN APPROACH

14.3.1 Historical Development

An alternative to designing work around individual jobs is to design work for teams of workers. Teams can vary a great deal in how they are designed and can conceivably incorporate elements from any of the job design approaches discussed. However, the focus here is on the self-managing, autonomous type of team design approach, which is gaining considerable popularity in organizations and substantial research attention today (Guzzo and Shea, 1992; Hoerr, 1989; Swezey and Salas, 1992; Sundstrom, DeMeuse, and Futrell, 1990). Autonomous work teams derive their conceptual basis from motivational job design and from sociotechnical systems theory, which in turn reflect social and organizational psychology and organizational behavior (Cummings, 1978; Davis, 1971; Davis and Valfer, 1965). The Hawthorne studies (Homans, 1950) and European experiments with autonomous work groups (Kelly, 1982; Pasmore, Francis and Haldeman, 1982) called attention to the benefits of applying work teams in other than sports and military settings. Although enthusiasm for the use of teams had waned in the 1960s and 1970s due to research discovering some disadvantages of teams (Buys, 1978; Zander, 1979), the 1980s brought a resurgence of interest in the use of work teams and it has become an extremely popular work design in organizations today (Hoerr, 1989; Sundstrom et al., 1990). This

rei interest may be due to the cost advantages of having fewer supervisors with self-managed teams or the apparent logic of the benefits of teamwork.

14.3.2 Design Recommendations

Teams can vary in the degree of authority and autonomy they have. For example, manager-led teams have responsibility only for the execution of their work. Management designs the work, designs the teams, and provides an organizational context for the team. However, in autonomous work teams, or self-managing teams, team members design and monitor their own work and performance. They may also design their own team structure (e.g., delineating interrelationships among members) and composition (e.g., selection of members). In such self-designing teams, management is only responsible for the teams' organizational context (Hackman, 1987). Although team design could incorporate elements of either mechanistic or motivational approaches to design, narrow and simplistic mechanistically designed jobs would be less consistent with other suggested aspects of the team approach to design than motivationally designed jobs. Mechanistically designed jobs would not allow an organization to gain as much of the advantages from placing workers in teams.

Figure 14.1 and Table 14.3 provide important recommendations from the self-managing team design approach. Many of the advantages of work teams depend on how teams are designed and supported by their organization. According to the theory behind self-managing team design, decision making and responsibility should be pushed down to the team members (Hackman, 1987). If management is willing to follow this philosophy, teams can provide several additional advantages. By pushing decision making down to the team and requiring consensus, the organization will find greater acceptance, understanding, and ownership of decisions (Porter, Lawler, and Hackman, 1987). The perceived autonomy resulting from making work decisions should be both satisfying and motivating. Thus, this approach tries to design teams so they have a high degree of self-management and all team members participate in decision making.

The team design approach also suggests that the set of tasks assigned to a team should provide a whole and meaningful piece of work (i.e., have task identity as in the motivational approach to job design). This allows team members to see how their work contributes to a whole product or process, which might not be possible with individuals working alone. This can give workers a better idea of the significance of their work and create greater identification with the 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 (Campion, Cheraskin, and Stevens, 1994).

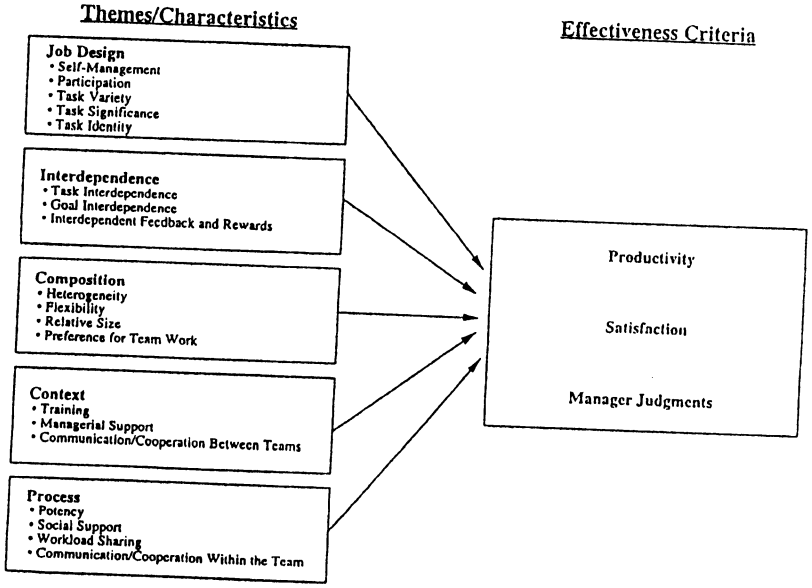

Figure 14.1 Characteristics related to team effectiveness.

Interdependent tasks, goals, feedback, and rewards should be provided to create feelings of team interdependence among members and focus on the team as the unit of performance, rather than on the individual. It is suggested that team members should be heterogeneous in terms of areas of expertise and background so their varied knowledge, skills, and abilities (KSAs) complement one another. Teams also need adequate training, managerial support, and organizational resources to carry out their tasks. Managers should encourage positive group processes including open communication and cooperation within and between work groups, supportiveness and sharing of the workload among team members, and development of positive team spirit and confidence in the team's ability to perform effectively.

14.3.3 Advantages and Disadvantages

Table 14.4 summarizes advantages and disadvantages of team design relative to individual job design. To begin with, teams designed so members have a heterogeneity of KSAs can help team members learn by working with others who have different KSAs. Cross-training on different tasks can occur, and the work force can become more flexible (Goodman, Ravlin, and Argote, 1986). Teams with heterogeneous KSAs also allow for synergistic combinations of ideas and abilities not possible with individuals working alone, and such teams have generally shown higher performance, especially when task requirements are diverse (Goodman et al., 1986; Shaw, 1983).

Social support can be especially important when teams face difficult decisions and deal with difficult psychological aspects of tasks, such as in military squads, medical teams, or police units (Campion and Medsker, 1992). In addition, the simple presence of others can be psychologically arousing. Research has shown that such arousal can have a positive effect on performance when the task is well learned (Zajonc, 1965) and when

Table 14.4 Advantages and Disadvantages of Work Teams

Advantages	Disadvantages
Team members learn from one another	Lack of compatibility of some individuals with team work
Possibility of greater work force flexibility with cross-training	Additional need to select workers to fit team 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	
Social support for difficult tasks and situations	Increased competition and conflict between teams
Increased communication and information exchange between team members	More time consuming due to socializing coordination losses, and need for consensus
Greater cooperation among team members	Inhibition of creativity and decision-making processes; possibility of groupthink
Beneficial for interdependent work flows	Less powerful evaluation and rewards; social loafing or free-riding may occur
Greater acceptance and understanding of decisions when team makes decisions	Less flexibility in cases of replacement, turnover, or transfer
Greater autonomy, variety, identity, significance, variety, and feedback possible for workers	
Commitment to the team may stimulate performance and attendance	

Source: Table adopted from Campion and Medsker (1992)

other te. ,nembers are perceived as evaluating the performer (Harkins, 1987; Porter et al., 1987). With routine jobs, this arousal effect may counteract boredom and performance decrements (Cartwright, 1968).

Another advantage of teams is that they can increase information exchanged between members through proximity and shared tasks (McGrath, 1984). Increased cooperation and communication within teams can be particularly useful when workers' jobs are highly interrelated, such as when workers whose tasks come later in the process must depend on the performance of workers whose tasks come earlier or when workers exchange work back and forth among themselves (Mintzberg, 1979; Thompson, 1967).

