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Health, Productivity, and Work Life

Economic logic tells us that material affluence should bring psychological well-being. But is this happening? In many ways, working populations in industrial countries such as the United States and Sweden, who should be experiencing the highest levels of satisfaction in history, are showing increasing signs of stress. People born in the United States during the last thirty years are more than three times as likely to experience depression than were their grandparents (Seligman 1988; Robbins et al. 1984); the number of mental health professionals more than quintupled between 1947 and 1977 (Mechanic 1980); worker's compensation claims related to stress have tripled since 1980 (Grippa and Durbin 1986); and losses to the U.S. economy associated with job stress are currently estimated to be as large as $150 billion per year (Freudenheim 1987). Clearly, our models of modern industrial organization, designed to yield the greatest good for the greatest number, have omitted much that is important. These models appear to be forcing us to trade off our psychological well-being for material affluence, instead of enhancing both.

Is stress from our work environments serious enough to cause heart disease, the major cause of death in industrial societies (World Health Organization 1984)? Could the same aspects of the work situation that cause stress also reduce productivity? If the answer to both these questions is yes, there would seem to be good reason to change our conventional views about how to organize and manage work activity. Yet most of the solutions currently advanced to reduce stress—relaxation therapies, for example—address only its symptoms. Little is done to change the source of the problem: work organization itself. While we recognize that stress is damaging, we act as though its sources were inevitable.

The alternative view presented in this book is that damaging job stress is not inevitable, that its causes can be found in the conventional models of work organization in Western industrial society, and that its cure lies in the transformation of the workplace. This solution is based on attention to psychological and social aspects of work that have been consistently omitted in conventional economic and technological calculations of how best to design work. The overlooked psychosocial side of work would also appear to be a logical place to search for solutions to the unintended consequences of modern industrialization related to lost "productivity": the decline in the quality of goods, the impersonality of services, and the emphasis on short-term profits at the expense of the ingenuity and long-term utility of products. We will argue that it is possible to reorganize production in a manner that can both reduce the risk of stress-related illness and increase aspects of productivity associated with creativity, skill development, and quality.

We contend that change in the workplace is not only desirable but essential. If the models of work organization that we use every day are so clearly connected to stress development, then we may be in the process of creating even more stressful environments—now on a global scale—that are totally incompatible with human physiological capabilities. The magnitude of the problem expands as work outside the home becomes more central to family life, involving two wage earners instead of one and overturning previous community and regional traditions. Unless many present models of economic and production organization are changed, the future will see not only a progressively poorer trade-off of health for productivity but many situations in which both are needlessly lost.

The first step toward solving the problem will be to develop new models of the psychosocial work environment, addressing both stress and productive behavior. A clearer understanding of this "soft" side of industrial production, we believe, will turn out to be the most successful pathway to the eminently "hard" and practical goals of reducing the risk of heart disease and ensuring the long-term survival of growth-oriented sectors of the industrial economy. Although the research on which this book is based actually covers only a narrow range of illnesses and restricted components of productivity, we believe that these will be increasingly important aspects of work experience in the future.

The impetus for this book came from a new set of findings relating job structure to psychological stress and then to heart disease and, separately, relating job structure to productivity. Our work has been a collaborative effort involving engineering, medical, and social researchers from several countries, who are attempting to formulate new methodologies for associating social and psychological aspects of work structure with the outcomes

of coronary heart disease (CHD) and productivity change. In this book we attempt to extend the utility of these developments by integrating them with existing contributions from the fields of occupational health, industrial democracy and quality of work-life practice, industrial psychology, and organizational change.

The data have been gathered both in the United States and in Sweden, two countries different in their cultures relating to work organization (although less different than the United States and Japan). But there are also substantial similarities between the economies of the United States and Sweden: in level of technological sophistication, in the proportion of service to manufacturing employment, in standard of living (among the two highest in the world), and in the importance of individual rights. Both are private economies with substantial public sectors (albeit with higher funding levels in Sweden). Sweden's labor force, however, enjoys a much higher level of union representation and a generally more positive climate toward employee-oriented workplace reforms, particularly those involving job stress. Thus, the findings from these two countries have given us the advantage of testing the generality of our hypotheses. Many other industrialized countries might see themselves fitting somewhere between the United States and Sweden in terms of risks of psychosocial problems at work and the potential for alternative job designs.

Health and the Psychosocial Structure of Work

The goal of promoting well-being at work is not new; it has been the purpose of the occupational health movement since its modern inception in the late 1960s in both the United States and Sweden. These movements have been politically conscious attempts to roll back the residual destructive aspects of modern industrialization with scientific evidence of problems and scientifically formulated solutions.

The U.S. Occupational Safety and Health Act of 1970 and Sweden's comparable act in 1974 were both outgrowths of public reaction to longstanding physical hazards in some of the most dangerous industries and their consequences, such as the coal mining disaster in Tennessee in 1969 (see Ashford 1973) and the miners' strikes in northern Sweden in 1969 (Dahlström et al. 1971). Essential support for the enactment of these laws came from labor unions in both countries—the fight led by Anthony Mazzochi of the Oil, Chemical, and Atomic Workers' Union to protect workers from the ill effects of working with toxic chemicals is a prime

example—and, in the United States, from institutional funding by the Ford Foundation (see Ashford 1973). Considerable resistance came from management (Dahlström 1965) and still continues in the United States, although now some of the largest corporations in both the United States and Sweden are staunch supporters of health and safety programs. For each step in the battle for expanded worker protection, medical research, such as Selikoff's study of asbestos (Selikoff, Chung, and Hammond 1964), has been the crucial starting point.

There has been no natural bridge, however, between this initial attention to the physical causes of occupational illness and the concerns regarding the psychosocial hazards of work. Research in the psychosocial area has involved a separate group of scientists, social scientists such as Kornhauser (1965) in the United States and Dahlström (1965, 1969) in Sweden who have studied the alienating and dehumanizing conditions of work. The U.S. and Swedish Quality of Work Life movement was also based in the social sciences but had a pragmatic program of work redesign to eliminate work dissatisfaction and increase productivity. This movement, along with the Scandinavian Industrial Democracy movement, developed some of the most important examples of new social organization of work that now exist.

New jobs and organizational structures were designed to replace the skill-fragmenting and socially-isolating industrial bureaucracies of the post–World War II era. The changes first took root as Industrial Democracy in Norway in the early 1960s with the help of pioneers such as Eric Trist, Einar Thorsrud, and Fred Emery (see Trist et al. 1963; Emery and Thorsrud [1964] 1969), and were picked up in Sweden in the late 1960s. In the United States, Lou Davis and colleagues built a parallel Quality of Work Life movement on a platform of principles of job enrichment. Enlightened managers, experimenting with new social organizations at work and new interfaces to technology, particularly in Scandinavia, cooperated with unions demanding democracy in the workplace to construct many important demonstrations of a new industrial order (see chapter 7).

Unfortunately, these results had little impact on the occupational health community. The practical realities of managing the work redesign process and concern for productivity left little energy for doing the sophisticated medical research on health effects that had been done in the case of physical work hazards. The result was that these two bodies of research on the hazards of work remained almost entirely separate.

