

**WORKING PAPER SERIES - 269  
JOB DESIGN AND EMPLOYEE SELECTION  
Chapter 6**

**of  
HUMAN RESOURCE MANAGEMENT: AN ECONOMIC APPROACH  
by**

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**DRAFT: February 1994**

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## **JOB DESIGN AND EMPLOYEE SELECTION**

Economic concepts of productivity at the level of the firm, which were introduced and discussed in Chapter 5, generally treat capital and labor as lumps of resources which are combined in a production process (function) to yield certain outputs. The microeconomics of human resources focuses centrally on the efficiency consequences of combining certain quantities of "labor" and capital. With respect to the issue of how particular jobs are designed, microeconomics has relatively little to say, although the macroeconomic principle of the division of labor has important implications for the design of jobs in the firm. Microeconomics has quite a lot to say (explicitly and implicitly) about employee selection, however. In this chapter, we examine the processes by which jobs are designed and employees are selected to fill jobs. We ground our examination of these processes in both economic and organizational behavior concepts of human resource management.

### **Traditional Job Design**

The economic concept of the division of labor has been of major importance to thinking about and designing jobs. A synonym for the division of labor is "specialization," and the way in which jobs have traditionally been designed in firms, especially large corporations, reflects strong application of the specialization principle. Such specialization, as Adam Smith pointed out long ago, is a major source of productivity gains in a commercial enterprise

and of growth in an economy as a whole<sup>1</sup>.

Surely the best known argument for job specialization was advanced by the industrial engineer Frederick W. Taylor. Writing and practicing as a consultant early in the 20th century, Taylor coined the term "scientific management" to refer to the design (or redesign) of jobs according to the principles of industrial engineering<sup>2</sup>. In application, these principles identified the key tasks or elements of a job, yielded measurements of the "standard" time required to complete each task or element of a job, and constructed (or reconstructed) the job so as to have it performed in its most efficient (time and thus cost effective) manner. Taylor's work spawned the field of motion time management, or "time study," as well as numerous disciples (such as Frank and Lillian Gilbreth) who extended and refined applications of scientific management to the design of jobs<sup>3</sup>.

A major consequence of the application of principles of scientific management to job design was that jobs became increasingly specialized or, as some prefer, narrow. In Taylor's world, a worker performed a specialized/narrow job repetitively under the eye of a supervisor (monitor) and repeated this process until the end of his work shift<sup>4</sup>. Performance of this narrow job according to the time study-established standards for it yielded more reliable (higher quality) job performance and larger quantities of output than had been the case prior to the introduction of the principles of industrial engineering to the workplace. For the firm, this translated into higher output per

worker, lower unit labor costs, lower product prices, increasing sales volume, and increasing returns (though no change in proportionate returns) to capital and labor<sup>5</sup>.

The design of jobs and organization of work according to the principles of scientific management fit virtually hand in glove with the development of the hierarchical form of business enterprise, which also followed the principle of the division of labor. Today, terms such as hierarchy and bureaucracy are typically regarded as pejoratives, and the hierarchical or bureaucratic firm is considered to be inefficient, if not anachronistic. But earlier in the 20th century, practitioner executives such as Alfred Sloan and Chester Barnard extolled the productive virtues of the firm designed according to the principles of bureaucratization, and even earlier the famous sociologist Max Weber did the same from a theoretical perspective<sup>6</sup>.

Consequently, the prototypical firm of the mid-20th century was organized into narrow functional components and jobs were organized into collections of narrow repetitive tasks. At the level of the firm the concept of returns to scale underlay the practice of functional specialization, while at the level of the job the concept of efficiency underlay the practice of narrowly designed work. This organizational and job specialization, in turn, reached its zenith during an era of high concentration--oligopoly--in many industries and monopoly in some other industries<sup>7</sup>.

## **New Job Design**

Enhanced global competition in some industries and the deregulation of other industries during the late 1970s and early 1980s seemed to have brought about new thinking in terms of the way in which jobs and work are organized--indeed and more fundamentally, in the way in which business enterprises are organized. The concept of organizing a firm according to the principles of functional specialization increasingly came under scrutiny and attack during this period, as did the design of jobs according to the principles of task specialization. Terms such as "flexibility," "broadbanding," "multiskilling," "reengineering," and "decentralization" appeared with increasing frequency in academic and practitioner circles during the 1980s and early 1990s, and they were invoked to question and challenge the traditional ways of organizing business enterprises and jobs<sup>8</sup>. In this regard some academics posed a model of a "high commitment" work system featuring broadly designed jobs and work performed in teams, in sharp contrast to narrowly designed jobs and work performed individually in the traditional "high control" work system<sup>9</sup>. One version of the contrasting job design principles between "high commitment" and "high control" work systems is shown in Exhibit 1. Moreover, the contrast between high commitment and high control work systems was proffered not only in conceptual terms but in normative terms; high commitment work systems were claimed to be "better"--in terms of quantity and quality of output, job satisfaction, and commitment of employees to the business

enterprise--than high control work systems<sup>10</sup>. Analogously, various reengineering and transformation models of business organizations featuring decentralized decision making, lateral (rather than vertical) relationships, and flexible or modular communications systems and information networks were advanced during the 1980s and early 1990s. These systems, too, were claimed to be "better"--in terms of organizational outputs or performance--than more conventional hierarchical/bureaucratic organizational systems<sup>11</sup>.

To gain insight into traditional/conventional job design, consider the titles and descriptions of duties and responsibilities for the jobs of airline pilot and in-flight steward shown in Exhibit 2. These descriptions are drawn from a major U.S. air transportation company and reflect the characteristics of specialization and narrowness associated with scientific management. In contrast, consider the titles and descriptions of duties and responsibilities for the jobs of flight manager and customer service manager shown in Exhibit 3. These descriptions are drawn from a 1980 start-up air transportation company and reflect the characteristics of broadness and flexibility associated with newer broadbanding or multiskilling concepts of job design (or, as this air carrier referred to it, "crossutilization").

An especially important example of relatively broader, more flexible jobs designed according to principles of multiskilling and broadbanding is that at the New United Motors Manufacturing Company, Inc. (NUMMI), which produces mid-sized automobiles and trucks<sup>12</sup>. This joint venture between the General Motors Corporation

(GM) and the Toyota Automobile Corporation (Toyota) commenced operations in 1984 and has only one production worker classification (titled "production worker"), in contrast to the numerous, more specialized job classifications characteristic of traditional job design in General Motors automobile assembly plants located in North America and elsewhere. These differences can be seen by comparing Exhibits 4 and 5<sup>13</sup>.

Another important influence on the design of jobs is technological change. While technological change is often thought to displace workers from jobs, and sometimes does so, more typically it alters the content and design of work. Consider, for example, the effects of the personal computer on the work of managers, professionals, secretaries and others. One such effect is to reduce interpersonal contacts and interactions and increase man-machine contacts and interactions. With the data bases and software available on personal computers, line managers are less dependent than previously on specialized staff personnel and now spend relatively more time interacting with machines and less time interacting with staff. Secretaries, who at one time took dictation and provided various other in-person services to professionals and managers, now perform letter writing and related tasks on the personal computer and are far more word processors than traditional secretaries<sup>14</sup>.

Automation and roboticization of various production tasks, such as in oil refining and automobile production, have increased the "monitoring" content and reduced the "production" content of

manufacturing jobs. Similarly, the enhanced use of computing technology in commercial aircraft by which takeoffs, landings, and flight routes are "computer-controlled" has increased the monitoring content and reduced the "flying" content of pilots' jobs<sup>15</sup>.

Relatedly, the use of specialized subcontractors to manufacture computer chips, sound boards, video screens, disk drives and the like has reduced the production content of manufacturing jobs in firms such as Digital Equipment Corporation, Hewlett-Packard, Apple Computer, Sun Worksystems and International Business Machines Corporation, and increased the assembly content of such jobs. Development of the personal computer together with the advent of electronic mail systems has meant that millions of workers in the U.S. labor force now perform part (and in some cases all) of their work at home rather than in company offices and factories. The introduction of fax machines and cellular telephones permits sales personnel to work out of their cars, homes, and various other off-site locations in addition to or in substitution of working out of the "office." These are but a few examples of the effects of technological change on the content and thus the design of jobs<sup>16</sup>.

The movement towards flatter organizations and smaller work forces in large firms (sometimes referred to as "rightsizing") has also had a major influence on career paths in the internal labor markets of firms. Traditionally, good or exceptional performance by a worker in an entry level job led to promotion to intermediate

level and then higher level jobs in the firm. The concept of a vertically structured job ladder underlay this promotional path. But with flatter or less hierarchically structured firms comes a reduction in vertical promotion opportunities, while work force downsizings (reductions) in large firms appear to be accompanied by expansion of the job duties and responsibilities of "surviving" employees<sup>17</sup>. Thus, in the 1990s, firms are faced with the problem of managing "horizontal promotions," and many jobs seem to have become bigger jobs. These developments, in turn, have substantially eroded if not eliminated the older concept of a career with the company<sup>18</sup>.

Underlying some of the trends described here is the concept of flexible specialization, which means that an individual worker can be used to perform a variety of tasks, rather than a single narrow task, depending upon customer demand, technology, and staffing levels in the firm. Indeed, flexibility may be said to be the watchword of restructured, flatter organizations, in contrast to the notion of specialization which previously guided the design of organizations and jobs. But flexibility of job content or skills can be distinguished from flexibility of work schedules and arrangements.

For example, during the 1970s firms began to experiment with flexible work schedules under which workers could report to and leave work during bands of hours rather than at fixed points in time<sup>19</sup>. To illustrate, an insurance company which previously required all of its office clerical staff to report for work at 8:30AM and leave work at 5:00PM now permits office clerical staff

to report for work between 7:00 and 10:00AM and leave work between 3:30 and 6:30PM. In some firms, employees may choose between performing their work during a four day week as opposed to a five day week. And, in a few firms, employees may work six day weeks for part of the year, five day weeks for other parts of the year, and four day weeks for still other parts of the year.