In addition, if teams are rewarded for team effort, rather than individual effort, members will have an incentive to cooperate with one another (Leventhal, 1976). The desire to maintain power by controlling information may be reduced. More experienced workers may be more willing to train the less experienced when they are not in competition with them. Team design and rewards can also be helpful in situations where it is difficult to measure individual performance or where workers mistrust supervisors' assessments of performance (Milkovich and Newman, 1993).

Finally, teams can be beneficial if team members develop a feeling of commitment and loyalty to their team (Cartwright, 1968). For workers who do not develop high commitment to their organization or management and who do not become highly involved in their job, work teams can provide a source of commitment. That is, members may feel responsible to attend work, cooperate with others, and perform well because of commitment to their work team, even though they are not strongly committed to the organization or the work itself.

Thus, designing work around teams can provide several advantages to organizations and their workers. Unfortunately, there are also disadvantages to using work teams and situations in which individual-level design is preferable to team design. For example, some individuals may dislike team work and may not have necessary interpersonal skills or desire to work in a team. When selecting team members, one has the additional requirement of selecting workers to fit the team, as well as the job. (Section 14.4.3 provides more information on the selection of team members; see also Chapter 16 for general information on personnel selection.)

Individuals can experience less autonomy and less personal identification when working on a team. Designing work around teams does not guarantee workers greater variety, significance, and identity. If members within the team do not rotate among tasks or if some members are assigned exclusively to less desirable tasks, not all members will benefit from team design. Members can still have fractionated, demotivating jobs.

Team work can also be incompatible with cultural norms. The United States has a very individualistic culture (Hofstede, 1980). Applying team methods that have been successful in collectivistic societies like Japan may be problematic in the United States. In addition, organizational norms and labor–management relations may be incompatible with team design, making its use more difficult.

Some advantages of team design can create disadvantages, too. First, though team rewards can increase communication and cooperation and reduce competition within a team, they may cause greater competition and reduced communication between teams. If members identify too strongly with a team, they may not realize when behaviors which benefit the team detract from organizational goals and create conflicts detrimental to productivity. Increased communication within teams may not always be task-relevant either. Teams may spend work time socializing. Team decision making can take longer than individual decision making, and the need for coordination within teams can be time consuming.

Decision making and creativity can also be inhibited by team processes. When teams become highly cohesive they may become so alike in their views that they develop "groupthink" (Janis, 1972). When groupthink occurs, teams tend to underestimate their competition, fail to adequately critique fellow team members' suggestions, not appraise alternatives adequately, and fail to work out contingency plans. In addition, team pressures distort judgments. Decisions may be based more on persuasiveness of dominant individuals or the power of majorities, rather than on the quality of decisions. Research has found a tendency for team judgments to be more extreme than the average of individual members' predecision judgments (Janis, 1972; McGrath, 1984). Although evidence shows highly cohesive teams are more satisfied with their teams, cohesiveness is not necessarily related to high productivity. Whether cohesiveness is related to performance depends on a team's norms and goals. If a team's norm is to be productive, cohesiveness will enhance

Table 14.5 When to Design Jobs Around Work Teams

1. Are workers' tasks highly interdependent, or could they be made to be so? Would this interdependence enhance efficiency or quality?
2. Do the tasks require a variety of knowledge, skills, abilities such that combining individuals with different backgrounds would make a difference in performance?
3. Is cross-training desired? Would breadth of skills and work force flexibility be essential to the organization?
4. Could increased arousal, motivation, and effort to perform make a difference in effectiveness?
5. Can social support help workers deal with job stresses?
6. Could increased communication and information exchange improve performance rather than interfere?
7. Could increased cooperation aid performance?
8. Are individual evaluation and rewards difficult or impossible to make or are they mistrusted by workers?
9. Could common measures of performance be developed and used?
10. It is technically possible to group tasks in a meaningful, efficienct way?
11. Would individuals be willing to work in teams?
12. Does the labor force have the interpersonal skills needed to work in teams?
13. Would team members have the capacity and willingness to be trained in interpersonal and technical skills required for team work?
14. Would team work be compatible with cultural norms, organizational policies, and leadership styles?
15. Would labor–management relations be favorable to team 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 teams be defined as a meaningful unit of the organization with identifiable inputs, outputs, and buffer areas which give them a separate identity from other teams?
19. Would members share common resources, facilities, or equipment?
20. Would top management support team job design?

Source: Table adopted from Campion and Medsker (1992). Affirmative answers support the use of team job design.

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

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 individual performance, do not believe their output can be distinguished from the team's, or do not perceive a link between their personal performance and outcomes, social loafing (Harkins, 1987) 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 depends to a great extent on the composition, structure, reward systems, environment, and task of the team. Table 14.5 presents questions which can help determine whether work should be designed around teams rather than individuals. The more questions answered in the affirmative, the more likely teams are to be beneficial. If one chooses to design work around teams, suggestions for designing effective teams are presented in Section 14.4.3.

14.4 IMPLEMENTATION ADVICE FOR JOB AND TEAM DESIGN

14.4.1 General Implementation Advice

14.4.1.1 Procedures to Follow

There are several general philosophies that are helpful when designing or redesigning jobs or teams:

1. As noted previously, designs are not inalterable or dictated by technology. There is some discretion in the design of all work situations, and considerable discretion in most.
2. There is no single best design, there are simply better and worse designs depending on one's design perspective.
3. Design is iterative and evolutionary and should continue to change and improve over time.
4. Participation of workers affected generally improves the quality of the resulting design and acceptance of suggested changes.
5. The process of the project, or how it is conducted is important in terms of involvement of all interested parties, consideration of alternative motivations, and awareness of territorial boundaries.

Procedures for the Initial Design of Jobs or Teams

In consideration of process aspects of design, Davis and Wacker (1982) suggest four steps:

1. ***Form a steering committee.*** This committee usually consists of a team of high-level executives who have a direct stake in the new jobs or teams. The purposes of the committee are to: (a) bring into focus the project's objective, (b) provide resources and support for the project, (c) help gain cooperation of all parties affected, and (d) oversee and guide the project.
2. ***Form a design task force.*** The task force may include engineers, managers, job or team design experts, architects, specialists, and others with relevant knowledge or responsibility relevant. 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 decisions involved in the project. The philosophy statement is developed with input from the steering committee and may include the project's purposes, organization's strategic goals, assumptions about workers and the nature of work, and process considerations.
4. ***Proceed in an evolutionary manner.*** Jobs should not be overspecified. With considerable input from eventual job holders or team members, the work design will continue to change and improve over time.

According to Davis and Wacker (1982), the process of redesigning existing jobs is much the same as designing original jobs with two additions. First, existing job incumbents must be involved. Second, more attention needs to be given to implementation issues. Those involved in the implementation must feel ownership of and commitment to the change and believe the redesign represents their own interests.

Potential Steps to Follow

Along with the steps discussed above, a redesign project should also include the following five steps:

1. ***Measuring the design of the existing job or teams.*** The questionnaire methodology and other analysis tools described in Section 14.5 may be used to measure current jobs or teams.
2. ***Diagnosing potential design problems.*** Based on data collected in step 1, the current design is analyzed for potential problems. The task force and employee involvement are important. Focused team meetings are a useful vehicle for identifying and evaluating problems.
3. ***Determining job or team design changes.*** Changes will be guided by project goals, problems identified in step 2, and one or more of the approaches to work design. Often several potential changes are generated and evaluated. Evaluation of alternative changes may involve consideration of advantages and disadvantages identified in previous research (see Table 14.1) and opinions of engineers, managers, and employees.
4. ***Making design changes.*** Implementation plans should be developed in detail along with back-up plans in case there are a difficulties with the new design. Communication and training are keys to implementation. Changes might also be pilot tested before widespread implementation.
5. ***Conducting a follow-up evaluation.*** Evaluating the new design after implementation is probably the most neglected part of the process in most applications. The evaluation might include the collection of design measurements on the redesigned jobs/teams using the same instruments as in step 1. Evaluation may also be conducted on outcomes, such as employee satisfaction, error rates, and training time (Table 14.1). Scientifically valid evaluations require experimental research strategies with control groups. Such studies may not always be possible in organizations, but often quasi-experimental and other field research designs are possible (Cook and Campbell, 1979). Finally, the need for adjustments are identified through the follow-up evaluation. (For examples of evaluations, see Section 14.5.8 and Campion and McClelland, 1991, 1993)

14.4.1.2 Individual Differences Among Workers

It is a common observation that not all employees respond the same to the same job. Some people on a job have high satisfaction, while others on the same job have low satisfaction. Clearly, there are individual differences in how people respond to work. Considerable research has looked at individual differences in reaction to the motivational design approach. It has been found that some people respond more positively than others to highly motivational work. These differences are generally viewed as differences in needs for personal growth and development (Hackman and Oldham, 1980).