In the 1970s, however, the social scientists joined forces with occupational health and safety institutions to undertake two vigorous decades of research on psychosocial work hazards. In Sweden, such researchers as

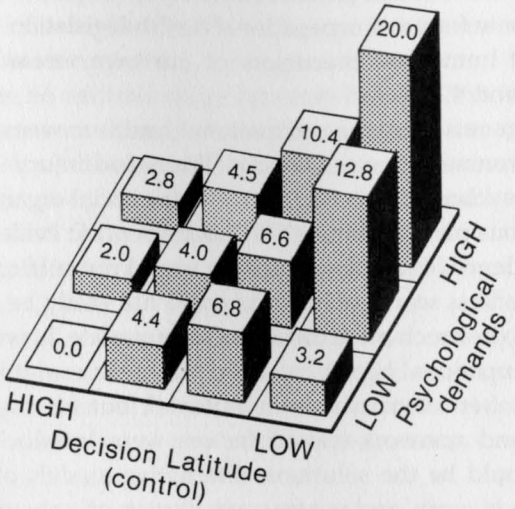
Frankenhaeuser (1980) and Levi (1971) did pioneering research on the physiological consequences of adverse psychosocial work settings. In the United States, Kohn (1977; Kohn and Schooler 1973) studied the impact of job structure on personality, and Gardell (1971b) did innovative work in developing processes of work reorganization to reduce psychosocial hazards. In Norway, Gustavsen (1985, 1987) helped translate this psychosocial research into new forms of occupational health legislation. Such work has been the most immediate precursors of our own research described in chapters 2, 3, and 4.

The challenge raised by the occupational health movement—that modern work environments caused serious illness and injury—was now presented to the psychosocial researchers. Did the social organization of work also cause serious physical illness? Without scientific evidence of such associations (evidence of job dissatisfaction would not suffice), the same political will to redress workers' hazards could not easily be mustered. This evidence was to be much more difficult to accumulate, however. In the case of physical occupational health hazards, such as in coal mining, the cause of injury was often obviously environmental, but for psychosocial risks work-related and nonwork-related factors were interlocked. Still more challenging would be the solutions: alternative models of the organizational structure of work, and not just substitution of a chemical in a manufacturing process, would be required.

With these challenges in mind, the research illustrated in figure 1–1 was undertaken (Karasek et al. 1981). Figure 1–1 shows the prevalence of heart disease symptoms in approximately 1,600 randomly selected Swedish working men who were interviewed in 1968 about their work and about heart disease symptoms. Symptoms were most common (with 20 percent of the workers affected) among those who described their work as both psychologically demanding and low on a scale measuring latitude to make decisions. The specific component of decision latitude that was measured—the worker's discretion over use of skills on the job—is an important part of the process of gaining control on the job: if the worker's skill is being utilized and developed, the worker is more likely to feel in control of the many different situations that may arise. By contrast, there were no heart disease symptoms among the group of workers who reported low psychological demands and a high level of skill discretion. Their jobs were associated with much better state of health than that enjoyed by the average worker. Is this the psychosocial "fountain of youth"? We will discuss a broad range of similar findings, including associations between job conditions and heart disease risk factors, in chapters 2, 3, and 4. For example, findings for measures of psychological strain, such as de-

FIGURE 1–1
Job characteristics and heart disease prevalence
(Swedish males, 1974, N = 1,621; see p. 123)

Number on vertical bar is percentage in each job category with symptoms.



SOURCE: Redrawn from Karasek et al. 1981. Reprinted by permission of the *American Journal of Public Health.*

pression, that could be a broad precursor to a range of physical illnesses have now been demonstrated for a consistent set of job conditions in many occupations and in a number of countries.

However, we must have more information before we can assess the implications of these findings for health-oriented job redesign. First, any contribution of the work environment to physical illness must be shown to be independent of the worker's personal characteristics, including both personality and physiology. All the phenomena discussed in this book—from stress-related illness to productive behavior—are affected by individual characteristics such as age, education, and personality. Nevertheless, it is our position that these outcomes are not determined solely, or even primarily, by personal factors. Moreover, the psychosocial impacts must be the result of aspects of the structure of work that are changeable and redesignable; we must demonstrate that it is not just the inevitable demands of work that cause illness but that alterable policies for organizing task and social relationships play a major role. More important, we must show that any such changes are consistent with productivity requirements of work in the modern world. We must also consider *how* jobs are to be changed: addressing the process of organizational change requires us to build interdisciplinary bridges to aspects of organization and technology that constrain the job change process. Our models of work organization, health, and productivity must be relevant to the broad range of scientists, practitioners, and workers who will both assess the validity of the findings and attempt to translate them into solutions—a difficult challenge. We must also understand the political implications of change within and among different occupational groups. Finally, we must develop methodologies that can be used for health-oriented job redesign—that is, true health promotion in the workplace.

The Person and the Environment: Two Bases of Stress-Related Illness

For decades, the medical, social, and management sciences have debated the extent to which stress-related illness can be attributed to the individual and how much should be attributed to the environment. The focus of one such current debate is the contribution of Type A behavior to heart disease via stress responses. These debates have tended to be divisive, separating medical professionals and psychologists, whose focus is on analysis and treatment of the individual, from job designers and industrial sociologists, who examine social environmental factors, with managers and engineers falling somewhere in the middle.

This book's primary emphasis on an environmental perspective is unusual. In the United States, the concern for stress-related illness has brought forth more research examining characteristics of the individual (personality, genetics) as causes of illness, which in turn have led to overwhelming numbers of person-oriented cures. There are high-priced relaxation therapies, "humor" therapies for corporations, and self-awareness therapies tending toward mysticism. These solutions seem to offer an easy alternative to complex and difficult labor/management negotiations over workplace control. To avoid the more difficult underlying issues is to deal with the symptoms instead of the causes, however. For that reason we suspect that at best such solutions will be only temporary. Certainly they will be expensive—according to one estimate, a $15 billion industry in the next ten years (Miller 1988). Even worse, they will lead to victim blaming and a tarnished reputation for any attempts to redress job stress.

If the individual is the only possible target for action, change efforts must concentrate on altering his or her biology, psychological traits, and individual behavior. Indeed, these are presently the most commonly recommended practices for reducing risk of heart disease. In the case of biological factors, they involve lowering lipids (cholesterol and other blood lipids) or

blood pressure by means of pharmaceutical drugs or changes in diet. In the case of life-style, the focus is on changing eating and smoking habits. Efforts are made to change psychological traits by means of behavior modification programs, although these are yet to be thoroughly validated. Behavior change by means of pharmaceutical drugs has even been discussed (Rosenman 1984). Aside from the costs and personal side effects, such as loss of concentration and depression, here we can imagine solutions whose social consequences are worse than the disease itself. For instance, it has been claimed in the *New England Journal of Medicine* (Relman 1980) that sixty million Americans should be treated for mild hypertension by the medical professions. What magnitude of interventions by well-meaning but "elite" medical professionals in our daily lives is desirable? How much is healthy from the perspective of a democratic society?

One of the most intense preventive health efforts in the United States, Scandinavia, and other industrial societies today is targeted on smoking, as much because of claimed associations with heart disease as because of clearly confirmed associations with lung cancer. The goal of reduced smoking is, of course, to be applauded. Almost the entire anti-smoking effort, however, is aimed at personal behavior change. Layman's wisdom tells us that people light a cigarette more often during stressful periods on the job. In the recent past in many occupations, the smoke break was one of the few legitimate reasons for a worker to take any rest break on the job. Tense employees may not stop smoking even if they know it is dangerous to their health, as anti-smoking campaign research tells us (Caplan et al. 1975). Some of our own research findings, described in chapter 4, imply that job stresses are one cause of smoking. Work environment tensions represent forces that cannot be made to disappear through individually oriented coping strategies, such as stop-smoking campaigns. We argue that a more effective approach would be to set up health care teams to educate employees about how tensions at work affect smoking behavior, about alternative ways of coping with stress, about techniques for monitoring physiological and medical changes, and about the skills for critiquing work design solutions from a health viewpoint. Smoke cessation campaigns could work more effectively if the broader goals of psychosocial preventive medicine were advanced.