How prevalent is the use of flexible work schedules, or flexitime, in the U.S.? One answer to this question is provided by the U.S. Bureau of Labor Statistics (BLS) data contained in Table 1, which show that between 13 and 14 percent of the work force is covered by flexitime arrangements. Further, the incidence of flexitime is higher among part-time than among full time workers, higher among white than among black workers, higher among managers and professionals than among other occupational groups, higher among college graduates than among high school and elementary school graduates, and is positively correlated with family income.

Table 1 also provides data on work at home in the U.S. For the work force as a whole, more than one out of six works at home, with the incidence of "home work" being higher among men than among women, higher among full-time than among part-time workers, much higher among white than among black workers, most prevalent among middle-aged workers compared to other age groups, far more prevalent among managers and professionals than among other occupational groups, and highly positively correlated with family income. Note, further (and not shown in Table 1), that almost half of all self-employed workers in the U.S. work at home, in contrast

to less than 10 percent of the work force in the manufacturing, communications, utilities and transportation sectors<sup>20</sup>.

A somewhat different perspective on flexible work arrangements in the U.S. is provided by the data in Table 2, which come from a recent Columbia University study of human resource policies and practices in a sample of 495 publicly-held companies<sup>21</sup>. Table 2 provides data on the proportions of workers in these firms who are on flexitime, work part-time, or share a job with at least one other employee (so-called work sharing) as well as data on the number of job classifications in these firms. For all four measures of flexible work arrangements, lightly unionized firms appear to be more flexible than highly unionized firms. Corresponding to the BLS data, the Columbia data show that flexitime is more prevalent among managers and professionals than among other occupational groups, while part-time employment and work-sharing are more prevalent among clerical workers than among other occupational groups. There are also relatively fewer job classifications among clerical workers than among other workers in these firms. Manufacturing businesses have a higher proportion of workers on flexitime than nonmanufacturing businesses, but lower proportions of part-time workers, workers in work-sharing arrangements and fewer job classifications than nonmanufacturing businesses. Flexitime and part-time employment are more prevalent in large than in small firms, but small firms have far fewer job classifications than large firms as well as a slightly higher proportion of workers in work-sharing arrangements than large firms. Older firms differ from

younger firms in about the same ways as large firms differ from small firms, except that older firms have a slightly higher proportion of workers in work-sharing arrangements than younger firms.

Presented in Table 3 are certain relationships between selected human resource management characteristics and flexible work arrangements in the firms in the Columbia data set. Observe that senior human resource executive involvement in business planning (measured on a 1=never to 7=always scale) and the use of formal job analysis by these businesses are each positively associated with the incidence of flexible work arrangements in these businesses. Programs of employee financial participation are positively associated with flexitime and the presence of fewer job classifications, but negatively associated with part-time employment and work-sharing in these businesses. Programs of information sharing are positively associated with the use of fewer job classifications and work-sharing, but negatively associated with the use of flexitime and part-time employment in these businesses. The validation of employee selection tests is negatively associated with all four measures of flexible work arrangements in these businesses.

Flexible work arrangements are often claimed to improve the performance of business organizations, and the Columbia data set provides an opportunity to examine the relationships between flexible work arrangements and selected measures of firms' financial performance. These relationships are presented in Table

4 in which the firms in the Columbia data set have been split at the median to create categories of high and low return on investment (ROI), high and low return on assets (ROA), and high and low productivity (PROD or revenue per full-time equivalent employee). Observe from the contingency relationships in Table 4 that financial performance and flexible work arrangements appear to "go together" in the sense that the incidence of each of the four forms of flexible work arrangements is higher in high ROI, high ROA and high PROD firms than in low ROI, low ROA and low PROD firms.

A set of regression analyses in which each of these financial performance measures served as the dependent variable, each of the four forms of flexible work arrangements served as independent variables, and other factors (for example, firm size, age, industry, unionization, capital/labor ratio, etc.) served as control variables found that flexible work arrangements were generally not significantly associated with financial performance or bordered on significant positive associations<sup>22</sup>. Even if more "robust" findings had emerged from this analysis, however, they would not address the underlying causal relationships between flexible work arrangements and firms' financial performance. This is because time-series or longitudinal data rather than cross-section data are required in order to probe more deeply into the relationships between firm financial performance and flexible work arrangements as well as changes in these relationships over time. Still, it is important to remember that flexible work arrangements as well as flexible organizational structures have been offered as

"antidotes" to highly specialized jobs and hierarchically structured organizations in large part because such flexibility is thought to bring about improved job and organizational performance. Therefore, it is important to test these propositions empirically-- ideally with longitudinal data drawn from large representative samples of companies in the U.S. and abroad.

An even broader perspective on job and work restructuring than has been presented here so far is offered by Robert Reich, who was appointed by President Clinton in 1992 to the position of U.S. Secretary of Labor. Reich distinguishes among three types of jobs: routine production services, in-person services, and symbolic-analytic services<sup>23</sup>. In this schema, routine production services jobs are "traditional" jobs requiring the performance of repetitive tasks with little or no variation. Such jobs are often found in the manufacturing sector and are performed by blue-collar workers and foremen, but they can also be found in the service sector and are performed by clerical personnel and supervisors. According to Reich, routine production services job, especially in manufacturing, are increasingly being exported from the U.S. and other advanced economies to lower wage nations<sup>24</sup>. The consequence of this industrial shift is to lower the demand for routine production services jobs in economically advanced nations (and to raise the demand for routine production services jobs in developing nations). For the U.S., Reich estimates that only about one-quarter of the work force is employed in routine productions services jobs.

In-person services jobs also entail simple repetitive tasks

but must be provided on a person-to-person basis and are not sold worldwide. Sales workers, barbers, hotel and restaurant workers, cashiers, hospital attendants, and many other types of workers perform these in-person services jobs. Reich estimates that in-person services jobs account for about 30 percent of all jobs in the U.S. economy, and while he notes the increased demand for in-person services jobs that has occurred in the U.S. and other advanced nations in recent years, he implies that the supply of workers to fill these jobs has grown faster than the demand for them<sup>25</sup>. Consequently, in-person services jobs are "typically" relatively low-wage jobs.

Symbolic-analytic services jobs require problem identification and problem-solving skills. While, like routine productions services jobs, symbolic-analytic services jobs can be traded worldwide, they are far less standardized than routine production services jobs. Software engineers, lawyers, computer systems analysts, investment bankers and research scientists are among those who perform symbolic-analytic services jobs, according to Reich, and the demand for specialists of these types has been growing relatively faster than the supply of them in advanced nations. Reich estimates that about 20 percent of the U.S. work force is employed in symbolic-analytic jobs<sup>26</sup>.

A major consequence of the differences in demand-supply relationships for routine productions services jobs and in-person services jobs, on the one hand, and symbolic-analytic services jobs, on the other hand, according to Reich, is widening income

inequality. In other words, Reich's analytical framework links changes in demand-supply conditions in particular labor markets -- or, put differently, changes in job content and job design in the workplace--to changes in income distribution in the economy and society.

There can be little doubt that the distribution of family income in the U.S. has become more unequal in recent years. This is evident from the data presented in Table 5, which show the proportions, or shares, of aggregate family income received by fifths of families in the decennial census years of 1970, 1980 and 1990<sup>27</sup>. Observe that during this 20-year period, the share of national income received by the lowest fifth of families declined from 4.1 to 3.9 percent, and that the share of national income received by the highest fifth of families increased from 43.3 to 46.6 percent. Also observe that the share of national income received by the middle 60 percent of U.S. families declined from 52.7 to 49.5 percent of national income between 1970 and 1990. Apparently, then, not only has the gap between the "rich" and the "poor" widened in recent years, the gap between the "rich" and the "middle class" has also widened! This phenomenon is also reflected in the Gini ratio, which is a measure of income inequality in which perfect equality is represented by .000 and perfect inequality is represented by .999. Between 1970 and 1990, according to the data in Table 5, the Gini ratio for the U.S. increased from .394 to .428.

Two other observations about the family income data shown in

Table 5 are worth mentioning here. First, real family income decreased slightly between 1970 and 1980 (from a mean of \$33,689 to a mean of \$33,409), but increased markedly between 1980 and 1990 (from a mean of \$33,409 to a mean of \$37,403)<sup>28</sup>. Hence, at least during the second of the two decades considered here, all fifths of families were sharing (albeit unequally) in an enlarging economic "pie." Set against this, however, is the decline in real family income that has been experienced in the U.S. during the economic recession of the early 1990s.

Second, the data presented in Table 5 are not for cohorts or longitudinal samples of families whose incomes were monitored from 1970 through 1990. Instead, the data are for cross-section samples or snapshots of families in 1970, 1980 and 1990. This means that a particular family that was in the lowest, highest or other income fifth of families in 1970 was not necessarily in the same fifth in 1980 or 1990. Stated differently, the data in Table 5 do not address the matter of the movement of families among the fifths of aggregate income distribution in the U.S. between 1970 and 1990, and it should not be concluded from these data that any single family or group of families was permanently consigned to the same fifth of families during this 20-year period. Further, and because individual workers are also not permanently consigned to the categories of routine production services jobs, in-person services jobs, and symbolic-analytic services jobs, the strong link between this threefold job/occupation categorization scheme and income inequality forged by Reich may be weaker, perhaps far weaker, than

he realizes.

Nevertheless, the linking of job design to income distribution helps to broaden our perspective on the types of initiatives, reviewed earlier, that many employers have undertaken to create more flexible work arrangements. Where such flexibility translates into broader, more varied jobs requiring work in teams, self-management and multiskilling on the part of job holders, or into flexible work schedules, it may enhance both the performance of the firm and the income and satisfaction of employees. But where such flexibility translates into (involuntary) part-time employment, (forced) work-sharing, and contingent or temporary employment, it may enhance the performance of the firm but reduce the income and job satisfaction of employees<sup>29</sup>. Thus, job redesign, like many other human resource management initiatives, can have mixed consequences, depending upon whether one adopts the perspective of the firm, the perspective of core employees, or the perspective of peripheral/contingent employees.

