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**THE ECONOMIC APPROACH TO  
PERSONNEL RESEARCH**

**CEO PUBLICATION  
T 01-1 (391)**

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**January, 2001**

Forthcoming in *The Expansion of Economics and Other Disciplines: Towards an Inclusive Social Science*  
NY: M.E. Sharpe, ed. by Shoshana Grossbard-Shechtman.

Prepared for the 1999 meetings of the Society for the Advancement of Behavioral Economics. We have benefited greatly from interactions with teachers, colleagues, and students over the years. A partial list of those who we wish to thank includes George Baker, Gary Becker, Mike Beer, Susan Cohen, Joe Cooper, David Finegold, Ray Friedman, Cristina Gibson, Richard Hackman, Wally Hendricks, Bengt Holmstrom, Kathryn Ierulli, Mike Jensen, Ed Lawler, Eddie Lazear, Gary Loveman, Bentley MacLeod, Janice McCormick, Sue Mohrman, Kevin J. Murphy, Canice Prendergast, Dan Raff, Sherwin Rosen, Wim van der Stede, and Karen Wruck.

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*“Definition of an Economist: A person who knows all the answers, but doesn’t understand the questions.”*

*(The Humorous Dictionary of Economics, 1983)*

*“An economist (John) loses his keys while walking across a dark parking lot. His friend (Jane) happens upon him some time later.*

*Jane: ‘Hi John! What are you looking for?’*

*John: ‘I lost my keys somewhere in this parking lot.’*

*Jane: ‘Did you lose them under one of these streetlights?’*

*John: ‘No, I checked those areas twice already.’*

*Jane: ‘So why are you still looking under the streetlights?’*

*John: ‘Because that’s where the light is!’”*

## **Introduction**

The economic approach to personnel and organizations has grown greatly in scope and importance over the last decade or two. It is now recognized as a separate field within labor economics, responsible for as much as a third of papers in leading labor journals.<sup>1</sup> Business schools increasingly offer personnel economics courses, and hire economists to teach human resource management and other organizational courses traditionally taught by non-economists. Textbooks using, or strongly influenced by, the economic approach to organizations have appeared regularly for several years (e.g., Milgrom and Roberts 1992; Brickley, Smith and Zimmerman 1996; Jensen 1998; Lazear 1998; Baron and Kreps 1999). Personnel and

organizational economics has developed to such a great extent that there are now many excellent literature reviews that take stock of the contributions or criticize the approach (see Appendix A for a partial list).

A cynic might worry that the abundance of literature reviews indicates the imminent death of the field. At the very least, many observers criticize the economic approach to personnel. The criticisms often are those applied to all of economics, such as the assumption of rational behavior, crude specifications of individual and group psychology (Kaufman (1999) is the most sophisticated critique along these lines), and too-simple models of complex reality (Hirsch, Michaels, and Friedman 1987). Another common criticism is that the field focuses narrowly on incentives to the exclusion of other interesting and important topics.

Our purpose is not to provide another survey of the field. Nor is it to join in what Winship and Rosen (1988) term “tiresome debates” about methodology. Instead, we try to be constructive in other ways. One barrier to interdisciplinary communication is differences in language (Merchant, Van der Stede and Zhang 2000). We use the language and viewpoints of both perspectives to try to decrease the language barrier. In the first section below, we briefly outline a way that many scholars outside of economics tend to view organizational design (see Figure 1): the “systems” view of an organization. We interpret this view in economic language, and use it as the skeleton for the rest of the chapter.

Our most important goal is to discuss research areas that we believe hold great promise for gains from integrating economic and behavioral approaches. In the spirit of the two quotes at

the beginning of the chapter, economics is stronger at providing theory based on mathematical models, and pursuing topics that existing theory or databases most readily lend themselves to. Organizational scholars outside of economics give more emphasis to topics that are of empirical and practical importance, and build theories accordingly, even where such theories do not lend themselves to formal (especially mathematical) modeling. We identify topics that have received great attention outside economics, little inside economics, and which might benefit greatly from the economic approach.

We do not provide a comprehensive review of topics in the management literature, with the objective of detailing how an economic approach can improve them, for two reasons. First, introducing the topics for economists is task enough for a single paper. Indeed, in many cases we give short shrift to topics that have received extensive coverage by behavioral researchers. Second, and perhaps more importantly, because many of the topics discussed here have been barely researched by economists, it is too soon to predict how taking an economic approach will improve the existing knowledge base. That said, we are confident that economics has much to add, as we point out below, and look forward to a day in the near future when such a review will draw on a large body of research completed by economists.