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) and to the team design approach (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995). Table 14.6 provides scales that can be used to determine job incumbents' preferences/tolerances. These scales can be administered in the same manner as the questionnaire measures of job and team design discussed in Section 14.5.

Although consideration of individual differences is encouraged, there are often limits to which such differences can be accommodated. Jobs or teams may have to be designed for people who are not yet known or who differ in their preferences. Fortunately, though evidence indicates individual differences moderate reactions to the motivational approach (Fried and Ferris, 1987), the differences are of degree but not direction. That is, some people respond more positively than others to motivational work, but few respond negatively. It is likely that this also applies to the other design approaches.

14.4.1.3 Some Basic Choices

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

1. ***Individual versus team designs for work.*** An initial decision is to either enrich individual jobs or create teams. This also includes consideration of whether any redesign should be undertaken and its likelihood of success.
2. ***Theory based versus intuitive changes.*** This choice was basically defined as the motivational (theory) approach versus 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 versus broadside installation.*** This choice is between tailoring changes to individuals or making the changes for all in a given job.
4. ***Participative versus top-down change processes.*** The most common orientation is that participative is best. However, costs of participation include the time involved and incumbents' possible lack of a broad knowledge of the business.
5. ***Consultation versus collaboration with stakeholders.*** The effects of job design changes often extend far beyond the individual incumbent and department. For example, a job's output may be an input to a job elsewhere in the organization. The presence of a union also requires additional collaboration. Depending on considerations, participation of stakeholders may range from no involvement, through consultation, to full collaboration.

Table ... **Preferances/Tolerances for the Design Approaches**

Instructions: Indicate the extent to which each statement is descriptive of your preferences and tolerances fo types of work on the scale below. Circle answers 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

Preferences/Tolerance for Mechanistic Design					
1. I have a high tolerance for routine work.	1	2	3	4	5
2. I prefer to work on one task at a time.	1	2	3	4	5
3. I have a high tolerance for repetitive work.	1	2	3	4	5
4. I prefer work that is easy to learn.	1	2	3	4	5
Preferences/Tolerances for Motivational Design					
5. I prefer highly challenging work that taxes my skills and abilities.	1	2	3	4	5
6. I have a high tolerance for mentally demanding work.	1	2	3	4	5
7. I prefer work that gives a great amount of feedback as to how I am doing.	1	2	3	4	5
8. I prefer work that regularly requires the learning of new skills.	1	2	3	4	5
9. I prefer work that requires me to develop my own methods, procedures, goals, and schedules.	1	2	3	4	5
10. 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					
11. I prefer work that is very fast paced and stimulating.	1	2	3	4	5
12. I have a high tolerance for stressful work.	1	2	3	4	5
13. I have a high tolerance for complicated work.	1	2	3	4	5
14. 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					
15. I have a high tolerance for physically demanding work.	1	2	3	4	5
16. I have a fairly high tolerance for hot, noisy, or dirty work.	1	2	3	4	5
17. I prefer work that gives me some physical exercise.	1	2	3	4	5
18. I prefer work that gives me some opportunities to use my muscles.	1	2	3	4	5
Preferences/Tolerances for Team Work					
19. If given the choice, I would prefer to work as part of a team rather than work alone.	1	2	3	4	5
20. I find that working as a member of a team increases my ability to perform effectively.	1	2	3	4	5
21. I generally prefer to work as part of a team.	1	2	3	4	5

Source: Table adopted from Campion (1988) and Campion, Medsker, and Higgs, (1993).

Note: See reference for reliability and validity information. Scores for each preference/tolerance are calculated by averaging applicable items. 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.

14.4.1.4 Overcoming Resistance to Change in Redesign Projects

Resistance to change can be a problem in any project involving major changes. Failure rates of new technology 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 for the failures than technical problems (Majchrzak, 1988; Turnage, 1990). The number one obstacle to implementation was considered to be human resistance to change (Hyer, 1984).

Based on the work of Majchrzak (1988), Gallagher and Knight (1986), and Turnage (1990), guidelines for reducing resistance to change include the following:

1. *Involve workers in planning the change.* Workers should be informed of changes in advance and involved in the process of diagnosing current problems and developing solutions. Resistance is decreased if participants feel the project is their own and not imposed from outside and if the project is adopted by consensus.
2. *Top management should strongly support the change.* If workers feel management is not strongly committed, they are less likely to take the project seriously.
3. *Create change consistent with worker needs and existing values.* Resistance is less if change is seen to reduce present burdens, offer interesting experience, not threaten worker autonomy or security or be inconsistent with other goals and values in the organization. Workers need to see the advantages to them of the change. Resistance is less if proponents of change can empathize with opponents (recognize valid objections and relieve unnecessary fears).
4. *Create an environment of open, supportive communication.* Resistance will be lessened if participants experience support and have trust in each other. Resistance can be reduced if misunderstandings and conflicts are expected as natural to the innovation process. Provision should be made for clarification.
5. *Allow for flexibility.* Resistance is reduced if the project is kept open to revision and reconsideration with experience.

14.4.2 Implementation Advice for Job Design and Redesign

14.4.2.1 Methods for Combining Tasks

In many cases, designing jobs is largely a function of combining tasks. Some guidance can be gained by extrapolating from specific design recommendations in Table 14.2. For example, variety in the motivational approach can be increased by simply combining different tasks in the same job. Conversely, specialization from the mechanistic approach can be increased by only including very similar tasks in the same job. It is also possible when designing jobs to first generate alternative task combinations, then evaluate them using the design approaches in Table 14.2.

A small amount of research within the motivational approach has focused explicitly on predicting relationships between combinations of tasks and the design of resulting jobs (Wong, 1989; Wong and Campion, 1990). This research suggests that a job's motivational quality is a function of three task level variables, as illustrated in Figure 14.2.

1. *Task design.* The higher the motivational quality of individual tasks, the higher the motivational quality of a job. Table 14.2 can be used to evaluate individual tasks, then motivational scores for individual tasks can be summed together. Summing is recommended rather than averaging because both the motivational quality of the tasks and the number of tasks are important in determining a job's motivational quality (Globerson and Crossman, 1976).
2. *Task interdependence.* Interdependence among tasks has been shown to be positively related to motivational value up to some moderate point; beyond that point increasing interdependence has been shown to lead to lower motivational value. Thus, for motivational jobs, the total amount of interdependence among tasks should be kept at a moderate level. Both complete independence and excessively high interdependence should be avoided. Table 14.7 contains the dimension of task interdependence and provides a questionnaire to measure it. Table 14.7 can be used to judge the interdependence of each pair of tasks that are being evaluated for inclusion in a job.