We do not attempt to argue that personal factors are unimportant for either health or productivity. It is rather our contention that the extraordinary breadth of the existing literature on psychosomatic causes of illness argues for integration of our understanding of environmental causes at work with the research on psychological and physiological mechanisms of individual response to the environment. Our approach is to link causes

based in the environment and causes based in the individual, but with environmental causes as the starting point. We present a staged model in which personal causes are linked to environmental factors in stepwise fashion, an idea that has had many previous advocates. These stages of explanation are linked to appropriate stages of job redesign action. We will introduce two mechanisms from the core of our basic model to help link the individual and the environmental levels of analysis. The first mechanism is that job stress may inhibit learning, via effects of accumulated strain. The second is that job-induced learning may, in the long term, reduce stress response through development of confidence and self-esteem.

The Redesignable Organization of Work and Stress-Related Illness

The argument for restructuring work environments would be impractical if the conditions of work that cause illness were inevitable (or avoidable only at great costs in terms of lost output to the society). Inevitability is assumed in the research tradition that explains illness in terms of "life-stressors." Stressful events—such as death of a spouse—that increase the risk of illness cannot be prevented. If the inescapable demands of work, from the farmer's labors to the social worker's burden of caring for the unfortunate, are the primary contributors to the psychosocial illness burden of work, we can expect few advocates for eliminating its contribution to stress. But this is precisely what we do not find.

Our findings show that social and psychological aspects of work situations are indeed significant risk factors for coronary heart disease, but not in the manner that might initially be supposed. While the psychological demands of work, along with time pressures and conflicts, are found to be significant sources of risk in many of our studies, work that is demanding (within limits) is not the major source of risk. The primary work-related risk factor appears to be lack of control over how one meets the job's demands and how one uses one's skills. In many cases, elevation of risk with a demanding job appears only when these demands occur in interaction with low control on the job. Other research has shown that regular physical exertion has positive effects on cardiovascular health in many situations (although physical hazards can of course pose major health threats beyond our stress perspective). Thus, in our research findings it is not the demands of work itself but the organizational structure of work that plays the most consistent role in the development of stress-related illness. Since this organizational structure is an eminently "designable" aspect of our industrial society, we are optimistic that new job redesign solutions can be found.

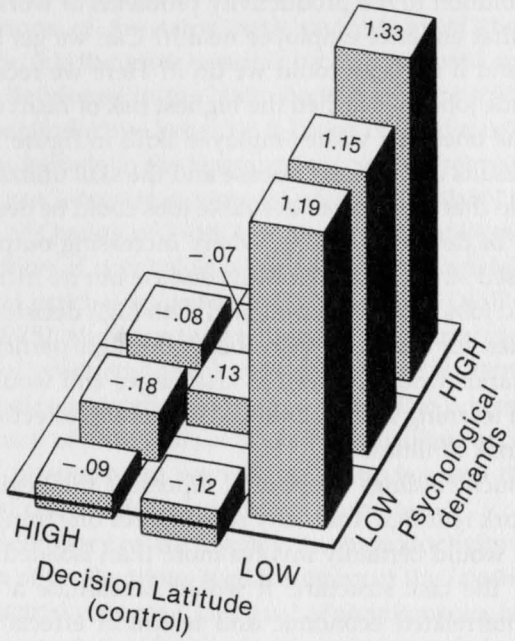
Productivity and the Psychosocial Structure of Work

Several generations of modern management theorists have documented the need to go beyond our present conventional (that is, hierarchical) organizational models in order to understand productivity. Almost as soon as Max Weber had clearly defined his model of the hierarchical bureaucracy ([1922] 1947) as the most efficient organizational form in growing industrial societies of the early twentieth century, critics of that model arose. Starting in the late 1920s, an entirely new direction in management theory, the Human Relations School, illustrated the importance of social interaction patterns, not just economic rewards or skill specialization, in determining the actual productivity of work. Organization theorists, from Merton (1940) to Melman (1984) and including Selznick (1949) and Gouldner (1954a), have criticized bureaucratic hierarchy as dysfunctionally rigid and easily co-opted by power structures to serve ends other than economic efficiency. The most recent generation of critics, such as Peters and Waterman (1981) and Swedish industrialists Carlzon (1987) and Gyllenhammar (1979), highlight the fact that simple, short-term economic criteria used to justify the hierarchical model in its original form can no longer be the sole validation of an organization's performance. But if short-term profitability is not sufficient, what should be the measure? One theme common to these critiques has been the underutilization of creative resources at all levels: workers' skills are insufficiently developed or not utilized. Organizations rigidly reject rather than facilitate creative adaptations to their environments. There is new pressure, visible in many management and business-oriented journals, to develop new management strategies for innovation, research and development, and other growth-oriented productive activities.

It is this theme of lost productivity that we are addressing with the skill underutilization associations shown in figure 1–2. In a nationally representative sample of the male U.S. work force we found an association between psychosocial job characteristics and a measure of skill underutilization: the difference between a worker's formal education and the amount of skill the worker's job actually required, assessed in terms of years of training. The diagram clearly shows that jobs low in decision latitude—jobs that gave little opportunity to make decisions or to decide which skills to use—were highly wasteful of the worker's actual capabilities. By contrast, jobs high in decision latitude (as in managerial and professional occupations) actually pushed workers beyond their training—possibly a good strategy (within limits) to encourage new learning. If such

FIGURE 1–2
Job characteristics and skill underutilization
(U.S. males, 1972, 1977, N = 1,749)

Number on vertical bar is underutilized skills in terms of years of education (see p. 175).



NOTE: Cell sizes, reading from left to right, are as follows (see p. 49*n*)—high demands: 225, 177, 174; medium demands: 146, 221, 137; low demands: 162, 255, 202.

SOURCE: Data from Quality of Employment Surveys.

extra challenges are motivators for those jobholders, it is hard to imagine that the jobs low in decision latitude and with wasted skills can be anything but unmotivating and unproductive. Indeed, in chapter 5 we shall examine further evidence that increased job demands lead to productivity increases only when the demands are combined with high decision latitude. When possibilities to control were perceived to be small, high levels of demands were associated with low productivity and stress symptoms.

It is truly ironic that just such low-decision-latitude jobs have been recommended in the conventional management models of the last two centuries, as we will see at the end of this chapter. Added to the business costs of the productivity losses resulting from this conventional wisdom are, of course, the economic costs of job-related illness discussed earlier. General Motors' biggest supplier is Blue Cross (Sloan, Gruman, and Allegrante

1987). Health care is becoming one of society's biggest budget items, in the United States increasing from 7 percent to over 11 percent of the gross national product in just ten years (Ginzberg 1987), while Sweden devotes 9½ percent to it (Swedish Central Bureau of Statistics 1987). Consumption of this part of the GNP is rarely associated with much happiness.

Could the solution to the productivity problems of work be the same as the solutions that enhance employee health? Can we get both health and productivity, and if so, how could we do it? Here we recall that the low-decision-latitude jobs that carried the highest risk of heart disease in figure 1–1 are also the ones that waste employee skills in figure 1–2. Thus, if we combine the results of the heart disease and the skill utilization studies, we might speculate that much more desirable jobs could be designed by avoiding low levels of decision latitude, where increasing output demands results in increased stress and even heart disease but no increase in productivity. If instead jobs could be redesigned with high decision latitude—that is, opportunities for taking responsibility through participative decision making—demands would be seen as challenges and would be associated with increased learning and motivation, with more effective performance, and with less risk of illness.