### **Employee Selection**

The selection of employees to fill jobs is often thought to occur only for entry-level positions, but in practice selection decisions also take the form of promotions to vacant positions from the firm's internal labor market (commonly known as "promotion from within") and the hiring of applicants from the external labor market to fill vacancies at mid-level and senior positions in the firm. But because most selection and hiring decisions do occur for

entry level position, we begin this section by presenting what we label the "psychological model of employee selection,"<sup>30</sup> and then move on to consider "clinical selection."

The psychological model of employee selection is a statistical model which attempts to determine quantitatively the relationships between predictors and criteria. In the context of employee selection decisions, examples of "traditional" predictors include test scores, educational credentials, interviews, prior work experience and reference letters. Less traditional, which is to say more contemporary, examples of predictors for use in selecting employees include polygraph (lie-detector) tests, drug tests, personality tests, and assessment centers. Any characteristic or attribute of an individual or sets of individuals which is used in the selection process is, from this perspective, regarded as a (potential) predictor.

Criteria refer to dimensions of job performance which those charged with selection decisions hope to predict. Such criteria can include the number of products produced, the quality of products produced, the number of products sold, the dollar volume of products sold, the number of forms processed or letters typed (word processed), the number of customers serviced, the quantity of machines repaired, and many, many others. Fundamentally, the psychological model of employee selection is most applicable to large-scale selection decisions in which there are many jobs to fill and many applicants for those jobs. The model's methodology correlates predictors with criteria in an attempt to determine the

validity and reliability of the predictors. In plainer language, this model attempts to identify those selection tools and methods which will accurately and repeatedly predict performance on the job<sup>31</sup>.

Consider, for example, a telephone company that is seeking to fill a telephone line repair technician position. Assume that this company has 78 such positions to fill and decides to advertise the job in newspapers and on the radio--that is, search the external labor market for job applicants. In addition, this company advertises the telephone line repair technician position by posting notices of the job vacancies on company bulletin boards and through its internal electronic mail system--that is, search the internal labor market for job applicants. As a result of these efforts, assume that the telephone company in this example has 465 applicants for 78 vacancies in telephone line repair technician positions. How should the company go about assessing the applicant pool to determine whom it should select--select in and select out--to fill its job vacancies?

The company could require each job applicant to take a basic telephone line repair technician knowledge test, and then use the results of the test to make hiring decisions. For example, if the test results ranged between 24 and 96, with zero representing the lowest and 100 representing the highest possible level of knowledge about telephone line repair, the company might simply select the 78 individuals with the highest scores on the test and offer them telephone the vacant line repair technician jobs. In this instance,

the test score is taken to be the predictor of subsequent performance in the job of telephone line repair technician.

The test does not actually measure such performance itself, however. Put differently, the test score is a prospective measure--predictor--of how an individual is likely to perform in the job of telephone line repair technician after (and if) he is hired to fill this position. This method of making selection decisions is known as synthetic validity. In the case of professionally developed selection tests, experts in the job specialty in question are often asked to write sample questions for the selection test, with such questions intended to capture relevant performance dimensions of the job--or what we refer to as "criteria." Alternatively, the company may undertake a study of the job to determine the relevant performance dimensions of the job--a process known as "job analysis"--and then use these dimensions to construct questions designed to test an applicant's knowledge of the job<sup>32</sup>. For the job of telephone line repair technician, performance dimensions might include assembly and disassembly of telephone switching equipment, wire stripping, cable soldering, reporting to a supervisor on repairs completed, and reporting to a commercial customer on repairs completed. The selection test used by the telephone company in this example presumably will yield (synthetic) results reflecting applicants' knowledge of these performance dimensions of the telephone line repair technician job.

If the telephone company were to use test scores as the sole predictor of subsequent performance in the job of telephone line

repair technician to make its employee selection decisions, it could then attempt (further) to validate this predictor by measuring the performance of its new hires after they have been on the job for, say, six months. For this purpose, assume that the performance of each of the 78 new telephone line repair technicians is evaluated by their respective supervisors on or about the sixth month after they became employed by the company, and further assume that the evaluation "format" used by the company yields a ranking of the employees from 1, representing the highest ranking employee, to 78, representing the lowest ranking employee.

The telephone company would then proceed to correlate the results of the test scores which were obtained prior to hiring of the 78 new telephone line repair technicians with the performance ranking of these technicians following their first six months on the job. If the test results, which in this example may have ranged between 64 and 96, are shown to be positively correlated with the technicians' job rankings, and if this correlation (coefficient) is statistically significant (which means that the magnitude of the correlation would have been unlikely to occur by chance), then the psychological model of employee selection (and, in this case, of test validation) leads to the conclusion that the knowledge test is a "valid" predictor of job performance. This type of validation procedure is known as "concurrent validation" because it correlates test scores (or other predictors) with job performance only for those employees who are actually hired, and not for all those who actually applied for the position of telephone line repair

technician.

If our telephone company continued to correlate test scores with telephone line repair technicians' job performance rankings at six-month intervals over, say, a two-year period, and if the correlations between predictor (test scores) and criterion (performance rankings) continued to be positive and statistically significant, the firm's confidence in the validity of its selection instrument (the knowledge test) would grow and it would be very likely to continue to use the knowledge test for future employee selection decisions. When a predictor, such as a knowledge test, is shown to be significantly associated (positively or negatively) with a criterion, such as job performance ranking, over time or multiple trials, the predictor is said to be "reliable." The psychological model of employee selection emphasizes both the validity and reliability of any and all selection tools, and a predictor (such as the knowledge test) which is valid at one point in time but not over time (that is, the predictor is not reliable) is considered to be inferior to a predictor which is consistently valid (or stable) over time.

An alternative procedure to concurrent validation is "predictive validation"<sup>33</sup>. The main difference between these two procedures can be illustrated as follows. First, assume that our telephone company has experienced a very large increase in customer demand for its products and services, and therefore has also experienced a very large increase in its (derived) demand for telephone line repair technicians. Second, assume further that this

labor demand increase is so large that the telephone company will hire everyone who applies for the job of telephone line repair technician--in the example used here, the company hires all 465 job applicants. Third, assume that the company administers the knowledge test to all 465 job applicants just prior to the time of their hire (even though it hires them all). Fourth, assume that the company proceeds to correlate these test scores with job performance rankings after the new technicians have been on the job for six months (in this case, the technician-employees are ranked from one to 465). Fifth, assume that the correlation (coefficient) between test scores and performance rankings is positive and statistically significant.

The conclusion to be drawn from this validation "exercise" is the same as that reached previously in the case where only 78 telephone line repair technicians were hired, namely, that the selection test is valid. In this instance, however, the validation has occurred for all 465 job applicants/hires or, in other words, for the entire pool of applicants, rather than for a portion of the applicant pool. This, in essence, is the difference between predictive validation and concurrent validation. Armed with this knowledge of the selection test's (predictive) validation, our telephone company can decide to use the selection test for the future hiring of telephone line repair technicians during periods when labor demand is such as to not permit or require the hiring of all job applicants. By validating its selection test on the entire applicant/hire pool (all 465 applicants in our second example),

rather than on a subset of the pool (the 78 hires in our first example), the company has obtained stronger, which is to say better, evidence of the validity of its telephone line repair knowledge test. And, if the company continued to validate its selection test among all 465 hires at six-month intervals over a two-year period, it would obtain stronger evidence of the reliability of the test than if this validation procedure was limited to only 78 hires.

Let us momentarily return to our first example in which the 78 applicants for the position of telephone line repair technician who scored highest on the knowledge test are hired by the telephone company. Assume that the company then performed the concurrent validation procedure described above, relating test scores to job performance rankings after the first six months, and that the overall correlation (coefficient) was positive but not statistically significant. In investigating further the relationship between test scores and job performance rankings, the company discovers that while for the majority of the 78 employees the test scores appear to correlate positively or "go together" with performance rankings, for two subgroups of the 78 employees the test scores and performance rankings do not go together.

In the case of one of the subgroups of technician-employees, relatively high test scores and low performance rankings are observed. In the case of the other subgroup of technician-employees, relatively low test scores and high performance rankings are observed. In the first instance and in the terminology of the

psychological model of employee selection, the company is observing what is known as "Type I (selection) error." That is, the test scores "predicted" relatively high job performance, but actual job performance turned out to be relatively low. In the second instance and again in the terminology of the psychological model of employee selection, the company is observing what is known as "Type II (selection) error." That is, the test scores "predicted" relatively low job performance, but actual job performance turned out to be relatively high. These two contrasting phenomena are portrayed in Figure 1.

In practice, Type I employee selection errors are more easily discovered by the firm than Type II selection errors. This is because job applicants with high test scores (predictors) are far more likely to be hired by a firm than job applicants with low test scores (predictors), so that by subsequently conducting concurrent validation studies the firm can "discover" its Type I selection errors. In the case of job applicants who are not hired, that is, "selected out" by a firm because they have low test scores, the firm cannot conduct validation studies to determine if Type II errors have occurred. Rather, to conduct such studies the firm in question must gain access to job performance data from other firms which have hired those job applicants who were rejected by the firm in question. As one might imagine, such data are difficult for a particular firm to obtain (especially from competitors), even if the firm actively sought such data.

In our telephone company example, we have dwelt on the use

of a test to make employee selection and hiring decisions. This is because tests--of skill, knowledge, aptitude, and personality--are widely used by firms to make selection and hiring decisions for a wide range of jobs and occupations. In practice, our hypothetical telephone company would be quite unlikely to make employee selection decisions based on test scores alone, even if these scores accurately distinguish among applicants' knowledge of the job of telephone line repair technician. This is because it is extremely rare for a single selection tool fully to predict actual job performance or fully to account for the variance in subsequent job performance after certain job applicants are hired--as our discussion of Type I and Type II selection errors implies. Therefore, most large-scale selection decisions involve multiple selection tools and techniques--predictors.

To illustrate, again using the case of our telephone company, a drug test may be administered to job applicants along with the knowledge test. Obviously, drug tests are administered to determine who among the applicant pool is and is not using (illegal) drugs. Those applicants who are found to be using (illegal) drugs are "predicted" to yield lower levels of job performance than those applicants who are not using (illegal) drugs, so that the drug test becomes another screening device in this selection process.