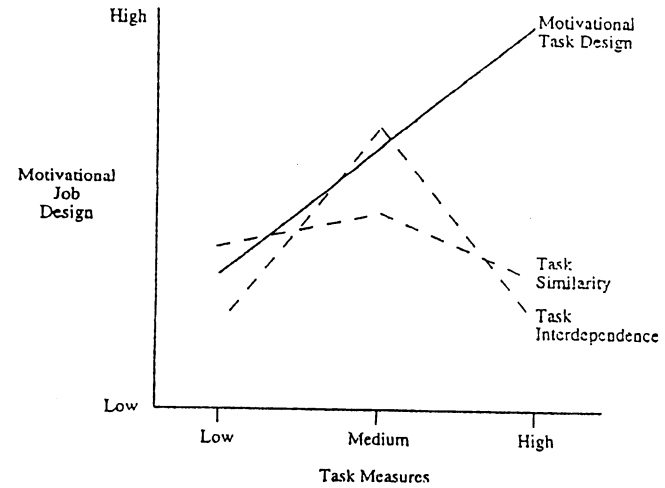

Figure 14.2 Effects of task design, interdependence, and similarity on motivational job design.

3. ***Task similarity.*** Similarity among tasks may be the oldest rule of job design, but beyond a moderate level, it tends to decrease a job's motivational value. Thus, to design motivational jobs, 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 dimensions in Table 14.7 (see the note to Table 14.7).

14.4.2.2 Trade-Offs Among Job Design Approaches

Although one should strive to construct jobs that are well designed on all the approaches, it is clear design approaches conflict. As Table 14.1 illustrates, benefits of some approaches are costs of others. No one approach satisfies all outcomes. The greatest potential conflicts are between the motivational and the mechanistic and perceptual/motor approaches. They produce nearly opposite outcomes. The mechanistic and perceptual/motor approaches recommend jobs that are simple, safe, and reliable, with minimal mental demands on workers. The motivational approach encourages more complicated and stimulating jobs, with greater mental demands. The team approach is consistent with the motivational approach, and therefore also may conflict with the mechanistic and perceptual/motor approaches.

Because of these conflicts, trade-offs may be necessary. Major trade-offs will be in the mental demands created by the alternative design strategies. Making jobs more mentally demanding increases the likelihood of achieving workers' goals of satisfaction and motivation, but decreases the chances of reaching the organization's goals of reduced training, staffing costs, and errors. Which trade-offs will be made depends on outcomes one prefers to maximize. Generally, a compromise may be optimal.

Trade-offs may not always be needed, 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 clerical jobs to improve employee satisfaction and customer service (Campion and McClelland, 1991). Expected benefits occurred along with some expected costs (e.g., increased training and compensation requirements), but not all potential costs occurred (e.g., quality and efficiency did not decrease).

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

Table 14.7 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 necessary 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 Tasks					
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 get 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.	1	2	3	4	5

Source: Table adopted from Wong and Campion (1991). See reference and Wong (1989) for reliability and validity information.

Note: The task similarity measure contains 10 comparable items (excluding 4, 6, 8, 9, and 14, and including an item on customer/client). Scores for each dimension are calculated by averaging applicable items.

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

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

14.4.2.3 Other Implementation Advice for Job Design

Davis and Wacker (1982, 1987) have provided a list of criteria for grouping tasks, part of which is reproduced below. The list represents a collection of criteria from both the motivational (e.g., 1, 5, 9) and mechanistic (e.g., 2, 8) approaches. Many of the recommendations could also be applied to designing work for teams.

1. Each task group is a meaningful unit of the organization.
2. Task groups are separated by stable buffer areas.
3. Each task group has definite, identifiable inputs and outputs.
4. Each task group 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 group 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.
9. Task groups incorporate opportunities for skill acquisition relevant to career advancement.

Based on experience redesigning jobs in AT&T, Ford (1969) advocated "work-itself workshops." These are basically workshops of managers and employees trained in motivational job design who then attempt to come up with ways to improve jobs. Ford provides the following advice for these workshops:

1. Start with a meeting with senior management.
2. Work within a single department at first.
3. Gain commitment.
4. Pick a job to focus on.
5. Conduct workshop meetings.
6. Facilitate creative thinking.
7. Deal with visitors to the job site.
8. Search for a natural module of work.
9. Deal with resistance due to expense.
10. Individualize feedback.

Griffin's (1982) advice is geared toward the manager considering a job redesign intervention in his or her area. He notes the manager may also rely on consultants, task forces, or informal discussion groups. Griffin suggests nine steps:

1. Recognition of a need for change.
2. Selection of job redesign as a potential intervention.
3. Diagnosis of the work system and content on the following factors:
   a. Existing jobs.
   b. Existing work force.
   c. Technology.
   d. Organization design.
   e. Leader behaviors.
   f. Team and social processes.
4. Cost/benefit analysis of proposed changes.
5. Go/no-go decision.
6. Establishment of a strategy for redesign.
7. Implementation of the job changes.
8. Implementation of any needed supplemental changes.
9. Evaluation of the redesigned jobs.

14.4.3 Implementation Advice for Team Design

14.4.3.1 Deciding on Team Composition

Research encourages heterogeneous teams in terms of skills, personality, and attitudes because it increases the range of competencies in teams (Gladstein, 1984) and is related to effectiveness (Campion, Papper, and Medsker, 1995). However, homogeneity is preferred if team morale is the main criterion, and heterogeneous attributes must be complementary if they are to contribute to effectiveness. Heterogeneity for its own sake is unlikely to enhance effectiveness (Campion, Medsker, and Higgs, 1993). Another composition characteristic of effective teams is whether members have flexible job assignments (Campion, Medsker, and Higgs, 1993; Sundstrom et al., 1990). If members can perform different jobs, effectiveness is enhanced because they can fill in as needed.

A third important aspect of composition is team size. Evidence suggests the importance of optimally matching team size to team tasks to achieve high performance and satisfaction (Campion, 1993). Teams need to be large enough to accomplish work assigned to them, but may be dysfunctional when too large due to heightened coordination needs (O'Reilly and Roberts, 1977; Steiner, 1972) or increased social loafing (McGrath, 1984; Wicker, Kirmeyer, Hanson, and Alexander, 1976). Thus, groups should be staffed to the smallest number needed to do the work (Goodman et al., 1986; Hackman, 1987; Sundstrom et al., 1990).

14.4.3.2 Selecting Team Members

With team design, interpersonal demands appear to be much greater than with traditional individual-based job design (Lawler, 1986). A team-based setting highlights the importance of employees being capable of interacting in an effective manner with peers, because the amount of interpersonal interactions required is higher in teams (Stevens and Campion, 1994a,b). Team effectiveness can depend heavily on members' "interpersonal competence," or their ability to successfully maintain healthy working relationships and react to others with respect for their viewpoints (Perkins and Abramis, 1990). There is a greater need for team members to be capable of effective interpersonal communication, collaborative problem solving, and conflict management (Stevens and Campion, 1994a,b).

The process of employment selection for team members places greater stress on adequately evaluating interpersonal competence than is normally required in the selection of workers for individual jobs. To create a selection instrument for evaluating potential team members' ability to work successfully in teams, Stevens and Campion (1994a,b) reviewed literature in areas of sociotechnical systems theory (e.g., Cummings, 1978; Wall, Kemp, Jackson, and Clegg, 1986), organizational behavior (e.g., Hackman, 1987; Shea and Guzzo, 1987; Sundstrom et al., 1990), industrial engineering (e.g., Davis and Wacker, 1987; Majchrzak, 1988), and social psychology (e.g., McGrath, 1984; Steiner, 1972) to identify relevant knowledge, skills, and abilities (KSAs). Table 14.8 shows the 14 KSAs identified as important for teamwork.