The plan of the chapter is as follows. In the next section, we outline the systems view of organizational design, using it to compare economic and behavioral approaches. This also serves to bring out the main topics we pursue. In the third section we consider important organizational policies that behavioral scholars have studied extensively, but that economists have paid little attention to. In that section, our goal is to suggest interesting areas of research for economists to

pursue, as well as to sketch some ideas about how that research might be pursued. Topics we discuss include intrinsic motivation, job design, decision-making, organizational structure, and coordination. The fourth section takes a similar approach to topics in organizational dynamics. The fifth section provides a brief discussion of methodological and empirical issues, and sixth section ends with brief concluding remarks.

### **The Systems View of Organizational Design**

There are many ways to compare economic and behavioral approaches to thinking about organizational design. Here we highlight one difference that has not often been emphasized: behavioral approaches tend to take more of a *systems* view than does the economic approach (e.g., Galbraith 1977, Senge 1990). Figure 1 illustrates the systems view of organizational design. It is adapted from a similar figure in Beer, et al (1984, Fig. 2-1). Similar ideas can be found in other writings throughout organizational research for many years. We modified the Beer, et al figure to make it more consistent with the language of economics.

**<<FIGURE 1 NEAR HERE>>**

“Organizational Design” represents firm design and personnel policies; these are the focus of personnel economics.<sup>2</sup> However, the systems view represents it as part of a larger process. By doing so, it encourages thinking about broader questions than by focusing only inside the Organizational Design box.

Behavioral scholars often view firms by first starting with the “Strategy” and “Environment.” The firm chooses a strategy, product line, and product attributes (emphasis on cost, quality, timely delivery, customer service, innovation, etc.). This depends on the firm’s constraints, including product and labor market conditions, legal considerations, social or political pressures, and competitor strategies. The strategy determines *what must be done* inside the firm in order to produce the product and implement the strategy, which then determines optimal organizational policies.

Organizational policies, in turn, produce “Intermediate Outcomes,” which we have described in terms familiar to economists: investment, matching, and motivation. Personnel policies result in investments in firm-specific and general human capital, employee expectations, corporate culture, etc. They result in matching between employee skills and tasks, information and decisions, etc. They result in intrinsic and extrinsic motivation. These outcomes, combined with other firm inputs like capital, result in “Business Outcomes.” Business Outcomes are measured in the same way as Strategy objectives: profit, product attributes, innovation, etc. Of course, this simplistic description makes the relationships seem more linear/causal than they really are. Intermediate and business outcomes interact in complex ways, including feedback from business outcomes to intermediate outcomes.

### ***External and Internal Fit***

One thing the systems view highlights is that the firm’s design should be *complementary*, or have *external fit*, with the firm’s objectives and constraints. In other words, the Business

Outcomes produced by the Organizational Design should ideally match the Strategy. Thus, in behavioral research, an interesting question is how personnel policies should vary with dimensions of the firm's product, technology, or strategy. By contrast, virtually all economic models have a single "product" with no dimension other than quantity (and sometimes quality). In an economic model, it typically is irrelevant whether the firm is producing a simple, low-tech, standardized product such as a tin can, or a complex, evolving product such as a semiconductor. It is irrelevant whether the firm is in manufacturing or white-collar work. In behavioral research, such distinctions are fundamental, and lead to very different insights about optimal policies. We argue below that such distinctions may lead to important insights in personnel economics.

This is our first difference between the two approaches: economics tends to be vague about *what the firm is trying to do* beyond the abstract notion of "profit maximization." Because of this, economists have little to say about how policies should vary with different types of products, competitive environments, or technology, and how they might change over time.

The systems view also emphasizes *internal fit*, the idea that personnel policies may be more effective if they are designed to be mutually reinforcing (that is, that they should be viewed as a *system*). For example, promotion-from-within is often said to be complementary with lifetime employment and deferred compensation. Team production and employee "empowerment" (decentralization of some decision rights) are often said to be complementary with enriched jobs. In Figure 1, this is the idea that the four types of policies in the Organizational Design box might be designed to work well together. At one level, this is trivial and obvious. At another, though, it may imply that there are *patterns* of organizational policies



that firms tend to (and should) use together (Galbraith 1977; MacDuffie 1995; Lawler, et al. 1998; Baron and Kreps 1999).