Of course, such findings could only represent the beginning of a new strategy for work redesign, for many reasons. For one thing, the process of work redesign would certainly involve more than isolated changes to two dimensions of the task structure: it would necessitate a detailed understanding of interrelated economic and technical effects of task design, organizational-level opportunities for and constraints on participatory decision making, and institutional forces at the level of the market or national policy that might affect job structures.

A strategy based on the joint search for worker well-being and productivity has, indeed, been the core of the entire Quality of Work Life movement, at least in the United States (Katzell, Bienstock, and Faerstein 1977). The most common connection between productivity and well-being, however, has been the supposition that work redesigned to be more satisfying to employees would also be more productive. We believe that this construction, while refreshing to managers, is flawed in its justification of employee health primarily as a pathway to profitability. Productivity cannot be considered the sole justification for a healthy workplace. Workers' health must be a separate goal in its own right. From the standpoint of the worker as consumer, health is the obvious prerequisite to obtaining satisfaction from material consumption: it is hardly possible to be a happy consumer in the evening after being an unhealthy worker all day long.

To avoid this difficulty, and to enhance the scientific validity of research with a joint focus, our proposed mechanisms for predicting productive behavior are separated from those that predict illness. This approach also allows us to consider separately the maximization of individual benefits and of firm benefits when job design strategies are analyzed. These dual mechanisms for health and productive behavior, however, will turn out to be different combinations of the same basic parameters of the psychosocial structure of work. It is therefore possible for an integrated set of job design principles to be developed in the later chapters of the book.

Our model for productive behavior is based on evidence for the importance of decision latitude in the learning process. At that point in the book (chapter 5), we can integrate our model with productivity evidence from several decades of Quality of Work Life and Industrial Democracy experiments. Our addition of psychological demands to the models most widely used in industrial psychology (such as Hackman and Oldham's Job Diagnostic Survey [1975]) allows us to describe two previously overlooked long-term inhibiters of productivity: job-induced passive withdrawal and lowered ability to make successful long-range plans. The potential of stress to inhibit the learning of new skills at both the individual and the organizational level is a phenomenon we will use to understand the linkage between individual tasks and organizational processes.

An important corollary of our arguments on productivity is the need for a new definition of productivity itself for many of the fastest-growing sections of the industrial economy. Our goal of simultaneous health and productivity enhancement may be obtainable only in a subclass of industries and outputs, those outputs most associated with customer-adaptive services, innovative technical development, and high reliability and quality. Our primary examples involve enhancement of long-term productive capabilities: enhanced skills for the worker and enhanced product lines and service potential for firms. These issues fall outside the conventional economic definitions of productivity that have dominated our industrial policy making: definitions that have increasingly been criticized for encouraging short-sighted cost cutting. We propose a new skill-related productivity definition in chapter 5. It implies new social structures for production, not only at the task level but also at the market level. We recommend new and often direct linkages between producer and customer in order to monitor and satisfy customers' needs and to facilitate growth of producers' skills. While they are not universally applicable, we feel that such new definitions of productivity are well justified by the actual behaviors recently observed in the most rapidly growing and innovative industrial sectors.

The Work Reconstruction Process

The process of arriving at a new organizational structure of work may be as important as the form of the resulting organizational structure itself. This is the message of the Industrial Democracy movement in Scandinavia in the 1960s and 1970s. Results of recent experiments in the design process have shown that in order to work effectively, a model must be adopted as its own by each workplace—a "local theory" (Elden 1983; Gustavsen and Hunnius 1981). A new organization of tasks that is imposed from above may not work because it lacks the necessary worker and staff advocates. More importantly, it fails to reflect the democratic value structure that was the major goal of the Industrial Democracy movement—that is, a structure that ensures self-determination in workplace organization for employees at all levels, particularly low-status employees, who so clearly lack these rights otherwise.

The very fact that our approach is based on the psychosocial structure of work should make it more relevant for the inherently social process of work redesign than models that focus only on the physical reality or the impersonal financial rewards of work. We believe, however, that the true potential of our model lies in the centrality of the concept of control: influence by employees in the work process decision. Changing the distribution of control opportunities, a close correlate of the decision-latitude construct that we use to predict health and productivity, is the central strategy for changing the structure of an organization. Patterns of control are central features of an organization's social groupings, reward structures, and information structures. The involvement of control in both the nature of our solutions and the process of obtaining them means that it will be difficult to separate the ends from the means in our model. In our perspective, the job design process and its ultimate design goals are inextricably linked.

The models we use must be broad and flexible. They must address several salient issues for each type of participant among the many groups needed to build new job structures. These groups include not only managers and workers but professionals with diverse backgrounds: medical professionals, social scientists in psychology and sociology, and engineers. In order to serve as the basis for a dialogue, the models must also be simple enough to be understandable to all. They must be generally applicable across intellectual disciplines as well as across the different perspectives of labor and management. The need to address multiple scientific disciplines requires a multilevel model, one that deals with phenomena at the level of the person, the task, and the organization. Because of our concerns with

health and job design, we begin our discussions at the micro level, interactions between the individual and the environment. We then move up to the level of the organization and finally beyond the organization to occupational groups and their job design interrelationships. Finally, these task and organizational changes must be translated into changes in the management policies that have led to our present work situations—a grand feedback loop that will now include health effects as well as productivity.

The process we have described is called *work reconstruction*. Although it clearly develops out of the other work transformation strategies discussed above, it differs from them in several significant respects. Work reconstruction implies a broader social, economic, and political process than *job redesign*. In particular, it includes more precise measures of health and well-being. On the productivity side, conventional economic measures are supplemented by more humane measures of production output. It thus brings a more varied group of professionals into contact with workers and managers. Work reconstruction can be undertaken at the firm level since representatives for all these viewpoints exist within the microcosm of a single company. However, to be fully successful, work reconstruction will require redefinition of existing political agendas (see chapters 9 and 10). Although it is consistent with broad goals of Industrial Democracy, work reconstruction does not fit as neatly into the existing labor-relations structures of many countries—which would have to be expanded to include our new issues.

Work reconstruction ultimately may be more broadly diffusable than Industrial Democracy precisely because it is not as tightly dependent on the specific institutions of a country. The new measures of productivity, as well as the attempt to universalize some conceptions of psychosocial well-being at work, may make work reconstruction more easily generalizable. Finally, in contrast to most existing "work-site health promotion" strategies, work reconstruction involves environmental as opposed to personal behavioral change, addressing what we consider the causes rather than the symptoms of health problems.

Because of a lack of direct data on each individual's job, we have sometimes relied on occupational groups and their average job characteristics to test our hypotheses. Ultimately, this occupational-level analysis has provided us with a useful frame of reference for comparing health conditions and job conditions among sectors of the work force that were previously examined in isolation. From this perspective, many of the job redesign experiments of the last decades are seen to be surprisingly limited, primarily using the same basic solutions over and over again in limited sectors of the modern industrial work force. On the other hand, they have been surpris-

ingly powerful, bringing about changes in job characteristics far beyond the boundaries of single occupations and indicating the feasibility of major restructuring of occupational boundaries.

One straightforward example of the political implications of such job changes is illustrated in figure 1–1. The high incidence of health problems with low-decision-latitude jobs shows that it is not the bosses but the bossed who suffer most from job stress. The most common problem is not executive stress (although some executive jobs are certainly stressful) but stress among low-status workers who bear equally heavy psychological demands but lack the freedom to make decisions about how to do the work. For most people, decision-making freedom appears to aid in coping with the heavy psychological demands of work, but for high-level managers, it represents an additional job demand. These findings suggest a simple solution: equalize the decision-making opportunities of managers and workers within work organizations, thus both reducing an unhealthy burden on high-level executives and professionals and providing health enhancement and skill development opportunities for lower-status workers.