These KSAs have been used to develop a 35-item, multiple-choice employment test, which was validated in two studies to determine how highly related it was to team members' job performance. The job performance of team members in two different companies was rated by both supervisors and co-workers. Correlations between the test and job performance ratings were significantly high, with some correlations exceeding .50. The test was also able to add to the ability to predict job performance beyond that provided by a large battery of traditional employment aptitude tests. Thus, these findings provide support for the value of the teamwork KSAs and a selection test based on them (Stevens and Campion, 1994a). Table 14.9 shows some example items from the test.

Table 14.8 Knowledge, Skill, and Ability (KSA) Requirements for Teamwork

I. Interpersonal KSAs
  A. Conflict Resolution KSAs
    1. The KSA to recognize and encourage desirable, but discourage undesirable, team conflict.
    2. The KSA to recognize the type and source of conflict confronting the team and to implement an appropriate conflict resolution strategy.
    3. The KSA to employ an integrative (win–win) negotiation strategy rather than the traditional distributive (win–lose) strategy.
  B. Collaborative Problem Solving KSAs
    4. The KSA to identify situations requiring participative group problem solving and to utilize the proper degree and type of participation.
    5. The KSA to recognize the obstacles to collaborative group problem solving and implement appropriate corrective actions.
  C. Communication KSAs
    6. The KSA to understand communication networks, and to utilize decentralized networks to enhance communication where possible.
    7. The KSA to communicate openly and supportively, that is, to send messages which are (a) behavior- or event-oriented, (b) congruent, (c) validating, (d) conjunctive, and (e) owned.
    8. The KSA to listen nonevaluatively and to appropriately use active listening techniques.
    9. The KSA to maximize consonance between nonverbal and verbal messages, and to recognize and interpret the nonverbal messages of others.
    10. The KSA to engage in ritual greetings and small talk, and a recognition of their importance.

II. Self-management KSAs
  D. Goal Setting and Performance Management KSAs
    11. The KSA to help establish specific, challenging, and accepted team goals.
    12. The KSA to monitor, evaluate, and provide feedback on both overall team performance and individual team member performance.
  E. Planning and Task Coordination KSAs
    13. The KSA to coordinate and synchronize activities, information, and task interdependencies between team members.
    14. The KSA to help establish task and role expectations of individual team members, and to ensure proper balancing of workload in the team.

Aside from written tests, there may be other ways teamwork KSAs could be measured for purposes of selection. For example, interviews may be especially suited to measuring interpersonal attributes (e.g., Arvey and Campion, 1982). There is evidence that a structured interview specifically designed to measure social (i.e., nontechnical) KSAs can have validity with job performance and predict incrementally beyond traditional employment tests (M. Campion, J. Campion, and Hudson, 1993).

Assessment center techniques might also lend themselves to measuring teamwork KSAs. Group exercises have been used to measure leadership and other social skills with good success (Gaugler, Rosenthal, Thornton, and Benston, 1987). It is likely that existing team exercises, such as group problem-solving tasks, could also be modified to score teamwork KSAs.

Selection techniques using biodata may be another way to measure teamwork KSAs. Many items in biodata instruments reflect previous life experiences of a social nature, and recruiters interpret biodata information on applications and resumes as reflecting attributes such as interpersonal skills (Brown and Campion, 1993). A biodata measure developed to focus on teamwork KSAs might include items on teamwork in previous jobs, team experiences in school (e.g., college clubs, class projects), and recreational activities of a team nature (e.g., sports teams and social groups).

14.4.3.3 Designing the Teams' Jobs

This aspect of team design involves team characteristics derived from the motivational job design approach. The main distinction is in level of application rather than content

Table 14.9 Example Items from the Teamwork KSA Test

1. Suppose you find yourself in an argument with several co-workers about who should do a very disagreeable, but routine task. Which of the following would likely be the most effective way to resolve this situation?
   A. Have your supervisor decide, because this would avoid any personal bias.
   *B. Arrange for a rotating schedule so everyone shares the chore.
   C. Let the workers who show up earliest choose on a first-come, first-served basis.
   D. Randomly assign a person to do the task and don't change it.
2. Your team wants to improve the quality and flow of the conversations among its members. Your team should:
   *A. use comments that build upon and connect to what others have said.
   B. set up a specific order for everyone to speak and then follow it.
   C. let team members with more to say determine the direction and topic of conversation.
   D. do all of the above.
3. Suppose you are presented with the following types of goals. You are asked to pick one for your team to work on. Which would you choose?
   A. An easy goal to ensure the team reaches it, thus creating a feeling of success.
   B. A goal of average difficulty so the team will be somewhat challenged, but successful without too much effort.
   *C. A difficult and challenging goal that will stretch the team to perform at a high level, but attainable so that effort will not be seen as futile.
   D. A very difficult, or even impossible goal so that even if the team falls short, it will at least have a very high target to aim for.

* Correct answers.

(Campion and Medsker, 1992; Shea and Guzzo, 1987; Wall et al., 1986). All the job characteristics of the motivational approach to job design can be applied to team design.

One such characteristic is self-management, which is the team level analogy to autonomy at the individual job level. It is central to many definitions of effective work teams (e.g., Cummings, 1978, 1981; Hackman, 1987). A related characteristic is participation. Regardless of management involvement in decision making, teams can still be distinguished in terms of the degree to which all members are allowed to participate in decisions (McGrath, 1984, Porter et al., 1987). Self-management and participation are presumed to enhance effectiveness by increasing members' sense of responsibility and ownership of the work. These characteristics may also enhance decision quality by increasing relevant information and by putting decisions as near as possible to the point of operational problems and uncertainties.

Other important characteristics are task variety, task significance, and task identity. Variety motivates by allowing members to use different skills (Hackman, 1987) and by allowing both interesting and dull tasks to be shared among members (Davis and Wacker, 1987). Task significance refers to the perceived significance of the consequences of the team's work, either for others inside the organization or its customers. Task identity (Hackman, 1987), or task differentiation (Cummings, 1978), refers to the degree to which the team completes a whole and meaningful piece of work. These suggested characteristics of team design have been found to be positively related to team productivity, team member satisfaction, and managers' and employees' judgments of their teams' performance (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995).

14.4.3.4 Developing Interdependent Relations

Interdependence is often the reason teams are formed (Mintzberg, 1979) and is a defining characteristic of teams (Salas, Dickinson, Converse, and Tannenbaum, 1992; Wall et al., 1986). Interdependence has been found to be related to team members' satisfaction and team productivity and effectiveness (Campion, Medsker, and Higgs, 1993, Campion, Papper, and Medsker, 1995).

One form of interdependence is task interdependence. Team members interact and depend on one another to accomplish their work. Interdependence varies across teams, depending on whether the work flow in a team is pooled, sequential, or reciprocal (Thompson, 1967). Interdependence among tasks in the same job (Wong and Campion, 1991) or between jobs (Kiggundu, 1983) has been related to increased motivation. It can

also increase team effectiveness because it enhances the sense of responsibility for others' work (Kiggundu, 1983) or because it enhances the reward value of a team's accomplishments (Shea and Guzzo, 1987).

Another form of interdependence is goal interdependence. Goal setting is a well documented, individual-level performance improvement technique (Locke and Latham, 1990). A clearly defined mission or purpose is considered to be critical to team effectiveness (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995; Davis and Wacker, 1987; Hackman, 1987; Sundstrom et al., 1990). Its importance has also been shown in empirical studies on teams (e.g., Buller and Bell, 1986; Woodman and Sherwood, 1980). Not only should goals exist for teams, but individual members' goals must be linked to team goals to be maximally effective.