Our telephone company also may judge prior work experience as a telephone line repair technician to be a strong predictor of subsequent performance in this position. Consequently, personnel

staff of the telephone company may scrutinize the written forms submitted by applicants for telephone line repair positions for evidence of prior work experience in this specialty, and then screen the applicants based on whether or not they had such prior experience (or by the amount of such experience). Going further and if it is highly concerned about the security of the equipment--tools, materials, vehicles and the like--provided to telephone line repair technicians, our telephone company might use a polygraph (lie detector) test to screen/select job applicants.

In sum, a wide variety of procedures, methods, tools and techniques may be used by firms to make large scale selection decisions, and each of these may "add value" to the selection process in the sense of predicting performance on the job. Moving beyond our example of the telephone line repair technician job, the most widely used selection methods are interviews, aptitude tests, drug tests, and application blank items, such as prior work experience, education, and references<sup>34</sup>. Interestingly, many studies have shown that interviews have the relatively lowest validity and reliability when it comes to making selection decisions<sup>35</sup>. Equally as interesting, research has also shown that work sampling--having job applicants actually perform some or all components of the job for a short interval--has the relatively highest validity and reliability for the purpose of selecting employees. Yet, work sampling is among the least used selection methods<sup>36</sup>!

The incremental value added by one or another tool or method of large scale selection must be weighed against its cost. While it

is theoretically possible for a firm to use the full range of selection tools and methods in the hope of increasing the validity and reliability of selection decisions, there is an incremental cost of using each tool or method. The economic principle of diminishing marginal returns suggests that a firm will equate the cost and value of individual selection tools and methods in determining which set of tools and methods it will actually use to make employee selection decisions. This same process is referred to as "utility analysis" in the behavioral science literature on human resource management and personnel selection<sup>37</sup>.

A complicating factor in this regard may be termed the "proxy" effect. This refers to the fact (or likelihood) that one or more selection tools and methods replicate or proxy other tools and methods. Stated differently, there may be high intercorrelations among the several predictors used by a firm to make selection decisions. If, for example, the scores on aptitude tests, knowledge tests, interview protocols and the like are highly intercorrelated (that is, covary), then each individual selection tool is proxying the other and the amount of "value added" by each individual tool to the selection decision is small, perhaps even nonexistent. If such proxy effects do occur and are large, however, they can assist the firm in determining which selection tools to retain and which to discard--that is, they can aid in the cost-benefit analysis of multiple selection tools and methods<sup>38</sup>.

The psychological model of employee selection is so important and widely used that some of its unstated or implicit

assumptions about labor markets merit attention. Because the model assumes that the "problem" facing the firm when it comes to making selection decisions is that of winnowing the applicant pool to increase the likelihood of individuals performing well on the job once they are hired, the model assumes that there will always be more applicants than job vacancies. In the terminology of economics, the psychological model of employee selection assumes that the supply of labor will always exceed the demand for labor. While this assumption can generally be said to hold during periods of macroeconomic recession, such as occurred during the early 1990s, the assumption does not hold--is invalid--during periods of rapid macroeconomic growth, such as occurred during the mid-1980s. Indeed, it is well known that during periods of high labor demand selection/hiring standards and requirements will be reduced, just as it is well known that during periods of low labor demand selection/hiring standards will be raised. Stated another way, the predictors used to make employee selection decisions are not permanently fixed, as the psychological model of employee selection tends to imply, but instead vary according to external labor market conditions. Thus, it is not valid to assume that at any given point in time the labor market generally or certain occupational labor markets in particular will be characterized as excess supply-type markets when it comes to making employee selection decisions. Similarly, it is not valid to assume that when the labor market generally or certain occupational labor markets in particular are characterized by excess labor supply that this condition will

continue over time<sup>39</sup>.

Despite these caveats, it is equally important to appreciate that the psychological model of employee selection is fundamentally aimed at improving employee selection processes by making them more valid and reliable. From this perspective, selection processes based on the psychological model of employee selection should not be evaluated in isolation, but rather in relation to alternative selection processes that may be used by the firm. Historically, many selection decisions have been made not according to the predictor-criteria framework but, instead, according to personal favoritism, hunch, guess, bribery, payoffs, family connections and other "predictors" whose validity and reliability are far more doubtful than those of test scores, biographical information, written references, and the like<sup>40</sup>. Viewed from this perspective, the psychological model of employee selection is a framework with an accompanying methodology for enhancing the validity and reliability of employee selection decisions. Application of the framework does require sufficiently large numbers of job vacancies and sufficiently large numbers of job applicants to obtain the measurements of and to perform the statistical tests necessary to relate predictors to criteria in the context of employee selection decisions. In circumstances in which the number of job vacancies and/or the number of job applicants is small, the psychological model of employee selection cannot (as easily) be applied, and another type of selection process, which we refer to as clinical selection, must be undertaken.

By clinical selection we mean a selection process that does not feature the quantitative assessment of systematically measured predictors in relation to criteria and which, instead, relies heavily on qualitative judgments to make selection decisions. Perhaps the best examples of clinical selection at work are those instances in which firms are looking--searching--the labor market to fill single positions. Such a position might be that of Chief Executive Officer, company President, Director of Marketing, Chief Financial Officer or another high ranking job.

In recent years, it has become common for businesses to use executive search firms, such as Russell Reynolds, Inc. and Hewitt and Associates, to aid in filling high level job vacancies. Executive search firms typically maintain detailed information files on executives in a variety of firms and industries. When a high level job vacancy is made known to the executive search firm by its client company, these information files will be combed to determine if the background and experience of one or more "candidates" fits the specifications and requirements of the job in question. Via this process, one or more candidates may be recommended by the executive search firm to its client company. Clearly, this is a different process from that in which one or more candidates for vacant positions apply directly to the firm which has these vacancies (as is done for the types of jobs discussed above in the context of the psychological model of employee selection).

Typically, the next step in this process of executive

recruitment and selection is for the firm with the job vacancy to contact a few top ranking candidates and invite them to meet with and be interviewed by other executives of the firm. There may be several such meetings and many interviews during this clinical selection process, but the result is usually that the firm derives a short list of preferred candidates, ranks them, and then offers the job to the top candidate. If the top candidate turns down the job, the firm may offer the job to the next candidate or, instead, resume its labor market search to fill this position.

This ranking of candidates for an executive position in the context of a clinical selection process is based largely on the judgments that other senior executives form of the candidate based on his or her background, experience, and "impressions" made during the interviews<sup>41</sup>. Many of these impressions, and thus judgments, have to do with a candidate's (management) style and potential fit with the firm. The heavy reliance on personal and group judgment in this selection decision is, in the main, what gives rise to the label "clinical selection" to describe this process, and is also what most clearly distinguishes this process from a process based on the psychological model of employee selection.

Appointments to the most senior executive positions in a firm are made by the firm's board of directors, and this process is one of the clearest examples of clinical selection at work. In the 1991-93 period, the boards of directors of Hughes Electronics, General Motors Corporation, American Express, Kodak, IBM, Digital Equipment Corporation, Macy's, Motorola, Apple Computer and other

prominent corporations selected new Chief Executive Officers for their respective businesses. In some cases (such as General Motors and Apple) the appointees were selected from the internal labor market of the firm--promoted from within--and in other cases (such as Kodak and IBM) the appointees were selected externally from other firms. In none of these cases were predictors related to criteria using the statistical methods of the psychological model of employee selection. Rather, these appointments, as with appointments to single job vacancies in numerous contexts and circumstances, were made by a qualitative, judgmental process of clinical selection. This is not to say that clinical selection is somehow a better or worse process than "statistical selection," but it is to say that it is a different process from that of statistical selection. Both clinical selection and statistical selection are at work in the U.S. and elsewhere, and it is important to understand the characteristics and fundamental differences between these two major personnel selection processes.

### **Contentious Issues of Selection and Job Design**

The doctrines of private property rights and at-will employment which prevail in the U.S. and in some other nations might be thought to give the firm unbridled choice in determining whom it will and will not select for employment. Such free choice, however is circumscribed by legislation. In the U.S., for example, Federal legislation prohibits the use of sex, race, color, national origin, age and physical disabilities for the purposes of employee

selection, hiring, promotion, demotion, transfer, and work force reductions (the specific laws in this area are presented and discussed in Chapter 17). Similar, though less comprehensive, laws have been enacted in Canada, Great Britain, Australia and Japan. Succinctly stated in the terminology of the psychological model of employee selection, the intent of these laws is to prevent employee selection decisions from being made on the basis of predictors which are unrelated to criteria of job performance. In other words, and from this perspective, these laws declare that individuals' sex, race, color, national origin, religion, age and physical disabilities are unrelated to job performance<sup>42</sup>.

The merits and limitations of the various anti-discrimination statutes that exist in the U.S. and elsewhere have been and will continue to be vigorously debated. One point of contention in this debate is the extent to which the employee selection practices of firms "discriminate" against women, blacks, other racial minorities, older workers, the disabled and other groups which the statutes seek to protect. In broaching this issue, it is important to be clear about the meaning of the term "discriminate" (or "discrimination"). All employee selection decisions are made intentionally and precisely for the purpose of discriminating among job applicants in attempting to determine who is most likely to succeed--perform best--on the job. Put differently, all choices, including the selection of employees by the firm, involve discrimination. The legislation referred to above seeks to limit certain bases of discrimination, but not

discrimination, or the making of choices, itself.

In this regard, selection tests have often come under fire for being unfairly discriminatory or, as it is sometimes put, "culturally biased." This claim in turn has led some to advocate restrictions on or abandonment of the use of ability, aptitude and related tests for the purposes of employee selection. A particular version of this advocacy position calls for the use of differential validity in the employee selection process, which means that test scores and other predictors should be validated separately for men and women, blacks and whites, etc.

Interestingly and importantly, the most comprehensive studies of ability tests (and other tests) in the employee selection process conclude that such tests validly predict performance on the job, have higher validity than other selection tools, and equally validly predict job performance for men and women and black and white workers. In other words, ability tests do not unfairly or illegally discriminate against certain of the main protected groups under Federal legislation<sup>43</sup>.