Obstacles to Work Reconstruction

Redesigning work with these new goals will not be an easy task. Part of the hesitancy to address stress at the workplace is obviously political. There are national priority disagreements over the importance of occupational health, clearly illustrated by the divergent policies of the United States and Sweden. During the early 1980s in the United States, the National Institutes of Health eliminated research sections of the National Institute of Mental Health that were studying work stress and dramatically cut funding for research at the National Institute for Occupational Safety and Health (NIOSH). The U.S. government's denial of the importance of work stress was dramatically illustrated in the firing of the U.S. air traffic controllers. The U.S. Office of Management and Budget has deleted job stress measurements on some occupational health questionnaires (Cimons 1987).

In Sweden, the situation has been different. Over the last decade, workers and experts alike have become increasingly aware of the importance of psychosocial factors in the working environment. More and more courses on work stress, including its relationship to work organization and structure, are being organized for occupational health personnel. The Swedish Work Environment Fund (which has a budget equal to that of its U.S. counterpart NIOSH, despite the 25-fold difference in size of the national populations) directs more and more of its money to research on psychosocial factors. Although the actual pace of job restructuring has been slow, more and more leading Swedish company managers publicly acknowledge that participatory processes in the workplace are an important goal for a democratic society and may also be related to job stress problems.

Surprisingly, there is also resistance from institutional groups and universities. While the general public widely believes that psychosocial work stress is important to cardiac health and productivity, this relationship has been largely unrecognized and even denied by many experts. The Danish National Confederation of Management (Brøchner 1983a, 1983b) several years ago demanded the elimination of national funding for occupational stress research as too politically provocative among workers, although it ultimately reversed its position because of professional and public protest. In the area of education, job stress is almost universally ignored in the engineering curricula of all industrialized countries, and engineering courses routinely teach work design principles that if rigorously applied would be almost certain to increase job stress. The training of physicians also devotes little attention to issues important for understanding environmental stress.

We believe that there is also an underlying intellectual problem stemming from an expanding scientific gap in multidisciplinary knowledge, a gap that is visible in both countries. There is a deficit in comprehensive understanding, caused by the ever greater specialization that each scientific discipline develops in the advancement of its own field. The resulting "collective myopia" about real work problems can totally prevent the undertaking of coordinated solutions to modify the structure of work. There is at present little agreement on any aspect of the psychosocial redesign of work that can unite the full range of experts and workers needed to bring about the solutions. Many of these already unreconciled perspectives have become even more isolated in recent decades. We see several underlying issues that are causing the gap in multidisciplinary knowledge to widen. For example, as we have seen, while occupational medicine has been a cornerstone for our research, much of medical science has largely been preoccupied with individual-level causes of and cures for illness. When environmental factors are addressed, they are rarely the social organizational factors that could provide a pathway for prevention as well as an explanation of illness. And while some pragmatically oriented social scientists involved in experiments in Industrial Democracy and Quality of Work Life have been our teachers, many other academic social scientists are involved in much less helpful debates on narrowly specialized topics that indirectly diffuse energy for the common solutions we advocate.

The greatest barrier to redesigning work, however, is in the world of conventional business philosophy. While a large number of business school professors in organizational behavior are researching new management approaches similar to ours—and we must acknowledge our debt to them—there is still an increasing emphasis in the business and economic community on easily quantified, short-term productivity results. And in the United States there is still much implacable reluctance to sharing of enterprise control either with workers or with the medical or social science experts—in spite of much sloganeering to the contrary (Lawler, Ledford, and Mohrman 1989). This is the primary source of resistance to our suggestions.

The Development of Contemporary Patterns of Work Organization

The political complexity of changing the organization of work suggests that we would do well to understand how jobs came to be the way they are today. A brief look back at the past justifications for work designs shows that the problems in work organization today are deeply rooted in the conventional economic and management theories of the last two centuries.

We believe, along with Piore and Sable (1984), that the choice of one work organization over another cannot be justified by inevitable natural or economic laws. Production organizations are ultimately justified by social decisions and by the state of technological development. As technology and society's goals evolve, so does what is considered logical in terms of work organization.

In many ways, work organization as a science is now in a transition period. Old patterns are deeply entrenched yet appear more vulnerable than ever. New models exist but have not yet won widespread acceptance. There are major changes in how optimal work organization is intellectually justified. Indeed, many of the interdisciplinary conflicts we have noted can be related to transition in the very choice of sciences we apply to work organization. This century has witnessed a dramatic change in the rewards and difficulties of work, from hard to soft science in nature. The physical and economic outputs and occupational hazards at the beginning of the century were analytically amenable to hard scientific measurement. They required progress in the quantitative sciences for solution. The emerging challenges in societies like the United States and Sweden require a new scientific synthesis on the soft, psychosocial side of work for their solution, if both the new health and the new productivity goals are to be achieved. These shifting perspectives may well be a major source of the tensions that exist between today's hard and soft scientific perspectives on work organization and the major discrepancies between the reality of new psychosocial job design experiments and the still-dominant theories inherited from the earlier era of heavy industry. Let us first trace the source of the older, conventional models.

The extraordinary increases in material standards of living in the industrialized world in the last century have clearly been based on technological innovations with origins in the physical sciences: the steam and internal combustion engines, electrical power, the telephone, the automobile, the computer chip. A close look at the social history of the end of the nineteenth century reveals that the hard sciences were also the key to solving the health problems of that era. The primary problems then were the daily debilitations faced by physical laborers: physically exhausting working conditions and life-threatening hazards such as those faced by mine workers (and described vividly in Émile Zola's *Germinal* ([1885] 1952) and slaughterhouse workers (revealed by Upton Sinclair [1906]). The economic and physical deprivations of these workers were easy to measure and simple to understand (now, at least) and were thus good candidates for solutions according to the model of hard scientific analysis. To the list of physical oppressions Karl Marx added his economic analysis of the easily measurable injustices of labor's meager share of production rewards and forecast a decline in the system if workers lost the income necessary to buy the goods that kept capitalism's industries afloat (1867).

The hard science–based industrial revolution of the nineteenth century also changed the social structures of work. Swept away were the old small-scale shops of independent artisans and their craft guilds and unions. By the turn of the century, these forms of traditional work organization yielded to the political and economic power of enterprises based on new technologies—but not without a struggle. Violence often accompanied the destruction of traditional social structures of work, in which fiercely independent tradesmen had powerful control over their work processes and over passing on their skills. These changes in work organization occurred earlier in England, Germany, and the United States and later in Scandinavia and Japan, but they were always accompanied by enormous social protest. In some countries, there were socialist revolutions; in others, battles were waged by captains of industry against workers, as in the Homestead Strike at Carnegie Steel in Pennsylvania in 1892. Craft groups were replaced by lower-skilled (previously agricultural) labor that was in plentiful

supply. The new labor supply, along with new machine-driven production technologies, resulted in a drop in the production skills required, from the high craftsman level to medium and low levels. The companies acquired control over job training and removed the responsibility for planning production from the workers (see Stone 1973 for a well-documented discussion of these processes in the U.S. steel industry). The downgrading of production workers' skill levels eventually left a gap at the middle skill level in the work force where numerous self-managing craftsmen had been. This resulted in the need to develop a smaller "middle-elite" of technical managers and foremen and a whole new breed of engineers to manage the newly retrained workers and their machines (Piore and Sable 1984).