Finally, interdependent feedback and rewards have also been found to be important for team effectiveness and team member satisfaction (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995). Individual feedback and rewards should be linked to a team's performance in order to motivate team-oriented behavior. This characteristic is recognized in many theoretical treatments (e.g., Hackman, 1987; Leventhal, 1976; Steiner, 1972; Sundstrom et al., 1990) and research studies (e.g., Pasmore et al., 1982; Wall et al., 1986).

14.4.3.5 Creating the Organizational Context

Organizational context and resources are considered in all recent models of work team effectiveness (e.g., Guzzo and Shea, 1992; Hackman, 1987). One important aspect of context and resources for teams is adequate training. Training is an extensively researched determinant of team performance (for reviews see Dyer, 1984; and Salas et al., 1992), and training is included in most interventions (e.g., Pasmore et al., 1982; Wall et al., 1986). Training is related to team members' satisfaction, and managers' and employees' judgments of their teams' effectiveness (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995).

Training content often includes team philosophy, group decision making, and interpersonal skills, as well as technical knowledge. Many team-building interventions focus on aspects of team functioning that are related to the teamwork KSAs shown in Table 14.8. A recent review of this literature divided such interventions into four approaches (Tannenbaum, Beard, and Salas, 1992)—goal setting, interpersonal, role, and problem solving—which are similar to the teamwork KSA categories. Thus, these interventions could be viewed as training programs on teamwork KSAs. Reviews indicate that the evidence for the effectiveness of this training appears positive despite the methodological limitations that plague this research (Buller and Bell, 1986; Tannenbaum et al., 1992; Woodman and Sherwood, 1980). It appears that workers can be trained in teamwork KSAs. (See Chapter 16 for more information on team training.)

Regarding how such training should be conducted, there is substantial guidance on training teams in the human factors and military literatures (Dyer, 1984; Salas et al., 1992; Swezey and Salas, 1992). Because these topics are thoroughly addressed in the cited sources, they will not be reviewed here.

Managers of teams also need to be trained in teamwork KSAs, regardless of whether the teams are manager-led or self-managed. The KSAs are needed for interacting with employee teams and for participating on management teams. It has been noted that managers of teams, especially autonomous work teams, need to develop their employees (Cummings, 1978; Hackman and Oldham, 1980; Manz and Sims, 1987). Thus, training must not only ensure that managers possess teamwork KSAs, but that they know how to train employees on these KSAs.

Managerial support is another contextual characteristic. Management controls resources (e.g., material and information) required to make team functioning possible (Shea and Guzzo, 1987), and an organization's culture and top management must support the use of teams (Sundstrom et al., 1990). Teaching facilitative leadership to managers is often a feature of team interventions (Pasmore et al., 1982). Finally, communication and cooperation between teams is a contextual characteristic because it is often the responsibility of managers. Supervising team boundaries (Cummings, 1978) and externally integrating teams with the rest of the organization (Sundstrom et al., 1990) enhance effectiveness. Research indicates that managerial support and communication and cooperation between work teams are related to team productivity and effectiveness and to team members' satisfaction with their work (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995).

14.4.3.6 Developing Effective Team Process

Process describes those things that go on in the group that influence effectiveness. One process characteristic is potency, or the belief of a team that it can be effective (Guzzo and Shea, 1992; Shea and Guzzo, 1987). It is similar to the lay-term "team spirit." Hackman (1987) argues that groups with high potency are more committed and willing to work hard for the group, and evidence indicates that potency is highly related to team members' satisfaction with work, team productivity, and members' and managers' judgments of their teams' effectiveness (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995).

Another process characteristic found to be related to team satisfaction, productivity, and effectiveness is social support (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995). Effectiveness can be enhanced when members help each other and have positive social interactions. Like social facilitation (Harkins, 1987; Zajonc, 1965), social support can be arousing and may enhance effectiveness by sustaining effort on mundane tasks.

Another process characteristic related to be satisfaction, productivity, and effectiveness is workload sharing (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995). Workload sharing enhances effectiveness by preventing social-loafing or free-riding (Harkins, 1987). To enhance sharing, group members should believe their individual performance can be distinguished from the group's, and that there is a link between their performance and outcomes.

Finally, communication and cooperation within the work group are also important to team effectiveness, productivity, and satisfaction (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995). Management should help teams foster open communication, supportiveness, and discussions of strategy. Informal, rather than formal, communication channels and mechanisms of control should be promoted to ease coordination (Majchrzak, 1988; Bass and Klubeck, 1952). Managers should encourage self-evaluation, self-observation, self-reinforcement, self-management, and self-goal setting by teams. Self-criticism for purposes of recrimination should be discouraged (Manz and Sims, 1987).

14.5 MEASUREMENT AND EVALUATION OF JOB AND TEAM DESIGN

The purpose of an evaluation study for either a job or team design is to provide an objective evaluation of success and to create a tracking and feedback system to make adjustments during the course of the design project. An evaluation study can provide objective data to make informed decisions, help tailor the process to the organization, and give those affected by the design or redesign an opportunity to provide input. An evaluation study should include measures which describe the characteristics of the jobs or teams so that it can be determined whether or not jobs or teams ended up having the characteristics which they were intended to have. An evaluation study should also include measures of effectiveness outcomes an organization hoped to achieve with a design project. Measures of effectiveness could include such *subjective* outcomes as employee job satisfaction or employee, manager, or customer perceptions of effectiveness. Measures of effectiveness should also include *objective* outcomes such as cost, productivity, rework/scrap, turnover, accident rates, or absenteeism. Additional information on measurement and evaluation of such outcomes can be found in Part 6 of this handbook.

14.5.1 Using Questionnaires to Measure Job and Team Design

One way to measure job or team design is by using questionnaires or checklists. This method of measuring job or team design is highlighted because it has been used widely in research on job design, especially on the motivational approach. More importantly, questionnaires are a very inexpensive, easy, and flexible way to measure work design characteristics. Moreover, they gather information from job experts, such as incumbents, supervisors, and engineers and other analysts.

Several questionnaires exist for measuring the motivational approach to job design (Hackman and Oldham, 1980; Sims, Szilagyi, and Keller, 1976), but only one questionnaire, the *Multimethod Job Design Questionnaire* measures characteristics for all four approaches to job design. This questionnaire (presented in Table 14.2) evaluates the quality of a job's characteristics based on each of the four approaches. The *Team Design Measure* presented in Table 14.3) evaluates the quality of work design based on the team approach.

Questionnaires can be administered in a variety of ways. Employees can complete them individually at their convenience at their work station or some other designated area or they can complete them in a group setting. Group administration allows greater standardization of instructions and provides 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 work site, examination of the equipment and procedures, and discussions with any incumbents or managers are important methods of gaining information on the work before completing the questionnaires.

Scoring for each job design approach or for each team characteristic on the questionnaires is usually accomplished by simply averaging the applicable items. Then scores from different incumbents, managers, or engineers describing the same job or team are combined by averaging. Multiple items and multiple respondents are used to improve the reliability and accuracy of the results. The implicit assumption is that slight differences among respondents are to be expected because of legitimate differences in viewpoint. However, 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 may be useful to discuss each item until a consensus rating is reached.

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

Uses of Questionnaires in Different Contexts

1. ***Designing New Jobs or Teams.*** When jobs or teams do not yet exist, the questionnaire is used to evaluate proposed job or team descriptions, work stations, equipment, and so on. In this role, it often serves as a simple design checklist. Additional administrations of the questionnaire in later months or years can be used to assess the longer-term effects of the job or team design.

2. ***Redesigning Existing Jobs or Teams or Switching from Job to Team Design.*** When jobs or teams already exist, there is a much greater wealth of information. Questionnaires can be completed by incumbents, managers, and engineers. Questionnaires can be used to measure design both before and after changes are made to compare the redesign with the previous design approach. A premeasure before the redesign can be used as a baseline measurement against which to compare a postmeasure conducted right after the redesign implementation. A follow-up measure can be used in later months or years to assess the long-term difference between the previous design approach and the new approach.