Economists have recently shown interest in internal fit, drawing on the complementarities work of Milgrom and Roberts (1995). For example, Ichniowski and Shaw (1995) and Ichniowski, Prenzushi and Shaw (1997) investigated complementarity of personnel policies in steel finishing lines. In fact, their work was inspired by the HRM literature's emphasis on internal fit among personnel policies. Gibbons and Waldman (2000) emphasized the value of integrative models designed to address patterns of empirical evidence. In order to do so, such models consider a broader set of policies as a system. We believe internal fit is an interesting idea that deserves more theoretical and empirical analysis.

### ***Organizational Design***

In the Organizational Design box in Figure 1, the middle two types of policies are by far the main focus of personnel economics. "Internal Labor Markets" involve recruiting, developing, assigning, and retaining the right worker skills. "Performance Evaluation and Incentives" are, of course, the essence of personnel economics. The economic approach has made substantial contributions to our understanding of these policies, and to describing the links between them and the three kinds of Intermediate Outcomes. If anything, economics has a comparative advantage here. It is the other two areas where economics has had less impact, and economists have placed less emphasis.

“Job Design and Decision Making” encompasses the definition of jobs (bundling of tasks), teams, and information development and processing. It also includes macro organizational structure, such as hierarchy, divisionalization, and coordination mechanisms. We make two observations here. First, the initial work in personnel economics, the first chapter of Adam Smith’s *The Wealth of Nations* (1776), is on specialization in job design. However, there has been almost no work on job design in economics ever since. Second, much of the economic work on organizational structure has focused on the *boundaries* of the firm (Williamson 1975), rather than on what happens inside the boundaries. In contrast, job design and teams are large areas of interest among behavioral researchers. This research is often tied to discussions of “intrinsic” motivation, or ways in which jobs may be designed to make the work more motivating or less onerous. Decision making and organizational structure also have received much attention outside of economics, though less so than job design issues. We argue below that these are perhaps the most promising areas for future work in personnel economics.

A second major difference between the two research approaches is that personnel economics tends to be vague about *what employees do*. In economic models of assignment, training, or incentives, it is usually irrelevant to distinguish between blue-collar and white-collar jobs.<sup>3</sup> Workers are employed in generic “jobs” with abstract production functions. The only distinction between a manager and a worker is who is evaluating whom. Teams tend to be modeled as a group of workers with a common performance measure, but the reason for using teams in the first place is usually ignored. There is little analysis of different forms of hierarchy, coordination, or collaboration. All of these issues are fundamental to behavioral organizational research.

The last type of policy we call “Implicit Contracting.” These practices go by many names in other disciplines, such as “psychological contracting,” “employee voice,” or “cultural” practices.<sup>4</sup> We mean practices that firms use to facilitate implicit agreements between the firm and employees. These are used for a variety of reasons, all arising from the inability to write perfect explicit contracts. A classic example is developing mutual trust to share investments in, and returns from, firm-specific human capital. Another is setting the implicit terms of the employment relationship between the firm and the employee at hiring. Another is investing in a reputation for fair treatment of employees, to facilitate subjective performance evaluations. These practices have received great attention outside, and some attention inside, of economics. The most common method for economic analysis of them is game theory, with an emphasis on reputation and repeated games (Kreps 1990). Most of the work inside economics is theoretical, but most outside is empirical.

### *Organizational Dynamics*

The final message in the systems view in Figure 1 is that organizational design is dynamic. An important topic in behavioral research on organizations is “managing change.” Imagine that a firm has strong external and internal fit, so that the personnel policies are complementary, and well adapted to the product, technology, competitive environment, and strategy. Now suppose that something changes in the environment; e.g., a new technology is developed that leaves old production methods outdated and relatively inefficient. In terms of Figure 1, this means that the Business Outcomes no longer match the Strategy. How does the

organizational design change? Behavioral scholars often argue that organizational design is costly to change. This implies that the optimal change may involve not only changing the inside of the organization, but also reformulating the company's strategy to reflect constraints from the existing organization. This is why there is a feedback loop from Business Outcomes to Strategy in Figure 1. This topic has received little attention from economists.

The second sense in which an organization is dynamic is less reactive, and more proactive. It is possible to conceive of an organization being designed to be *adaptable* to future, unforeseeable environmental changes. Similarly, some personnel policies may foster continuous improvement in methods, innovation, learning, etc. These topics receive substantial attention outside, but very little inside, organizational economics.

These two senses of organizational dynamics lead us to our third major difference between behavioral and economic approaches: economics tends to take a *static view* of organizational design, which makes it difficult to consider issues of organizational change, or designing adaptable organizations.