It was this vacuum of the missing "middle-elite" that Frederick Taylor addressed with his *Principles of Scientific Management* in 1911 in the United States. Scolding the managers of his day for their lack of technical understanding, and banishing the old craftwork methods as hundreds of years out of date with the requirements of the new technologies, he laid the foundation for training a new profession: industrial engineers were to be educated at universities where they could "scientifically" identify and analyze the basic elements of a worker's task and recombine these elements into new task structures that could accommodate the new machines filling every corner of the shop. Precise division of labor facilitated the development of mechanized equipment to perform operations automatically, which in turn justified further division of labor.*

According to Taylor, workers' tasks were to be simplified into the elemental skills required and then reorganized in minute detail by plans drafted by engineers. Physical labor was to be reduced by elimination of wasted motions. The pace of work was to increase substantially, and workers were to be isolated from each other and individually evaluated, to avoid "time-wasting" habits and the development of social groups that might resist management plans. Taylor made encouraging promises to both labor and management: to traditional managers who had refused to interfere with old craftwork structures, he promised dramatic improvements in profits; to the new (often immigrant) workers, he promised major increases in wages. This dual largesse was to be made possible by the huge increase in overall output and productivity that would occur under what he called *scientific management*—the new scientific method of systematic work measurement, systematic review of data, formulation and testing of generalized theories, conclusions on the basis of evidence, and finally unwavering application of the solutions—to workers—by management.

*"Once a human task has been decomposed into its elementary motions, it became possible to build a device that would perform these motions, automatically; and as one step in the manufacturing process was thus mechanized, the preceding and following steps had to be correspondingly reorganized, to keep pace with the new machinery" (Piore and Sable 1984, p. 22).

Taylor's recommendations were actually only the task-level consequences of a much more general set of principles for organizing an industrial economy dating back to Adam Smith's *Wealth of Nations* ([1776] 1976). That book, along with Jeremy Bentham's (1794) "Utilitarian" philosophy of economic measurement for all individuals' pain and pleasure (the source of the economic logic on psychological well-being from the opening line of this chapter), are the cornerstones of Western "free-market" economic thought and quantitative (i.e., "bottom line") social decision processes. Adam Smith started the very first chapter of his book with the fundamental proposition that productive social organization of work is built upon the division of labor: productivity is maximized when workers are assigned to jobs with tasks as small and as specialized as possible, to promote dexterity, and to eliminate wasted motions. These benefits of specialization, however, could only be obtained by trade in the marketplace. Here the producer efficiently specializing in production of one good could obtain more "welfare" by trading with its profits than he would have obtained if he had (inefficiently) produced all goods he needed himself—what Smith called the principle of comparative advantage.

Smith acknowledged only one limitation to his principle of maximum specialization of labor leading to maximum economic profit: the size of the market for the product. Only a large market could justify the highest levels of labor specialization. Almost as a corollary, conventional management wisdom holds that large-scale markets and enterprises (hence corporate expansion) are economically efficient because of the high levels of specialization possible (of course, economies of scale in capital equipment also lead to collateral savings).

However, specialization of labor leads almost inevitably to restricted power for workers. This is so because a set of managers and engineers must be hired to control the workers' behavior in a way that recoordinates their specialized activities—Taylor's contribution. Ironically, in democratic Western industrial societies one of the only "legitimate" justifications for limiting equality of power is the "necessity" of achieving maximum economic efficiency, as a first priority. According to Smith and Bentham this will lead to the "greatest [economic] good for the greatest number." However, the tendency to evaluate all decisions on the basis of economic measurements can also adversely affect workers. The actual impact of Bentham's Utilitarian penchant for economic evaluation may be to benefit some groups at the expense of others: the quantifiable physical output of the firm becomes the primary basis for decision making, while non-quantifiable behavioral phe-

nomena at work, like control, are easily overlooked. Obviously, our later discussions will have to examine the distribution of both quantifiable and nonquantifiable production consequences.

Two major changes in working life, then, were wrought by the introduction of what we are calling the conventional theories of production organization. However, these changes were often invisible in hard economic or physical terms. The most obvious change was that onerous, concrete physical labor was relieved by new machinery. It was replaced by very high, but hard to measure, psychological work loads, the most salient characteristic of our new psychosocial work environment. The second change was the application of the division of labor principle, with its theoretically separate but closely related impacts on skill usage and control over the work process. These two transformations are closely related to the two dimensions used to categorize the psychosocial job structure in figures 1–1 and 1–2 and will form the basic analytic model used in the book.

A number of factors beyond the two-dimensional model may also significantly affect stress at work. One set of issues relates to the impact of the division of labor on social relations in the company—and outside it. Market transactions (which, according to Smith and subsequent economists of the still dominant neoclassical tradition, were to occur between "strangers") are the means to augment, evaluate, and distribute all production output. They also carry the negative consequences of disrupting the previous community-oriented production processes and further increasing workers' feelings of powerlessness. As markets increased to global scale, workers' job opportunities were affected by distant factors beyond their understanding and influence, and job insecurity became a problem.

Nevertheless, we will begin our analyses with just two primary dimensions, the division of labor and psychological demands, for the same reasons that Adam Smith did: he considered the division of labor in society to be the cornerstone upon which all his other principles of economic organization rested. This preliminary set of principles of work organization has remained intact to a remarkable degree almost to the present day; in some ways it is stronger than ever. Refinements added since the First World War have largely reinforced the resulting patterns of social relations at work. Scientific management's restriction on the power of labor in the work process can be seen in the fact that the primary tactic for increasing profits under the model is to search for ways to cut wage costs (using short-term measures of cost-effectiveness), while the costs of coordination and management (indirect costs) have gone relatively untouched. One recent enhancement of Smith's argument for the efficiency of large-scale enterprises was that large scale could ensure predictable operations. Easily repeatable operations came to be

considered an additional requirement for high productivity: unexpected variations could lead to waste, inefficient mixes of resources, and less-than-optimal use of new production technologies. This argument led to further justification for management's need to control all factors in its operating environment—not only labor behavior but even customer demand, which can only be manipulated if market share is large enough. Another new factor is, of course, the computer, which allows centralized monitoring and coordination of operations that were previously integrated by worker discretion, increasing the interdependence and complexity of the production system and the need for more coordinators.

The search for predictability and machine-like determinacy has also been evident in the design of new machinery to be operated, of course, by human beings. As Lund and Hansen (1986) recently pointed out, engineers (particularly in the United States) have often adopted simplified views of human requirements that focus on the quantitatively modelable "human machine" but usually overlook people's proactive, goal-oriented social and political needs. Conventional management's "profits only" orientation and the computer's data-processing potential have further reinforced information-gathering strategies that collect only hard, easily quantifiable data on economic outputs and inputs, hours of work, and material requirements, rarely measuring the pain or pleasure of psychosocial working conditions.

What have the consequences been? The historical impact of these policies on material productivity was often dramatically positive in the industries of the early twentieth century. The new industrial engineers often radically speeded up the pace at which the task was accomplished. For instance, Gilbreth (1909) describes the redesign of a bricklayer's job that produced a 300 percent increase in efficiency and also resulted in higher wages for the workers. Under Henry Ford in 1913, jobs became even more restricted in skill and authority as the mechanically controlled auto assembly line moved each car chassis through its sequence of worker operations. Ford offered workers double wages, and his offer was finally accepted by labor in spite of early walkouts and a turnover rate of 300 percent. Although organized labor resistance to the methods of scientific management was not insignificant (Hoxie 1920), these work methods were eventually almost universally accepted by major unions by the early 1950s in the United States and the 1960s in Sweden. Indeed, Walter Reuther's strategy for United Auto Workers was to give up control over the work process in trade for wage increases, a policy which has been significantly reversed only very recently with renewed worker interest in decision participation. No less a champion of worker interests than Vladimir Ilyich Lenin was a supporter of Taylor's methods for the U.S.S.R. in 1921, as an appropriate

building block of scientific socialism (Lenin [1917–1923] 1976). Taylor's principles are still at the core of industrial engineering curricula when it comes to the design of the worker's task. In spite of the entirely different and glitteringly successful examples of alternative work design in Western Europe, Japan, and the United States, Taylor's principles still probably represent the predominant direction of job design change in the modern world (for examples, see Gardell and Gustavsson 1979; International Labour Office 1979; U.S. Department of Defense 1985).