If other sites or plants with the same types of jobs or teams are not immediately included in the redesign but are maintained with the older design approach, they can be used as a comparison or "control group" to enable analysts to draw even stronger conclusions about the effectiveness of the redesign. Such a control group allows one to control for the possibilities that changes in effectiveness were not due to the redesign but were in fact due to some other causes such as increases in workers' knowledge and skills with the passage of time, changes in workers' economic environment (i.e., job security, wages, etc.), or workers trying to give socially desirable responses to questionnaire items.

3. ***Diagnosing Problem Job or Team Designs.*** When problems occur, regardless of the apparent source of the problem, the job or team design questionnaires can be used as a diagnostic device to determine if any problems exist with the design of the jobs or teams.

14.5.2 Choosing Sources of Data

1. ***Incumbents.*** Incumbents are probably the best source of information for existing jobs or teams. Having input can enhance the likelihood that changes will be accepted.

and involvement in such decisions can enhance feelings of participation thus increasing motivational job design in itself (see item 22 of the motivational scale in Table 14.2). One should include a large number of incumbents for each job or team because there can be slight differences in perceptions of the same job or team due to individual differences (discussed in Section 14.4.1). Evidence suggests that one should include at least five incumbents for each job or team, but more are preferable (Campion, 1988; Campion and McClelland, 1991; Campion, Medsker and Higgs, 1993; Campion, Papper and Medsker, 1995).

2. ***Managers or Supervisors.*** First-level managers or supervisors may be the next most knowledgeable persons about an existing work design. They may also provide information on jobs or teams under development. Some differences in perceptions of the same job or team will exist among managers, so multiple managers should be used.

3. ***Engineers or Analysts.*** Engineers may be the only source of information if the jobs or teams are not yet developed. But also for existing jobs or teams, an outside perspective of an engineer, analyst, or consultant may provide a more objective viewpoint. Again, there can be differences among engineers, so several should evaluate each job or team.

It is desirable to get multiple inputs and perspectives from different sources in order to get the most reliable and accurate picture of the results of the job or team design.

14.5.3 Long-Term Effects and Potential Biases

It is important to recognize that some effects of job or team design may not be immediate, others may not be long lasting, and still others may not be obvious. Initially, when jobs or teams are designed, or right after they are redesigned, there may be a short-term period of positive attitudes (often called a "Honeymoon Effect"). As the legendary Hawthorne studies indicated, changes in jobs or increased attention paid 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, employees may realize their work is now more complex and should be paid higher compensation (Campion and Berger, 1990).

Costs which are likely to lag in time also include stress and fatigue, which may take a while to build up if mental demands have been increased excessively. Boredom may take a while to set in if 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 or team. And some benefits, like reduced turnover, simply take time to estimate accurately.

Benefits which 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 work. Short-term increases in productivity due to heightened effort rather than better design may not last. Costs which may dissipate include training requirements and staffing difficulties. Once 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). These are only examples to illustrate how dissipating and lagged effects might occur. A more detailed example of long-term effects is given in Section 14.5.8.

A potential bias which may confuse the proper evaluation of benefits and costs is spillover. Laboratory research has shown that the job satisfaction of employees can bias perceptions of the motivational value of their jobs (O'Reilly, Parlette, and Bloom, 1980). Likewise, the level of morale in the organization can have a spillover effect onto employees' perceptions of job or team design. If morale is particularly high, it may have an elevating effect on how employees or analysts view the jobs or teams; conversely, low morale may have a depressing effect on 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, wages, and so on. Another factor which has an especially strong effect on employee reactions to work design changes is *employment security*. Obviously, employee enthusiasm for work design changes will be negative if they view them as potentially decreasing their job security. 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 to conduct longitudinal evaluations of job and team design.

In addition to questionnaires, there are many other analytical tools which are useful for work design. The disciplines which contributed the different approaches to work de-

sign ha .so contributed different techniques for analyzing tasks, jobs, and processes for design and redesign purposes. These techniques include job analysis methods created by specialists in industrial psychology, variance analysis methods created by specialists in sociotechnical design, time and motion analysis methods created by specialists in industrial engineering, and linkage analysis methods created by specialists in human factors. This section briefly describes a few of these techniques to illustrate the range of options. The reader is referred to the citations for detail on how to use the techniques.

14.5.4 Job Analysis

Job analysis can be broadly defined as a number of systematic techniques for collecting and making judgments about job information. Information derived from job analysis can be used to aid in recruitment and selection decisions, determine training and development needs, develop performance appraisal systems, and evaluate jobs for compensation, as well as to analyze tasks and jobs for job design. Job analysis may also focus on tasks, worker characteristics, worker functions, work fields, working conditions, tools and methods, products and services, and so on. Job analysis data can come from job incumbents, supervisors, and analysts who specialize in the analysis of jobs. Data may also be provided by higher management levels or subordinates in some cases.

Considerable literature has been published on the topic of job analysis (Ash, Levine & Sistrunk, 1983; Gael, 1983; Harvey, 1991; U.S. Department of Labor, 1972). Some of the more typical methods of analysis are briefly described below:

1. Conferences and Interviews. Conferences or interviews with job experts, such as incumbents and supervisors, are often the first step. During such meetings, information collected typically includes job duties and tasks, and knowledge, skill, ability (KSA), and other worker characteristics.
2. Questionnaires. Questionnaires are used to collect information efficiently from a large number of people. Questionnaires require considerable prior knowledge of the job to form the basis of the items (e.g., primary tasks). Often this information is first collected through conferences and interviews, and then the questionnaire is constructed and used to collect judgments about the job (e.g., importance and time spent on each task). Some standardized questionnaires have been developed which can be applied to all jobs to collect basic information on tasks and requirements. An example of a standardized questionnaire is the Position Analysis Questionnaire (McCormick, Jeanneret & Mecham, 1972).
3. Inventories. Inventories are much like questionnaires, except they are simpler in format. They are usually simple checklists where the job expert checks whether a task is performed or an attribute is required.
4. Critical Incidents. This form of job analysis focuses only on aspects of worker behavior which are especially effective or ineffective.
5. Work Observation and Activity Sampling. Quite often job analysis includes the actual observation of work performed. More sophisticated technologies involve statistical sampling of work activities.
6. Diaries. Sometimes it is useful or necessary to collect data by having the employee keep a diary of activities on his or her job.
7. Functional Job Analysis. Task statements can be written in a standardized fashion. Functional job analysis suggests how to write task statements (e.g., start with a verb, be as simple and discrete as possible, etc.). It also involves rating jobs on the degree of data, people, and things requirements. This form of job analysis was developed by the U. S. Department of Labor and has been used to describe over 12,000 jobs as documented in the Dictionary of Occupational Titles (Fine & Wiley, 1971; U.S. Department of Labor, 1977).

Very limited research has been done to evaluate the practicality and quality of various job analysis methods for different purposes. But analysts seem to agree that combinations of methods are preferable to single methods (Levine, Ash, Hall & Sistrunk, 1983).

Current approaches to job analysis do not give much attention to analyzing teams. For example, the Dictionary of Occupational Titles (U.S. Department of Labor, 1972) considers "people" requirements of jobs, but does not address specific teamwork KSAs. Likewise, recent reviews of the literature mention some components of teamwork such as communication and coordination (e.g., Harvey, 1991), but give little attention to ot teamwork KSAs. Thus, job analysis systems may need to be revised. Teamwork KSAs are more likely to emerge with conventional approaches to job analysis because of their unstructured nature (e.g., interviews), but structured approaches (e.g., questionnaires) will have to be modified to query about teamwork KSAs.