This is a very powerful and therefore controversial conclusion, which should not be taken to mean that unfair/illegal discrimination in the selection process does not occur at all, or that ability tests and other selection tests and predictors have been fully validated among all of the protected groups under Federal law--they have not. But the bulk of this evidence does provide powerful support for the psychological model of employee selection in that it affirms the effort to use statistical methods

for relating predictors to criteria, rather than more clinical judgmental methods, in making selection decisions.

Another contentious issue in the area of employee selection concerns the methods and procedures for determining whom to "select out" rather than "select in." As described in Chapter 2, the human resource strategy of the typical firm in recent years has focused on work force reductions or downsizing. This strategic thrust, in turn, requires choices to be made about which employees will be reduced in force and which employees will be retained by the firm.

In theory, a firm can use its performance appraisal ratings or rankings to make work force reduction decisions. This is known as performance or merit-based work force reductions, and appears to be the flip side of performance or merit-based employee selection decisions based on the psychological model of employee selection. Yet most firms have not made their work force reductions decisions on the basis of performance appraisal data. Rather, most firms either use reverse seniority to determine work force reductions, or announce programs of "voluntary" work force reductions in which the choice of whether to go or stay is left up to individual employees, and in which certain incentives or "sweeteners" are provided to employees who choose voluntarily to leave or retire from the firm.

One reason why firms make relatively little use of their performance appraisal data in deciding work force reductions is that such appraisals are typically "skewed" to the high end of the performance rating scales<sup>44</sup>. Lacking sufficient variance in performance ratings, it is difficult if not impossible to use the

ratings to make work force reduction decisions. In addition, some firms that have reduced their work forces, ostensibly by using performance appraisal data, have subsequently been challenged through discrimination suits filed by female, minority and/or older workers who were reduced-in-force to show that the performance appraisal data were valid and reliable<sup>45</sup>. In those instances in which these challenges have resulted in court trials, the firms in question have not been able to demonstrate that their performance appraisal data are in fact valid and reliable; indeed, most of the appraisals have been shown to be skewed toward the high end of the rating scale and thus to be invalid.

Therefore, the contentious issue here concerns the apparent differential ability of firms statistically to validate their selection tools and methods, on the one hand, and their performance appraisal tools and methods, on the other hand. Conceptually, these are virtually identical validation exercises, but experience and practice indicate that firms are far more likely to validate their employee selection practices than they are to validate their performance appraisal practices. As a result, it appears that the work force reduction, or "selection out," decisions of firms are far more likely to be challenged by (former) employees than are the employee selection/hiring, or "selection in," decisions of firms.

Finally, consider some of the implications of new job design and redesign initiatives for employee selection decisions. Earlier we noted the recent tendency of firms to redesign jobs to emphasize multiskilling, flexibility, broadened decision making

responsibility, and work in teams. These initiatives imply a strengthened emphasis on the interactive team or group nature of work and a lessened emphasis on the individual nature of work. Yet, virtually all employee selection decisions continue to focus on the hiring of individual workers, and most selection tools, methods and techniques, whether operationalized through statistical selection or clinical selection, remain focused on the measurement or determination of individual abilities, skills, knowledge and other characteristics.

If the job design and redesign initiatives described previously are not short-lived but, instead, represent a secular shift in the way in which work is organized and performed, then traditional individually-oriented employee selection practices and methods appear to be out of alignment with team-based work and organizations (much in the same way that individually-oriented compensation and reward practices appear to be out of alignment with team-based work and organizations). Therefore, one of two types of job redesign-employee selection practice adjustments is likely to occur. Either team-based work and jobs will recede as employee selection practices continue to emphasize individual abilities, skills and knowledge, or, instead, employee selection practices will change to give more emphasis to (the measurement of) those characteristics reflective (predictive) of the ability, skill and knowledge required to work in team-based jobs and organizations.

To illustrate this point, and to conclude this chapter,

consider the recent employee selection experience of Saturn, the operating subsidiary company created by General Motors during the mid-1980s. Saturn is modeled on team concepts and is structured as a team-based organization<sup>46</sup>. All work at Saturn, ranging from strategic planning to product design to customer service to automobile production, is performed in teams. In this respect, Saturn is closely similar to NUMMI, the General Motors-Toyota joint venture company.

When Saturn began to staff its new organization during the period from 1986 to 1990, it was inundated with applications from General Motors' employees working in the U.S., Canada and Western Europe. These employees had heard the clarion call sounded by General Motors Chief Executive Officer Roger Smith, who described Saturn as the initiative which would return General Motors to world leadership in automobile production. So strong was this "demand" of General Motors' employees to work at Saturn that the new company had 100 General Motors' applicants for each job vacancy (not to mention applications from employees of other companies in the U.S. and abroad).

Saturn selected approximately one out of every 100 of these job applicants to become employees of the new company, and did so largely on the basis of a "prediction" about how well the new employee would be able function in team-based work in a team-based organization. Those who were rejected for employment with Saturn were considered to be unlikely to perform well in the new, team-based company--largely because they had progressed through their

careers with General Motors in narrow, individually-oriented jobs in a highly structured, vertically organized company!

While we should not overgeneralize from this case example, the Saturn-General Motors experience with employee selection nevertheless puts into sharp relief the larger potential clash between traditional individually-oriented employee selection practices and newly developing team-based jobs and organizations. Either traditional selection practices will be modified to more validly and reliably identify (predict) those characteristics of job applicants which are required to perform well in team-based work and organizations, or the movement towards team-based work and organizations will peak and then decline in light of employee selection practices which are "out of alignment" with and thus opposed to it. The challenge here, then, is to "reengineer" employee selection processes to give more weight to team-based work and less weight to work performed individually, and also to balance those aspects of work which are best performed in teams with those aspects of work which are best performed individually.

EXHIBIT 1

JOB DESIGN PRINCIPLES OF HIGH CONTROL  
AND HIGH COMMITMENT WORK SYSTEMS

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High Control	High Commitment
-Individual attention limited to performing individual job	-Individual responsibility extended to upgrading system performance
-Job design deskills and fragments work and separates doing and thinking	-Job design enhances content of work, emphasizes whole task, and combines doing and thinking
-Accountability focused on individual	-Frequent use of teams as basic accountable unit
-Fixed job definition	-Flexible definition of duties contingent on changing conditions

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Source: Adapted from Richard E. Walton, "From Control to Commitment in the Workplace," Harvard Business Review, vol. 63 (March-April 1985), p. 64.

## EXHIBIT 2

### JOB DESCRIPTIONS FOR THE POSITIONS OF PILOT AND IN-FLIGHT STEWARD AT A MAJOR U.S. AIR CARRIER

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#### Pilot

The pilot is responsible for flying the aircraft, the safety of the aircraft, crew and passengers, monitoring in-flight aircraft systems and data, communicating with ground and tower personnel, communicating with passengers, communicating with and supervising all in-flight personnel, reporting in-flight anomalies, and reporting on status and condition of the aircraft during pre-flight, flight, and immediate post-flight periods.

#### In-Flight Steward

The in-flight steward is required to provide information and services to passengers, including safety instructions, flight schedule and route information, food and beverage service and in-flight amenities. The steward is also responsible for communicating with the cockpit crew and with other cabin crew personnel concerning passenger requests for information, passenger safety violations, and in-flight anomalies.

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### EXHIBIT 3

#### JOB DESCRIPTIONS FOR THE POSITIONS OF FLIGHT MANAGER AND CUSTOMER SERVICE MANAGER AT A MEDIUM-SIZED U.S. AIR CARRIER

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##### Flight Manager

The flight manager is responsible for flying the aircraft, the safety of the aircraft, crew and passengers, monitoring in-flight systems and data, communicating with ground and tower personnel, communicating with passengers, communicating with and supervising all in-flight personnel, reporting flight anomalies, and reporting on the status of the aircraft before, during and immediately after flight. During non-flying time, the flight manager also performs administrative, marketing, scheduling, and baggage handling duties, subject to constraints imposed by flight schedules. The flight manager is expected to work in teams composed of small groups of employees in performing administrative, marketing, scheduling and baggage handling duties.

##### Customer Service Manager

The customer service manager is required to perform a variety of task and duties, including ticket sales, scheduling, administration, marketing, baggage handling and in-flight services, including providing safety information, food service and related flight information to passengers. When serving in an in-flight capacity, the customer service manager is also required to report in-flight anomalies to the cockpit crew. The customer service is expected to work in teams composed of small groups of employees in performing these duties and responsibilities.

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## EXHIBIT 4

### JOB DESCRIPTION FOR THE POSITION OF PRODUCTION WORKER AT NEW UNITED MOTOR MANUFACTURING INCORPORATED (NUMMI)

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#### Production Worker

The production worker is a member of a work team which is responsible for all aspects of team functions, such as production, quality, safety and housekeeping. The production worker performs multiple jobs in connection with the production of the automobile and truck. These include body assembly, painting, electrical work, sanding, component and system installation, and safety checks. Where difficulties are encountered in any aspect of this work, the production worker is expected to work with his work team to resolve the difficulty.

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## EXHIBIT 5

### JOB DESCRIPTIONS FOR THE POSITIONS OF ASSEMBLER AND BODY PAINTER AT THE GENERAL MOTORS ASSEMBLY DIVISION PLANTS

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#### Assembler

The assembler is responsible for assembling specific automobile and truck body parts, components and assemblies assigned to him by the foreman. The assembler will repeat these assembly functions during the work shift on each car and truck assembly, and will report any parts shortages, defects, safety problems or other production problems immediately to the foreman. The assembler is also required to store and secure all equipment used in the performance of his duties upon completion of his work shift.

#### Body Painter

The body painter is responsible for spray painting automobile and truck assemblies as these are completed. The body painter will repeat this painting function during the work shift on each car and truck, and will report any parts shortages, defects, safety problems or other production problems immediately to the foreman. He will also report any conditions of the completed automobile and truck assemblies which prevent him from carrying out his spray painting duties immediately to the foreman. The assembler is also required to store and secure all equipment used in the performance of his duties upon completion of his work shift.