The Forces for Change I: A New Generation of Psychosocial Problems

Over time, the new solutions of Taylor and his followers gave rise to an entirely new set of worker deprivations and management problems, problems that have now created a need for a new set of work design principles for the future. Consider the profile that has been found to characterize the job at high risk for psychological stress: the job is low in task decision freedom, low in skill level, but high in psychological demands; it is also, as we will see, low in physical exertion and socially isolated from workmates. This stressful job fits, embarrassingly closely, the specific job design *goals* of Taylor's scientific management. Thus, psychological stress may easily be the direct, if unintended, outcome of application of these job design philosophies. Of course, Taylor's conscious goal was not to increase psychological stress; the word is never mentioned in his texts and did not even exist in its present meaning. Indeed, the stress consequences might be viewed as an innocent oversight, if only Taylor's crusade to transfer control over work processes from tradesmen to the new class of managers had not been waged with such dogmatic vigor (which ultimately resulted in his being called before Congress in 1921).

The three major oversights in Taylor's prescription for job design related to psychological demands, control, and social support. First, the worker was left with little possibility for psychological relaxation. The promised increase in work pace did indeed occur, and many motions that had served as the workers' only rhythmic respites from the pressures of production were eliminated as "wasted." Second, the worker was freed from the "burden" of making decisions about how to perform a job, a change usually resented by workers as a loss of control. The transformation was so thorough that workers were deprived of almost all possibility of self-pacing and self-initiated improvements to the work process. To craftsmen, the ultimate loss

was the loss of mastery of a trade capable of rendering a complete service to a customer. The divide-and-conquer aspects of job fragmentation placed labor at the mercy of the new market middlemen (Thompson 1963) and of engineers' and managers' "planning requirements." Job security became dependent on a new set of uncontrollable factors. Third, the social isolation of workers that was explicitly and rigidly enforced in Taylor's system had negative consequences not only for the workers but, in the long term, for work effectiveness. Eliminating group work, in which Taylor saw exaggerated dangers of loafing and featherbedding ("soldiering") as well as the power to resist work structures imposed by management, undercut not only the social support of the work group but the potential for easy cross-training of skills and ultimately the flexibility to restructure work processes to meet constantly changing markets and technological demands.

During the first half of the twentieth century, psychosocial work hazards such as loss of control, greater psychological demands, and social isolation were less important to workers than increased wages and reduced physical demands. Now, however, there is evidence that these psychological and social factors are gaining in importance in comparison with the physical burdens of work.* The nationally representative (1:1,000) Swedish Level of Living Surveys in 1968, 1974, and 1981 showed a clear increase in reports of psychologically demanding work, from 29 percent in 1968 to 42 percent in 1981 (Swedish Central Bureau of Statistics 1982). There is now a higher percentage of psychologically demanding jobs than of jobs involving heavy lifting, which dropped from 36 percent in 1968 to 28 percent in 1981, and jobs involving dirty work (noise problems have not changed significantly). Of course, part of this increase in reports of psychological job demands may be due to increasing worker awareness of these problems, but that would simply confirm our point. We suspect that similar tendencies are true in the United States, although comparable national statistics have unfortunately not been collected by the U.S. Department of Labor since 1977.

In the last decade or two, a new wave of critical literature on the work environment has emerged documenting these psychosocial problems (Edwards 1979; Gordon, Edwards, and Reich 1982; Howard 1985a, 1985b; Noble 1977; Shaiken 1984). Inappropriate use of computer technology and video display terminals, which can combine demands for concentration with socially rigid, deskilled job structures and monitoring, can build be-

*For lack of a new vocabulary to describe these phenomena, many authors (for example, Sennett and Cobb 1972) speak of stress and illness as "costs" and discuss the dollar value of these losses, relying on the symbol of the previous era of physical and economic deprivations, as though the new problems could also be neatly fitted into Adam Smith's marketplace model.

havioral prisons and restrict hopelessly the development of human potential in working life. These critics illuminate new debilitations of psychological job stress and show the powerlessness of segments of the work force who fear their skills will be made obsolete by new waves of automation. These criticisms of our present implementations of computer technology are all the more striking when we note that the computer is often a very benign technology that in the right circumstances leads to skill development and creativity.

Changes in health care delivery and its costs are also challenging the conventional approaches to work organization. The cost of illness attributed to the work environment is increasing in the psychosocial areas, with worker's compensation claims for stress-related causes rising to 14 percent of all claims, up from only 5 percent in 1980 (Grippa and Durbin 1986). The overall magnitude of these costs, while difficult to estimate precisely, as we shall see in chapter 5, has now come to represent a significant fraction of health care costs overall, which in turn continue to rise as a proportion of the gross national product. The potentially preventable health care costs thus run to many tens of billions of dollars every year.

"Preventive health care" is in fact becoming more and more common in the workplace, with over 66 percent of U.S. companies with more than 50 employees offering some kind of program (U.S. Office of Disease Prevention and Health Promotion 1987). The importance of the work site as a location for health care delivery is trivialized, however, if the prevention activity does not target hazards that exist at the workplace itself. At present, the work site health promotion programs almost never address such issues but instead focus on changing workers' life-styles, leading workers to question management's motives for sponsoring them (Canton 1984). In light of the magnitude of prepaid medical expenditures by third-party health care organizations such as private health insurance plans and the United States government (over $360 billion a year in the United States in 1987 [U.S. Department of Health and Human Services 1988]), it is surprising that these organizations devote so little funding to prevention that actually changes jobs. By contrast, over the last decade social expenditures in Western Europe have risen, often to cover the costs of work-related adjustments in areas of occupational health, employment maintenance, humanization of technology, and skill retraining. These expenditures represent preventive medicine against future health care problems and long-term productivity losses. What happens if the United States fails to pay these costs? The bill for omitted prevention will come due in the future, and it will be higher than the costs of prevention.

The Forces for Change II: A New Industrial Revolution

Ultimately, the strongest forces for job change are the transformations—fully as dramatic as those of the original industrial revolution—that production and technology themselves are undergoing. In many ways, these changes undermine core assumptions of Smith's, Taylor's, and Weber's conventional models of production organization. They imply the need for change in the most basic concepts, including development of new measures of the value of output from productive enterprises that transcend simple Utilitarian approaches.* Many of these changes imply new economic paradigms and social structures for work that may, with the proper design goals, be consistent with jobs with lower risks of stress.† If on the other hand psychosocial well-being is overlooked as a goal, we may confront more intractably disturbing psychological and emotional consequences than those of the first industrial revolution. While full elaboration of such new socioeconomic models is far beyond the scope of this book, we will review evidence for some of the job design implications of these models in chapters 5 through 10. But the evidence for changes is also contradictory. Some transformations, such as the globalization of the economy, appear to reinforce the impact of Adam Smith's original model—with market scale enlarged to its maximum extent.