### **Neglected Areas Inside the Black Box**

In this section, we discuss areas of organizational design that we believe hold promise for future research by personnel economists. Our first and most important topic is job design and intrinsic motivation. We contrast behavioral and economic approaches to job design (job enrichment v. specialization). Combining the two perspectives makes the two seemingly very

different approaches consistent. We suggest a way economists can begin modeling intrinsic motivation. This discussion also highlights the potential benefits of considering not only complementarity between personnel policies (internal fit), but also external fit; we argue that the firm's optimal approach to job design depends importantly on the nature of its product, technology, and environment.

### ***Job Design and Intrinsic Motivation***

In the first chapter of *The Wealth of Nations*, Adam Smith analyzes specialization in job design in a pin factory.<sup>5</sup> In what may be the first econometric case study in personnel economics, Smith calculates that if a worker does every task involved in making a pin, he can produce less than 20 pins per day. Smith then estimates that if workers specialize on different tasks, 10 workers can together produce about 48,000 pins per day. Thus, in Smith's example, specialization through narrow job design increases production by about *24,000 percent*. This is an astonishing figure; even with a very large standard error, it indicates the potential power of specialization as an approach to job design. Since then, a brief discussion of specialization (along with comparative advantage) has been a staple of microeconomics textbooks. There has been only a little work on job design in personnel economics since, usually focusing on specialization (e.g., Rosen 1983, Becker and Murphy 1992).

Contrast this with the treatment of job design in behavioral research. The classic works are Hackman and Lawler (1971), and Hackman and Oldham (1980), widely cited as the most important works on job design and intrinsic motivation. Their approach is the exact opposite of

Smith's: they argue that job *enrichment* (adding complexity or more tasks) generates intrinsic motivation and increases productivity. The Hackman and Oldham [H&O] model of job design (which builds off the foundation provided by Hackman and Lawler) is so important outside economics that we describe it briefly here, and focus our discussion around it. Figure 2 reproduces the diagram of their model (1980, p. 83). Lawler (1986) provides an excellent treatment of job enrichment.

<<FIGURE 2 NEAR HERE>>

H&O focus on designing jobs so that workers are more intrinsically motivated. They argue that three “critical psychological states” are required to achieve this: Meaningfulness, Responsibility for Outcomes, and Knowledge of Actual Results. The more of each of these states that the job design generates in the employee, the greater should be intrinsic motivation. These three states are determined by five elements of job design: Skill Variety, Task Identity, Task Significance, Autonomy, and Feedback. Finally, three “moderators” (what economists would call parameters) affect the strength of these effects: Growth Need Strength, Knowledge and Skill, and Context Satisfaction. Threaded through this section, we explain these terms as we interpret the model as economists.

The most important element of the H&O model is making work “meaningful” so that workers become more “involved” in their jobs: are more interested, pay more attention, think more carefully, and work more diligently. The key aspect of job design that generates such involvement in work is Skill Variety: “the degree to which a job requires a variety of different

activities in carrying out the work, involving the use of a number of different skills and talents of the person” (1980, p. 78). H&O argue that skill variety causes employees to “challenge or stretch their skills or abilities” (p. 78). They go on to say that this is a fundamental characteristic of human psychology, using the metaphor of newborn babies who are “wired in” to “explore and manipulate their environments” (p. 78). In this view, work is more interesting (less onerous) if it is more intellectually challenging. For this reason, they argue that job enrichment increases intrinsic motivation. Indeed, even Smith recognized in *The Wealth of Nations* that specialization could lead to boredom and reduced productivity of workers.

Job enrichment is important empirically, for at least three reasons. First, there are observable patterns of specialization and job enrichment that are ripe for theoretical explanation. For example, management, “knowledge work,” and jobs with higher levels of responsibility clearly tend to be defined with broader sets of tasks. Manufacturing jobs were historically defined with a narrower set of tasks. Second, and perhaps most interestingly, there appears to have been a recent trend toward job enrichment. Third, job enrichment is often associated with other policies such as job rotation, team production, and “empowerment.” This is suggestive of the idea of complementarities or internal fit, and as such has attracted some economic researchers. However, this area has lacked a strong theoretical foundation for empirical work (Cappelli and Neumark 1999).