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TABLE 1

INCIDENCE OF COVERAGE BY FLEXITIME AND WORK AT HOME,  
BY DEMOGRAPHIC GROUP AND FULL-TIME/PART-TIME EMPLOYMENT,  
U.S. WORK FORCE

Work Force Group	Proportion Covered by Flexitime	Proportion Working at Home
All	13.6%	16.9%
Males	13.8	16.9
Females	13.3	16.9
Married	13.3	19.5
Males	13.4	19.4
Females	13.1	19.6
Single	14.1	12.2
Males	14.6	11.4
Females	13.7	12.9
Full-Time	12.4	17.5
Males	13.2	17.4
Females	11.4	17.5
Part-Time	18.5	14.5
Males	19.1	12.6
Females	18.3	15.5
Race:		
White	14.0	18.1
Black	10.1	7.8
Other	13.8	12.2
Age:		
16-25	13.2	6.7
25-39	14.4	19.5
40-55	13.2	21.0
55 and above	12.3	17.4

Source: Data tape from the U.S. Department of Labor, Bureau of the Census, May 1985 Current Population Survey. Also see David Lewin and Daniel J.B. Mitchell, "Alternative Approaches to Workplace Flexibility in the U.S.A.," The Work Flexibility Review, vol. 3 (July 1992), p. 14.

TABLE 2

RELATIONSHIPS BETWEEN FLEXIBLE WORK ARRANGEMENTS  
AND FIRMS' STRUCTURAL CHARACTERISTICS

Structural Characte- ristic	% on Flexi- Time	<u>Flexibility Measure</u>		
		% Part- Time	No. of Job Classes	% on Work- Sharing
Highly Unionized	3.1	2.1	76	3.7
Lightly Unionized	13.4	4.3	46	6.3
Managerial	17.7	0.7	61	0.5
Professional	12.3	2.5	63	3.3
Clerical	9.2	4.5	43	7.4
Production	6.4	3.6	66	4.3
Manufacturing	9.1	3.4	51	3.8
Nonmanufacturing	7.2	5.3	42	6.7
-Mining	1.4	0.6	44	2.2
-Durable Mfg.	2.3	1.1	68	1.6
-Nondurable Mfg.	8.4	3.0	55	3.2
-Transportation/ Communications/ Utilities	10.5	3.9	48	4.6
-Wholesale/Retail Trade	5.9	2.7	62	2.4
-Business Services	3.7	6.4	39	7.3
-Personal Services	9.2	7.6	36	8.8
-Finance/Insurance/ Real Estate	9.5	5.9	31	6.3
Large Firm	11.6	6.3	55	5.2
Small Firm	5.7	3.2	38	5.6
Old Firm	12.1	5.3	57	5.8
Young Firm	5.2	2.4	37	5.0

Sources: John Thomas Delaney, David Lewin and Casey Ichniowski, Human Resource Policies and Practices in American Firms, Bureau of Labor-Management Relations and Cooperative Programs, U.S. Department of Labor, BLMR #137 (Washington, D.C.: G.P.O., 1989); David Lewin and Daniel J.B. Mitchell, "Alternative Approaches to Workplace Flexibility in the U.S.A.," The Work Flexibility Review, vol. 3 (July 1992), p. 7 (see this source for definitions of the structural characteristics listed above).

TABLE 3

**RELATIONSHIPS BETWEEN FLEXIBLE WORK ARRANGEMENTS  
AND FIRMS' HUMAN RESOURCE MANAGEMENT CHARACTERISTICS**

Human Resource Management Characteristic	<u>Flexibility Measure</u>			
	% on Flexi- Time	% Part Time	No. of Job Classes	% on Work- Sharing
<b>Status of Senior HR Executive Involvement in Business Planning:</b>				
-Involved	12.5	4.9	58	5.9
-Not Involved	7.2	3.3	63	4.2
<b>Employee Financial Participation</b>				
-Yes	7.3	3.5	55	4.8
-No	6.9	5.1	64	6.9
<b>Information-Sharing With Employees</b>				
-Yes	7.2	3.4	58	5.2
-No	7.7	4.1	62	4.8
<b>Test Validation Conducted</b>				
-Yes	7.4	3.2	64	4.7
-No	7.5	4.5	54	5.9
<b>Job Analysis Conducted</b>				
-Yes	9.2	5.0	49	5.7
-No	5.7	3.7	67	4.9

Sources: John Thomas Delaney, David Lewin and Casey Ichniowski, Human Resource Policies and Practices in American Firms, Bureau of Labor-Management Relations and Cooperative Programs, U.S. Department of Labor, BLMR #137 (Washington, D.C.: G.P.O., 1989); David Lewin and Daniel J.B. Mitchell, "Alternatives to Workplace Flexibility in the U.S.A.," The Work Flexibility Review, vol. 3 (July 1992), p. 10.

TABLE 4

RELATIONSHIPS BETWEEN FLEXIBLE WORK ARRANGEMENTS  
AND FIRMS' FINANCIAL PERFORMANCE

Financial Performance Measure	% on Flexi- Time	<u>Flexibility Measure</u>		
		% Part- Time	No. of Job Classes	% on Work- Sharing
High Return on Investment (ROI)	14.6%	14.3%	14.2%	14.1%
Low Return on Investment (ROI)	13.4%	13.7%	13.8%	13.9%
High Return on Assets (ROA)	12.3%	11.9%	12.5%	12.0%
Low Return on Assets (ROA)	11.8%	12.2%	11.6%	12.0%
High Productivity (Revenue per Employee); (PROD)	\$231,000	\$233,000	\$240,500	\$228,000
Low Productivity (Revenue per Employee); (PROD)	\$221,000	\$219,000	\$213,000	\$224,000

Sources: John Thomas Delaney, David Lewin and Casey Ichniowski, Human Resource Policies and Practices in American Firms, Bureau of Labor-Management Relations and Cooperative Programs, U.S. Department of Labor, BLMR #137 (Washington, D.C.: G.P.O., 1989); David Lewin and Daniel J.B. Mitchell, "Alternative Approaches to Workplace Flexibility in the U.S.A.," The Work Flexibility Review, vol. 3 (July 1992), p. 11.

TABLE 5

SHARES OF AGGREGATE NATIONAL INCOME RECEIVED BY EACH  
FIFTH OF HOUSEHOLDS (FAMILIES) IN 1970, 1980 AND 1990,  
BY RACE, FOR THE U.S.A.

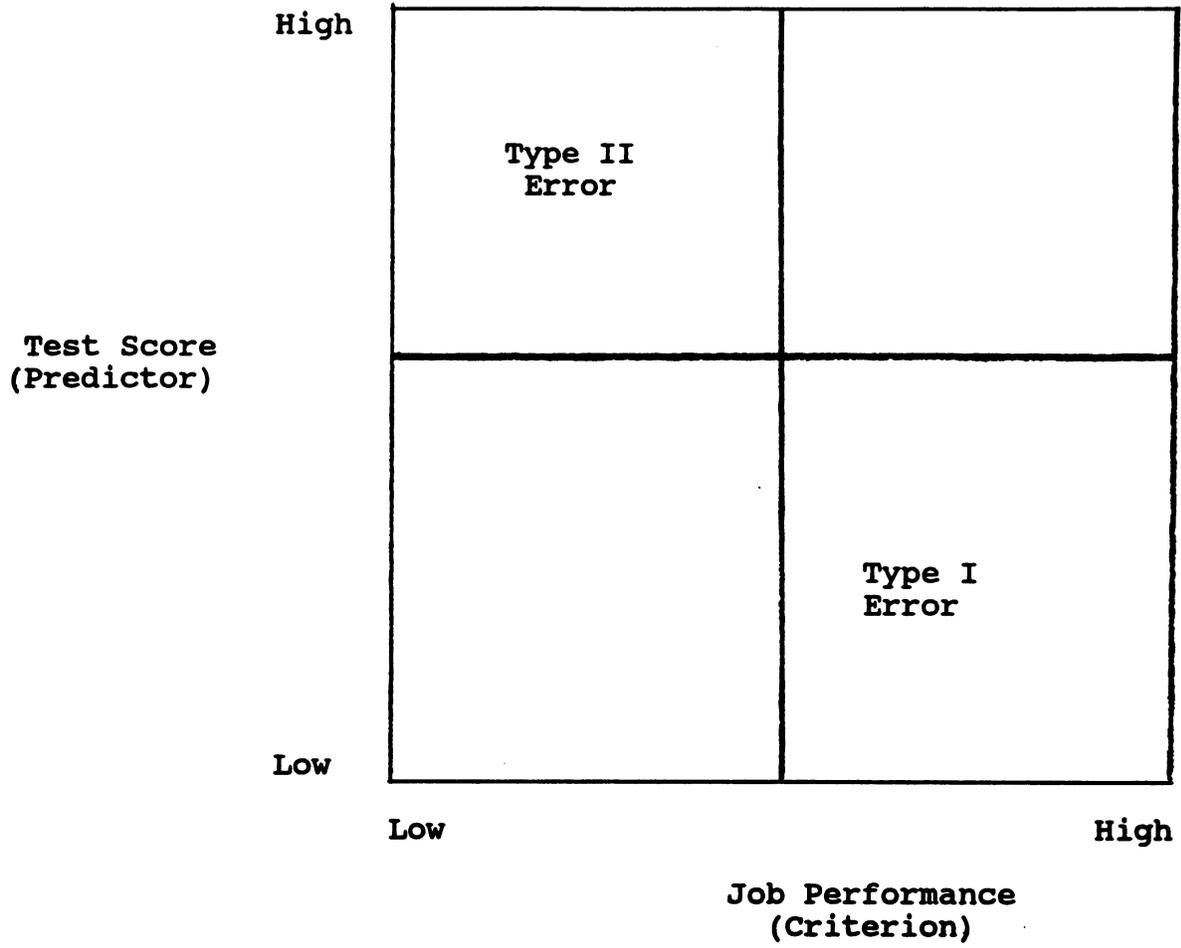
Year	Percent Distribution of Aggregate Income					Gini Ratio
	Lowest Fifth	Second Fifth	Third Fifth	Fourth Fifth	Highest Fifth	
<b>Total</b>						
1990	3.9	9.6	15.9	24.0	46.6	.428
1980	4.2	10.2	16.8	24.8	44.1	.403
1970	4.1	10.8	17.4	24.5	43.3	.394
<b>White</b>						
1990	4.2	10.0	16.0	23.9	46.0	.419
1980	4.4	10.5	17.0	24.6	43.5	.394
1970	4.2	11.1	17.5	24.3	42.9	.387
<b>Black</b>						
1990	3.1	7.9	15.0	25.1	49.0	.464
1980	3.7	8.7	15.3	25.2	47.1	.439
1970	3.7	9.3	16.3	25.2	45.5	.422
<b>Hispanic Origin</b>						
1990	4.0	9.5	15.9	24.3	46.3	.425
1980	4.3	10.1	16.4	24.8	44.5	.405
1970	5.3	11.2	17.2	24.0	42.3	.373

Source: Bureau of National Affairs, Daily Labor Report, No. 188  
(Washington, D.C.: BNA, September 27, 1991), p. B-16.