We first review the several major transformations that challenge the basic assumptions of conventional economic models: they are wide-ranging. In general, the social relationship components of production output are becoming more important while its physical components are becoming increasingly limited. The primary example is the expansion of the service industries, where social relations between the client and the server are of paramount importance. These already employ more than twice as many workers as the manufacturing sector. The true nature of output in these industries must often be described as unknown, because it is beyond the analytical capabilities of the old scientific management and productivity analysis to describe. The difference between these new service outputs

*New forms of productivity measurement focusing on growth and development are becoming more important. Management literature has recently criticized the myopic concern for short-term cost reductions, showing ultimately that it can lead to disastrous failures to invest adequately in new capital equipment or human capital. The short-term focus, based on conventional economic models, is also inconsistent with innovation, which yields uncertain but essential future benefits.

†Important syntheses have emphasized the importance of creative involvement of workers, but without taking into account the social structural prerequisites for humanized work that labor unions would emphasize (Naisbett 1984; Naisbett and Aburdene 1985; Toffler 1981).

and the conventional outputs of Adam Smith's world is fundamental. In our definition (Karasek 1989a), the production of goods involves adding value to inanimate objects, whereas services involve adding value to a person or to an organization, both entities that can grow. Since goods production involves the use of physical resources that are strictly limited, such as forests and fossil fuels, and poses a risk of catastrophic pollution at present scales of production, new forms of production emphasizing social relationships and development of human capabilities—rather than material output—could be an important contribution to an environmentally healthy planet.

Biological needs alone no longer generate sufficient demand to keep populations constructively employed. In much of the industrialized world, the previously hungry-for-products mass of consumers has now been replaced by a population that often needs to be persuaded to buy something (with advertising expenditures that for many popular products exceed production costs) and taught how to "need" the products that technology can make available (for example, home computers). The world's chief economic problems at the turn of the century often involved developing new production technologies to keep pace with increasing demands for basic industrial commodities such as steel and coal. Now the most pressing economic problem for the industrial economies of the world may be how to keep their populations employed in the face of overcapacity in everything from ships to computer chips, a problem that each country tries to solve by increasing its own relative productivity—and thereby, of course, producing greater overcapacity.* Desirable products for the future will be those that stimulate demand in a constructive way, not satiate it, completely reversing the previous model of economic satisfaction. Labor has become an item of consumption (in the sense of the need for a job), instead of just an input to production, and creative challenges at work are an important aspect of well-being.

Skill utilization and development are also becoming more important, and the education levels of the human resources of populations are increasing. The work forces in the industrialized countries have dramatically higher levels of educational training and more experience in democratic participation than the rural immigrant laborers discussed by the early production theorists. Skill surpluses, when combined with rigidly hierarchical organizational systems, lead to dissatisfaction, boredom, or disengagement from work. Furthermore, the present base of installed capital equipment

*We acknowledge that redistribution of income both within countries and between countries—an international Keynesianism discussed by Meade (1987) and Piore and Sable (1984)—would reduce the overcapacity problem, but we think our argument would still be relevant.

cries out for workers skilled enough to obtain the maximum yield from this expensive investment. The productivity of capital in the United States has not increased for decades (U.S. Office of Technology Assessment 1986); most of the effects of automation in this country have merely been to replace expensive labor with expensive equipment.

At the same time that these developments have been taking place, there has been a contrasting change in the form of a major expansion of the first industrial revolution, driven by the dramatic consolidation of enterprises around the world. The global economy has created a division of labor on an international scale. Ironically, many of the new technologies that have made global communication possible (such as software, computer chips, and sensor systems) are themselves suited to small-scale production and often do not technically require the vast organization or expenditures for production that mass automobile production, steel mills, or railroads require. A growing number of management theorists see small organizations, often combined in networks, as a more effective form for production in areas of future economic growth (Piore and Sable 1984; Starr 1989). The goal of market domination by global multinational corporations, however, and the international competition for job opportunities are leading to enterprise consolidation regardless of the costs to productivity or psychosocial well-being.

Overall, it is remarkable that our conventional principles for work organization have been successful to a fault. They have yielded productivity increases that have so far outstripped demand that for many they have led to job insecurity. Extreme division of labor has limited skill development, autonomy, and social relationships to the point of creating some very undesirable new environments. When the original principle of endless division of labor is seen in the light of its production of psychosocial outcomes, the need for alternative models of organizing work becomes clear.

We believe that significantly increased importance for the psychosocial aspects of work is common to all the transformations just described. To produce new models of work organization for these new conditions that will be genuinely useful in practice, there will need to be not just separate breakthroughs within disciplines such as medicine, engineering, and the social sciences, but coordinated changes around new tools developed using the combined wisdom of multiple disciplines. Our own attempt in this direction will begin in chapter 2, with presentation of an initially simple model formulated from the two most salient characteristics of the psychosocial work environment for predicting the health and behavioral consequences of work: specialization of labor and psychological work demands. A model based on these aspects of work could be a means of com-

munication for the major professional groups who must be involved in future job redesign processes. The inclusion of the demands of work addresses issues raised by productivity-oriented engineers and health-oriented physicians and other medical professionals, and the issues of task authority and skill use address concerns of organizationally conscious managers, industrial psychologists, sociologists, and job redesign professionals. We do not claim that our theoretical model explains everything, and indeed we have been obliged to make a number of expansions of its original formulation since the 1970s. Nevertheless, we will defend both its scientific validity and its use as a tool to encourage the first stages of communication between the groups of problem solvers mentioned above. Ultimately, its defense is that it is at least one attempt at developing a new vocabulary for the psychosocial side of work that is suitable for beginning policy discussions in an area where most issues are still not clearly articulated.

After presentation of the basic model in chapter 2, the topics in the book proceed in an order that moves from the micro level to the macro level. In chapter 3, we draw connections between the environmental perspectives discussed in chapter 2 and the psychological and physiological processes that explain our heart disease findings reported in chapter 4. The second half of the book is devoted to work reconstruction. The sequence of the topics we address in the second part of the book is determined by the level of the work reconstruction strategy involved. We start with task-level job redesign issues in chapter 5 and move to successively larger-scale work transformation challenges in chapters 6 through 10. In addressing issues of how to change work, we integrate our own findings with the products of two decades of job redesign experience and with currently emerging strategies of preventive health care at the work site. In chapter 5, we examine the economic consequences of job stress, review models of motivation, examine evidence for the effectiveness of these models as a basis for the redesign of work tasks, and develop a new definition of productivity. Chapter 6 reviews job redesign processes from the point of view of health promotion. What can the occupational health team do to improve job design? Chapter 7 examines methodologies for job redesign at the organizational level. Chapter 8 considers the effects of new technology on humane job redesign. Chapter 9 examines political strategies for different groups of occupations. Finally, chapter 10 explores the broader social and market context of our original task-based model and speculates on the implications for the nature of the future economy of implementing—or failing to implement—our models of work reconstruction.

2

The Psychosocial Work Environment

In this chapter, we demonstrate how a model based on the psychological demands of work, skill use, and task control can predict a broad range of health and behavioral consequences of the structure of work. Our management models in chapter 1 outlined the organizationally determined relationship between the breadth of skills workers could use on the job and their authority over decision making. We call these two concepts skill discretion and decision authority and combine them into the single measure—decision latitude—used in the figure below, along with psychological demands. Later in the chapter, we augment this model with measures of physical demands and social interaction at work, to complete our description of what we call the psychosocial work environment.

Psychological Demands and Decision Latitude: The Demand/Control Model

We begin with the two-dimensional model shown in figure 2–1. Four distinctly different kinds of psychosocial work experience are generated by the interactions of high and low levels of psychological demands and decision latitude: *high-strain* jobs, *active* jobs, *low-strain* jobs, and *passive* jobs. We will look at each of these types of experience in more detail.

High-Strain Jobs

Our first prediction, now familiar, is that the most adverse reactions of psychological strain (fatigue, anxiety, depression, and physical illness)