Given the importance of job enrichment in behavioral research and in practice, and the contrast with the economics focus on specialization, we believe that it is important for personnel economists to seriously explore this idea. We now outline how we think economists could get a

handle on this topic. By doing so, we present a different view of the H&O model that we hope illustrates the potential benefits of integrating economic and behavioral approaches.<sup>6</sup>

### *Modeling Intrinsic Motivation*

Economists tend to avoid assuming things about the utility function, such as that certain types of work design raise or lower the onerousness of effort, unless this can be done in a way that produces empirically testable implications. Therefore, most economic work on intrinsic motivation sidesteps this issue in one way or another. One recent approach avoids the issue by assuming that a worker's actions affect both firm profits, and the employee's utility; that is, the employee gets intrinsic motivation from the *output* (Murdock 1998).<sup>7</sup> Kreps (1997) focuses on how, in a multitask framework, intrinsic motivation on some tasks can be affected by extrinsic incentives on other tasks. Kreps does say, however, that perhaps it is time for economists to try to model intrinsic motivation more directly.

A simple starting point is the observation that job enrichment appears to increase intrinsic motivation. This might be done by assuming that the marginal cost of effort is lower if the worker is assigned more tasks. However, this runs the risk of assuming the result. Moreover, it does not capture the essence of the behavioral literature, that intellectual "stretch" or "challenge" are important. Therefore, a second possibility is to incorporate some notion of intellectual challenge about tasks by the worker. There are two senses that seem important. One is simply learning how to perform new tasks, or how to perform them better. The second is using intellectual or "thinking" skills on the job.



For the first sense of how work may be “challenging,” one approach is to incorporate learning by doing (Lindbeck and Snower 2000). Learning would increase the worker’s marginal product of effort, since the worker becomes more facile at the task. This is the standard economic approach. But the degree of learning by doing, perhaps modeled as the change in the worker’s human capital stock in the task, would also affect (lower) the marginal cost of effort. That would reflect intrinsic motivation through learning.

Consider how implications might be derived from such a model. The firm would face a tradeoff: more skilled workers are more productive, but less intrinsically motivated (holding characteristics of the job constant), because opportunities for further learning are diminished. It would not necessarily be the case that the best worker for a job is the one who is best trained for the job, since such a worker would have less to learn. This is different from the standard economic view that matching should be by comparative advantage. It is consistent with the evidence that many organizations using job enrichment also use job rotation: workers are moved to new jobs periodically, even if they have mastered their old jobs. Ordinarily this would seem a puzzle to economists (especially since job rotation reduces gains from specialization even further).

H&O discuss two factors affecting intrinsic motivation through job enrichment, the “growth need strength” moderator and the “knowledge and skill” moderator.<sup>8</sup> By growth need strength moderator, they mean that individuals respond differently to job enrichment. This is equivalent to saying that differences in marginal utility of learning affect how strongly a worker

is intrinsically motivated. By knowledge and skill moderator, they mean the extent to which the worker has the requisite skills so that the job will not be too challenging. It is straightforward to incorporate this into an economic model: the worker's stock of human capital in the task may have non-linear effects on intrinsic motivation. Very low levels of human capital may imply low intrinsic motivation because the challenge is too hard; very high levels of human capital may also imply low intrinsic motivation because the challenge is too easy. Thus, the optimal matching of worker to job may also imply some minimal level of training greater than zero.

There is a second sense of making the employee more involved in his or her work, beyond learning how to perform the job better: the extent to which the job is intellectually engaging. This is probably best modeled as a property of the work environment, or production function, not the worker's utility function, although it requires at least a rudimentary modeling of the idea that the intellectual nature of work may affect intrinsic motivation. Therefore, a second approach that we believe would be fruitful is modeling the information structure and intellectual nature of the production environment.

In addition, it is useful to distinguish between job enrichment and job enlargement. Job enlargement is a horizontal expansion of tasks without a commensurate increase in the intellectual nature of the job. Job enlargement can decrease boredom (and errors) by reducing repetition, but does not necessarily increase other aspects of intrinsic motivation. For example, reducing the number of hours devoted to filing, substituting hours devoted to stuffing envelopes, can enlarge a file clerk's job. The job can be enriched by including the worker in decision making over what types of documents should be stored electronically versus in paper form.

Most economic incentive models use a metaphor that seems to be drawn from physical tasks: the firm wants the worker to provide more “effort.” However, this is not quite what is needed for modeling intellectual work. In such jobs the firm does not want the employee to work “harder,” but to think more carefully, collect more relevant information, perform analysis, etc. We encourage theorists to think more carefully about how to model these issues. Perhaps most interesting, though, would be for empirical economists to study the relationship between the intellectual nature of the work environment, and the job design chosen by the firm.