FIGURE 1

TYPE I AND TYPE II SELECTION ERRORS

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## FOOTNOTES

1. Adam Smith, The Wealth of Nations (New York: Modern Library, 1937, pp. 734-735).
2. Frederick W. Taylor, The Principles of Scientific Management (New York: Harper and Brothers, 1911). It is difficult to overstate Taylor's contribution to the practice of management, initially in the U.S. and later around the world. For especially important analytical treatments, see Reinhard Bendix, Work and Authority in Industry (New York: Wiley, 1956), and Sanford M. Jacoby, Employing Bureaucracy: Managers, unions and the Transformation of Work in American Industry, 1900-1945 (New York: Columbia University Press, 1985). In recent years, Taylor has come to be viewed by many observers and social scientists as the "villain" in the development of overly narrow, stultifying, boring, repetitive jobs, and the term "Taylorism" has been coined to reflect this view. See, for example, Report of a Special Task Force to the Secretary of Health, Education and Welfare, Work in America (Cambridge, MA: M.I.T. Press, 1972), and the discussion of this report contained in Neil W. Chamberlain, Donald E. Cullen and David Lewin, The Labor Sector, 3rd. ed. (New York: McGraw-Hill, 1980), pp. 67-74. It is ironic that Adam Smith continues to be celebrated for his advocacy of the principles of the division of labor and specialization at the level of the economy, while Taylor is increasingly criticized for the application of these same principles at the level of the firm.
3. Frank Gilbreth, Motion Study (New York: Van Nostrand, 1911). The extensions of Taylor's work provided by the Gilbreth are briefly but cogently described in Bernard W. Bass and Gerald V. Barrett, Man, Work and Organizations (Boston, MA: Allyn and Bacon, 1972), p. 391, and Sudhir Kakar, Frederick Taylor: A Study in Personality and Innovation (Cambridge, MA: M.I.T. Press, 1970).
4. This conception of the role of the supervisor and the worker in Taylor's Schema is graphically described in Arnold S. Tannenbaum, Social Psychology of the Work Organization (Belmont, CA: Wadsworth, 1966), pp. 14-15.
5. Note that these consequences of the application of Taylor's principles to the organization of work implied that management had not previously been "maximizing" or "optimizing" firm performance. Put differently, acceptance of Taylor's principles and methods called into question the competency of management to manage. Perhaps for this reason, managements resisted the application of Taylor's principles to the design of managerial work/jobs and, more broadly, to the design of the business organization as a whole. For more on this point, see Bendix, op. cit., especially Chapter 5.

6. Alfred P. Sloan, My Years With General Motors (New York: Doubleday, 1964); Chester Barnard, The Functions of the Executive (Cambridge, MA: Harvard University Press, 1938); Max Weber, The Theory of Social and Economic Organization, Alan M. Henderson and Talcott Parson, Tr., and Talcott Parsons, ed. (Glencoe, IL: Free Press, 1947).

7. For a compelling treatment of the "conformist" behavior which such organizational and job specialization produced in professional and management ranks, see William F. Whyte, The Organization Man (New York: Simon and Schuster, 1956).

8. Peter M. Senge, The Fifth Discipline: The Art and Practice of the Learning Organization (New York: Doubleday Currency, 1990); Michael Hammer and James Champy, Reengineering the Corporation (New York: Harper Business, 1993); Chris Argyris, Organizational Learning (Englewood Cliffs, NJ: Prentice-Hall, 1990); Matthew J. Kiernan, "The New Strategic ARchitecture: Learning to Compete in the Twenty-First Century," Academy of Management Executive (January 1993), pp. 3-14; Thomas A. Kochan and Michael Useem, eds., Transforming Organizations (New York: Oxford Press, 1992); David A. Nadler, Marc S. Gerstein, Robert B. Shaw and Associates, Organizational Architecture: Designs for Changing Organizations (San Francisco: Josey-Bass, 1992); Paul Osterman, Employment Futures: Reorganization, Dislocation and Public Policy (New York: Oxford University Press, 1988); Shoshana Zuboff, In the Age of the Smart Machine (Cambridge, MA: Harvard University Press, 1988); Harley Shaiken, SStephen Herzenberg and Sara Kuhn, "The Work Process Under More Flexible Production," Industrial Relations, vol. 25 (Spring 1986), pp. 167-183; C.K. Prahalad and Gary Hamel, "The Core Competence of the Corporation," Harvard Business Review, vol. 68 (May-June 1990), pp. 79-91; Jeffrey Pfeffer and James Baron, "Taking the Workers Back Out: Recent Trends in the Structuring of Employment," in Barry M. Staw and Larry L. Cummings, eds., Research in Organizational Behavior, vol. 9 (Greenwich, CT: JAI Press, 1988), pp. 257-303; Katherine G. Abraham, "Restructuring the Employment Relationship: Thge Growth of Market-Mediated Work Arrangements," in Katherine G. Abraham and Robert B. McKersie, eds., New Developments in the Labor Market: Toward a New Institutional Paradigm (Cambridge, MA: M.I.T. Press, 1990), pp. 85-118.

9. Richard E. Walton, "From Control to Commitment in the Workplace," Harvard Business Review, vol. 63 (March-April 1985), pp. 57-74); Edward E. Lawler, III, High Involvement Management (San Francisco: Josey-Bass, 1986).

10. Lawler, loc. cit.; John Simmons and William Mares, Working Together: Employee Participation in Action (New York: New York University Press, 1985).

11. Nadler, Gerstein, Shaw and Associates, loc. cit.; Hammer and Champy, loc. cit.; Senge, loc. cit.; Zuboff, loc. cit.

12. Bill Childs, "New United Motor: An American Success Story," Proceedings of the Spring Meeting, Industrial Relations Research Association (Madison, WI: Industrial Relations Research Association, 1989), pp. 453-460; Stephen E. Weiss, "Creating the GM-Toyota Joint Venture: A Case in Complex Negotiation," Columbia Journal of World Business, vol. 22 (Spring, 1987), pp. 23-37.

13. The single production worker job design principle has also been adopted at the Saturn Corporation, the wholly-owned operating subsidiary established in 1984 by the General Motors Corporation. See Saul Rubenstein, Michael Bennett and Thomas A. Kochan, "The Saturn Partnership: Co-Management and the Reinvention of the Local Union," in Bruce E. Kaufman and Morris M. Kleiner, eds., Employee Representation: Alternatives and Future Directions (Madison, WI: Industrial Relations Research Association, 1993), pp. 339-370.

14. Zuboff, loc. cit.; Osterman, loc. cit.

15. See Jeffrey Keefe, "Numerically Controlled Machine Tools and Worker Skills," Industrial and Labor Relations Review vol. 44 (July 1991), pp. 503-519; John Paul MacDuffie, Beyond Mass Production, Flexible Production Systems and Manufacturing Performance in the World Auto Industry (Ph.D. Dissertation, Sloan School of Management, M.I.T., 1991).

16. Maryellen Kelley, "Programmable Automation and the Skill Question: A Reinterpretation of the Cross-National Evidence," Human Systems Management, vol. 7 (Fall 1986), pp. 223-242.

17. Joel Brockner, "Managing the Effects of Layoffs on Survivors," California Management Review, vol. 34 (Winter 1992), pp. 9-28; Joel Brockner, Casey Ichniowski, Rochelle Cooper and Jeanette Davy, "A Multi-Method Analysis of Survivors' Reactions to Seniority-Based Layoffs," in David Lewin and Donna Sockell, eds., Advances in Industrial and Labor Relations, Vol. 6 (Greenwich, CT: JAI Press, 1994), in press; James Lincoln and Arne Kalleberg, Culture, Control and Commitment: A Study of Work Organization and Work Artifacts in the United States and Japan (Cambridge, England: Cambridge University Press, 1990).

18. While the system of permanent or continuous employment in Japanese business organizations has drawn widespread attention, the fact is that in the post-World War II period through the third quarter of the 20th century or so, the U.S. had a larger proportion of its work force employed continuously with the same firm-employer than did Japan. On this point, see Robert Hall, "The Importance of Lifetime Jobs in the U.S. Economy," American Economic Review, vol. 72 (September 1982), pp. 716-724, and

Robert E. Cole, "Permanent Employment in Japan: Facts and Fantasies," Industrial and Labor Relations Review, vol. 26 (July 1972), pp. 615-630. Today, students graduating from high school and college are counseled not to expect to obtain "permanent" or "career" employment with one firm but, instead, to expect to make half a dozen or more changes of employers during their work lives. Further, the system of "permanent employment" in Japan has shown numerous signs of weakening, and in the early 1990s Japanese firms that had practiced permanent employment began for the first time to lay off workers.

19. David Lewin and Daniel J.B. Mitchell, "Alternative Approaches to Workplace Flexibility in the U.S.A.," The Work Flexibility Review, vol. 3 (July 1992), pp. 1-20; Kathleen Christensen, Flexible Staffing and Scheduling in U.S. Corporations, Research Bulletin No. 240 (New York: The Conference Board, 1989); Abraham, loc. cit.