14.5.5 Variance Analysis

Variance analysis is a tool of sociotechnical design used to identify areas of technological uncertainty in a production process. Variance analysis aids the organization in designing jobs so jobholders can control variability in their work. A variance is defined as an unwanted discrepancy between a desired state and an actual state and is a deviation that falls outside a specified range of tolerance. The variance concept is applied to the technical system and involves five steps (Davis and Wacker, 1982):

1. List variances that could impede the production or service process.
2. Identify causal relationships among variables. Job designers can use information about dependencies and points of interrelatedness in order to cluster tasks and link jobs.
3. Identify and focus on key variances whose control is most critical to successful outcomes.
4. Construct a table of key variance control which contains brief descriptions of variances.
5. Construct a table of skills, knowledge, information, and authority needed so workers can control key variances.

Chapters 12 and 13 in this handbook provide more information about task and workload analysis.

14.5.6 Time and Motion Analysis

Industrial engineers have created many techniques for use in the study of job design which help job designers visualize operations in order to improve efficiencies. A considerable literature exists on the topic (e.g., Mundel, 1985; Niebel, 1988). Some of the methods are briefly described below.

Process charts graphically represent separate steps or events that occur during performance of a task or series of actions. Charts usually begin with inputs of raw materials and follow the inputs through transportation, storage, inspection, production, and finishing. Charts use symbols for different types of operations. Examples of different types of process charts include Operation Process Charts, which show a chronological sequence of operations, inspections, time allowances, and materials used in a process from arrival of raw material to packaging of the finished product. Another type of process chart is a Worker and Machine Process Chart which combines operations of both the worker and equipment and shows idle time and active time for both. These charts are used to analyze only one work station at a time.

Flow diagrams differ from process charts because they utilize drawings of an area or building in which an activity takes place. Flow diagrams help designers visualize the physical layout of the work. Lines are drawn to show the path of travel. Process chart symbols and notations can be included to describe the process.

Possibility guides are tools for systematically listing all possible changes suggested for a particular activity or output. They assist in examining consequences of suggestions to aid in selecting the most feasible changes. Suggestions are recorded and are coded as to what classes of change they affect: job, equipment, process, product design, or raw materials.

Network diagrams are better for use in describing complex relationships than the above techniques. They are useful for situations where: (a) dependencies are tangled and do not progress uniformly, (b) the output has many components, (c) many of the components are service-type outputs, (c) the relationships among the steps of the process with respect to time are of vital importance, or (d) the process is too complex or large in scope for the usual process chart analysis. In network diagrams, a circle or square represents a "status" which is a partial or complete service or substantive output. Heavy lines are "critical paths" which determine the minimum time in which a project can be expected to be completed.

14.5.7 Linkage Analysis

Linkage analysis is a technique used by human factors specialists to represent relationships between components in a work system (Sanders and McCormick, 1987). Components can be either people or things and the relationships between them are called "links." Links fall into three classes as listed below with examples:

1. Communication links.
   a. Visual (person to person or equipment to person).
   b. Auditory, voice (person to person, person to equipment, or equipment to person).
   c. Auditory, nonvoice (equipment to person).
   d. Touch (person to equipment).
2. Control links.
   a. Control (person to equipment).
3. Movement links (movements from one location to another).
   a. Eye movements.
   b. Manual movements, foot movements, or both.
   c. Body movements.

Information collected about links generally includes how often components are linked, in what sequence links occur, and the importance of links. Once obtained, linkage data can be summarized in link tables, adjacency layout diagrams, and spatial operational sequences (SOS) diagrams. Designers of physical work arrangements use these tools to represent relationships between components so that they can better understand how to place these components in advantageous locations in order to minimize lengths between frequent or important links. With complex systems involving many components, quantitative analysis techniques, such as linear programming, can be used.

14.5.8 Example of an Evaluation of a Job Design

Studies conducted by Campion and McClelland (1991, 1993) are described as an illustration of an evaluation of a job redesign project. They illustrate the value of considering an interdisciplinary perspective. The setting was a large financial services company. The units under study processed the paperwork in support of other units which sold the company's products. Jobs had been designed in a mechanistic manner such that individual employees prepared, sorted, coded, and computer input the paper flow.

The organization viewed the jobs as too mechanistically designed. Guided by the motivational approach, the project intended to enlarge jobs by combining existing jobs in order to attain three objectives: (1) enhance motivation and satisfaction of employees, (2) increase incumbent feelings of ownership of the work, thus increasing customer service, and (3) maintain productivity in spite of potential lost efficiencies from the motivational approach. The consequences of all approaches to job design were considered. It was anticipated that the project would increase motivational consequences, decrease mechanistic and perceptual/motor consequences, and have no affect on biological consequences (Table 14.1).

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 focused team meetings were conducted with incumbents, managers, and analysts. The study was repeated at five different geographic sites.

Results indicated 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 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.

In a two-year follow-up evaluation study, it was found that the costs and benefits of job enlargement changed substantially over time, depending on the type of enlargement. Task enlargement, which was the focus of the original study, had mostly long-term costs (e.g., lower satisfaction, efficiency, and customer service, and more mental overload and errors). Conversely, knowledge enlargement, which emerged as a form of job design since the original study, had mostly benefits (e.g., higher satisfaction and customer service, and lower overload and errors).

There are several important implications of the latter study. First, it illustrates that the long-term effects of job design changes can be different than the short-term effects. Second, it shows the classic distinction between enlargement and enrichment (Herzberg, 1966) in that simply adding more tasks did not improve the job, but adding more knowledge opportunities did. Third, it illustrates how the job design process is iterative. In this setting, the more favorable knowledge enlargement was discovered only after gaining experience with task enlargement. Fourth, as in the previous study, it shows that it is possible in some situations to gain benefits of job design without incurring all the potential costs, thus minimizing the trade-offs between the motivational and mechanistic approaches to job design.

14.5.9 Example of an Evaluation of a Team Design

Studies conducted by the authors and their colleagues are described here as an illustration of an evaluation of a team design project (Campion, Medsker, and Higgs, 1993; Campion, Papper, and Medsker, 1995). They illustrate the use of mutliple sources of data and multiple types of team effectiveness outcomes. The setting was the same financial services company as in the example job design evaluation above. Questionnaires based on Table 14.3 were administered to 391 clerical employees in 80 teams and 70 team managers in the first study (Campion, Medsker, and Higgs, 1993) and to 357 professional workers in 60 teams (e.g., systems analysts, claims specialists, underwriters) and 93 managers in the second study (Campion, Papper, and Medsker, 1995) to measure teams' design characteristics. Thus, two sources of data were used, team members and team managers, to measure the team design characteristics.

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

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, followed by job design, context, interdependence, and composition characteristics (see Figure 14.1). 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 than less well designed teams.

Results were stronger when the team design characteristics data were from team members, rather than from the team managers. This illustrates the importance of collecting data from different sources to gain different perspectives on the results of a team design project. Collecting data from only a single source may lead one to draw different conclusions about a design project than if one obtains a broader picture of the team design results from multiple sources.

Results were also stronger when outcome measures came from employees (employee satisfaction, team member judgments of their teams), managers rating their own teams, or productivity records, than when they came from other managers or from performance appraisal ratings. This illustrates the use of different types of outcome measures to avoid drawing conclusions from overly limited data. This example also illustrates the use of separate data collection methods and times for collecting team design characteristics data versus team outcomes data. A single data collection method and time in which team design characteristics and outcomes are collected from the same source (e.g., team members only) on the same day can create an illusion of higher relationships between design characteristics and outcomes than really exist. Although it is more costly to use multiple sources, methods, and administration times, the ability to draw conclusions from the results is far stronger if one does.

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