20. Lewin and Mitchell, loc. cit. See also Christensen, loc. cit. and Chris Tilly, Short Hours, Short Shift: Causes and Consequences of Part-Time Work (Washington, D.C.: Economic Policy Institute, 1990).

21. John Thomas Delaney, David Lewin and Casey Ichniowski, Human Resource Policies and Practices in American Firms, Bureau of Labor-Management Relations and Cooperative Programs, U.S. Department of Labor, BLMR #137 (Washington, D.C.: G.P.O., 1989).

22. Lewin and Mitchell, loc. cit.

23. Robert B. Reich, The Work of Nations (New York: Knopf, 1991).

24. Reich, loc. cit., Chapter 14.

25. Reich, loc. cit., Chapter 16.

26. Reich, loc. cit., Chapter 17.

27. Bureau of National Affairs, Daily Labor Report, No. 188, (Washington, D.C.: BNA, September 27, 1991), pp. B-14 to B-16.

28. Bureau of National Affairs, loc. cit., p. B-14.

29. Richard S. Belous, The Contingent Economy: The Growth of the Temporary, Part-Time and Subcontracted Workforce (Washington, D.C.: National Planning Association, 1989); Peter D. Sherer and Kyungmook Lee, "Cores, Peripheries, and More and Less: An Examination of Mixes of Labor Relationships in Firms," Proceedings of the Forty-Fourth Annual Meeting, Industrial Relations Research Association (Madison, WI: Industrial Relations Research Association, 1992), pp. 317-324.

30. For a concise presentation and explanation of this model, see Richard D. Arvey and Robert H. Faley, Fairness in Selecting Employees, 2nd. ed. (Reading, MA: Addison-Wesley, 1988).

31. For further detail on processes and methods for measuring the validity and reliability of selection tools, see Arvey and Faley, loc. cit., and Wayne F. Cascio, Applied Psychology in Personnel Management, 3rd. ed. (Englewood Cliffs, NJ: Prentice-Hall, 1987). Classic works in this area include Robert L. Thorndike, Personnel Selection: Test and Measurement Techniques (New York: Wiley, 1949); Louis L. Thurstone, The Reliability and Validity of Tests (Ann Arbor, MI: Edwards, 1931); Edwin E. Ghiselli, The Validity of Occupational Selection Tests (New York: Wiley, 1966); Lee J. Cronbach, Essentials of Psychological Testing, 4th ed. (New York: Harper and Row, 1984); and Marvin D. Dunnette, Personnel Selection and Placement (Belmont, CA: Wadsworth, 1966); Robert M. Guion, Personnel Testing (New York: McGraw-Hill, 1965).

32. See Robert J. Harvey, CMO: A Job Analysis System (San Antonio, TX: The Psychological Corporation, 1991); Ernest J. McCormick and Associates, PAQ: Job Analysis Manual (Logan, Utah: PAQ Services, 1977); Ernest J. McCormick, Job Analysis: Methods and Applications (New York: AMACOM, 1979); Control Data Business Advisors, Micro-OAQ Sample Report Formats and Selection Capabilities (Minneapolis, MN: Control Data Corporation, 1985); Casio, loc. cit., Chapter 10.

33. Robert M. Guion and C.J. Cranny, "A Note on Concurrent and Predictive Validity Designs: A Critical Reanalysis," Journal of Applied Psychology, vol. 67 (March 1982), pp. 239-244; Gerald V. Barrett, James S. Phillips and Ralph A. Alexander, "Concurrent and Predictive Validity Designs: A Critical Reanalysis," Journal of Applied Psychology, vol. 66 (January 1981), pp. 1-6.

34. See Leonard Saye, Denise Dougherty and Theodore Cross, "The Validity of Polygraph Testing," American Psychologist, vol. 40 (June 1985), pp. 355-366; William Terris and John Jones, "Psychological Factors Related to Employees' Theft in the Convenience Store Industry," Psychological Reports, vol. 51 (December 1982), pp. 1219-1238; Paul Sackett and Michael Harris, "Honesty Testing for Personnel Selection: A Review and Critique," Personnel Psychology, vol. 37 (February 1984), pp. 221-246; Michael McDaniel and John Jones, "A Meta-Analysis of the Validity of the Employee Attitude Inventory Theft Scale," Journal of Business and Psychology, vol. 1 (March 1986), pp. 31-50; Deborah F. Crown and Joseph G. Rosse, "A Critical Review of the Assumptions Underlying Drug Testing," in Douglas Bray, John W. Jones and Brian D. Steffy, eds., Applying Psychology in Business: The Manager's Handbook (Lexington, MA: Lexington, 1991), pp. 345-368; Thomas Geidt, "Drug and Alcohol Abuse in the Work Place: Balancing Employer and Employee Rights," Employee Relations Law Journal, vol. 11 (June 1985), pp. 181-205; Kermit R. Davis, "A

Longitudinal Analysis of Biographical Subgroups Using Owens' Developmental-Integrative Model," Personnel Psychology, vol. 37 (January 1984), pp. 1-14; Michael D. Mumford and William M. Pugh, "Methodology Review: Principles, Procedures and Findings in the Application of Background Data Measures," Applied Psychological Measurement, vol. 11 (February 1987), pp. 2-6. In certain case, handwriting samples are taken from job applicants and analyzed to infer certain "predictions" about subsequent job performance. See, for example, Richard J. Klimoski and Anat Rafaeli, "Inferring Personal Qualities through Handwriting Analysis," Journal of Occupational Psychology, vol. 56 (July 1983), pp. 185-195. Much attention has recently focused on the detection and management of AIDS in the workplace. See, for example, William F. Banta, AIDS in the Workplace (Lexington, MA: Lexington, 1988), and Sam B. Puckett and Alan R. Emery, Managing AIDS in the Workplace (Reading, MA: Addison-Wesley, 1989).

35. See, for example, Richard D. Arvey and James L. Campion, "The Employment Interview: A Summary and Review of Recent Research," Personnel Psychology, vol. 35 (March 1982), pp. 281-322.

36. See Casio, loc. cit., and Wayne F. Casio and Neil Phillips, "Performance Testing: A Rose Among Thorns?," Personnel Psychology, vol. 32 (September 1979), pp. 751-766.

37. John W. Boudreau, "Utility Analysis: A Review and Agenda for Future Research," in Michael Smith and Ian Robertson, eds., Advances in Personnel Selection and Assessment (London, England: Wiley, 1988), pp. 234-267; John E. Hunter and Ronda F. Hunter, "The Validity and Utility of Alternative Predictors of Job Performance," Psychological Bulletin, vol. 96 (January 1984), pp. 72-98; John D. Arnold, John M. Rauschenberger, Wendy G. Soubel and Robert M. Guion, "Validation and Utility of a Strength Test for Selecting Steelworkers," Journal of Applied Psychology, vol. 67 (July 1982), pp. 588-604.

38. Frank L. Schmidt, John E. Hunter, A.N. Outbridge and Marvin H. Trattner, "The Economic Impact of Job Selection Methods on Size, Productivity and Payroll Costs of the Federal Work Force: An Empirically Based Demonstration," Personnel Psychology, vol. 39 (January 1986), pp. 1-29; Olen L. Greer and Wayne Cascio, "Is Cost Accounting the Answer? Comparison of Two Behaviorally Based Methods for Estimating the Standard Deviation of Job Performance in Dollars with a Cost-Accounting Approach," Journal of Applied Psychology, vol. 72 (June 1987), pp. 588-595.

39. This assumption about the labor market in the psychological model of employee selection is not explicitly stated in the literature. Instead, it requires the reader to combine knowledge of labor markets with knowledge of the psychological model of selection to identify this assumption.

40. T.S. Ashton, The Industrial Revolution, 1760-1830 (London, England: 1948); Jacoby, loc. cit.

41. For an early systematic treatment of the validity and reliability of executive and managerial selection methods, see Abraham K. Korman, "The Prediction of Managerial Performance," Personnel Psychology, vol. 21 (June 1968), pp. 295-322.

42. Indeed, the Federal Government has spelled out the nondiscrimination requirements of private employers in selecting employees. See U.S. Equal Employment Opportunity Commission, U.S. Civil Service Commission, U.S. Department of Labor, and U.S. Department of Justice, Adoption of Four Agencies of Uniform Guidelines on Employee Selection Procedures, 43 Federal Register 38 (Washington, D.C.: G.P.O., August 25, 1978), pp. 290-338. Also see American Psychological Association, Division of Industrial/Organizational Psychology, Principles for the Validation and Use of Personnel Selection Procedures, 3rd. ed. (Washington, D.C.: APA, 1986), and James L. Ledvinka, Federal Regulation of Personnel and Human Resource Management Boston, MA: PWS-Kent, 1982), Chapters 1-6.

43. John E. Hunter and Frank L. Schmidt, "Ability Tests: Economic Benefits Versus the Issue of Fairness," Industrial Relations, vol. 21 (Fall 1982), pp. 293-308; John E. Hunter and Frank L. Schmidt, "Critical Analysis of the Statistical and Ethical Implications of Various Definitions of Test Bias," Psychological Bulletin, vol. 83 (October 1976), pp. 1053-1071; John E. Hunter, Frank L. Schmidt and Ronda F. Hunter, "Differential Validity of Employment Tests by Race: A Comprehensive Review and Analysis," Psychological Bulletin, vol. 86 (July 1979), pp. 721-735.

44. For an example of this phenomenon in a leading pharmaceutical firm, see Kevin J. Murphy, Merck & Co., Inc. (A), (B) and (C), cases #491-005, 491-006 and 491-007 (Boston, MA: Harvard Business School, 1990). More broadly, see Robert Bretz, George T. Milkovich, and Walter Read, "The Current State of Performance Appraisal Research: Concerns, Directions and Implications," Journal of Management, vol. 18 (March 1992), pp. 321-352.

45. See, for example, Dennis Martin and Kenneth Bartol, "The Legal Ramifications of Performance Appraisal: An Update," Employee Relations Law Journal, vol. 17 (September 1991), pp. 257-286.

46. See Rubenstein, Bennett and Kochan, loc. cit.