#### *Which Tasks Should Be Bundled Together?*

In order to put further content on the idea of job enrichment, it is useful to consider which tasks should be bundled together. The clear answer to an economist is that more complementary tasks (larger positive cross-marginal products of production) should be bundled together. Unfortunately, this has little empirical content as stated, since it provides no way of thinking about which tasks are complementary. A second factor in the H&O model helps us begin to think about this issue: “Task Identity.” H&O describe Task Identity as “the degree to which a job requires completion of a ‘whole’ and identifiable piece of work.”

An economic interpretation of Task Identity is constructive. H&O seem to be saying that it is important to *modularize* production into relatively discrete or separable sub-processes. There are three implications of such modularity. First, if production can be modularized, then it must be that the modules capture most of the important task complementarities *within* each module.

Indeed, this is almost the definition of modularity. Thus, designing jobs with this concept of Task Identity in mind captures in a practical and implementable way the economist's notion of bundling complementary tasks together. Second, it gives guidance on how far to take job enrichment. The benefits of job enrichment are limited by the ability of the worker to learn and handle multiple tasks on the job. But the benefits are *also* limited by the nature of the tasks, in that bundling unrelated tasks together is less likely to increase productivity.

Third, modularity is consistent with our emphasis on designing work to increase *learning* on the job. When more closely related tasks are bundled together, it seems very likely that the employee will learn more about ways to improve production. For example, if an employee produces two parts that work closely together in a diesel engine, then the employee is likely to make both parts with higher quality, because the worker has a better understanding of how the parts will be used, how they fit with each other, etc. It also seems plausible that the worker will be more likely to figure out process improvements, because the production of each part may have implications for the effectiveness of the other part.

#### *Where Is Job Enrichment Most Valuable?*

This perspective helps us to understand trends toward adoption of job enrichment and related techniques. Under the traditional "Taylorist" approach, stemming from the work of Frederick Taylor (1923), industrial engineers worked out the "best" way to do work *ex ante*. They then designed narrow, specialized jobs, combined with mechanization, to repeat these best practices as much as possible; the goal was to *standardize* production to wring out variation and

defects. This approach makes sense to the extent that the best production process can be figured out *ex ante* at reasonable cost.<sup>9</sup>

In many environments, figuring out the best approach to job design *ex ante* will be inefficient for several reasons. The more complex the product (in terms of number of parts, number of production tasks, or technology), the more difficult is the industrial engineer's optimization problem. Similarly, more complex product lines, with more variations in product design or more customization, imply costlier industrial engineering. More rapid technological change implies that the process must be redesigned more frequently. All imply lower returns to investing in *ex ante* industrial engineering, and thus less *ex ante* optimization of production methods.

The less effective is *ex ante* industrial engineering, the greater the scope for workers to learn process improvements. The greater the scope for workers to learn, the more beneficial will be job designs that encourage learning by workers. This helps explain why job enrichment and related policies are adopted more in some settings than in others. There has been a trend toward job enrichment in recent decades partly because firms increasingly use customization, and techniques that facilitate more frequent changes in products and product lines (Milgrom and Roberts 1990). It is also likely that more rapid technological change in recent decades has fueled this trend; thus, such policies should be adopted more in settings where technological change is more important. Finally, under this view it is not surprising that adoption of job enrichment is closely associated with having workers emphasize continuous process improvement and total

quality management; both are more important if the firm is less able to conduct effective *ex ante* process optimization.

This discussion suggests that economists think about modeling the information properties of the production environment, to try to capture their effects on job enrichment and modularization. For example, theoretical and empirical researchers might consider incorporating ideas like the following into their models and data collection: how long the firm has been making a given product; how long it anticipates making the product without major changes in design or production technology; the complexity of the product, product line, or production process; the rate of change in technology in the industry; and whether the production process allows for frequent changes in products to accommodate customization.

### *Job Enrichment and Decision Making*

If one of the primary benefits of job enrichment is that workers can learn and figure out process improvements, it follows that the firm will want workers to take initiative to some extent: come up with suggestions, and make some decisions about which to try and how to implement them. Two other parts of the Hackman-Oldham model address this.

H&O define “Autonomy” as “the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and determining the procedures” (p. 79). By Autonomy, H&O do not really argue that workers get intrinsic motivation from being able to work independently (though that might be true). Instead, they

emphasize giving the worker responsibility about procedures, in the sense of being able to try new methods (see Fig. 2).

“Feedback” is defined as “the degree to which carrying out the work activities ... provides the individual with direct and clear information about the effectiveness of his or her performance” (p. 80). In other words, workers need to be provided information on the effects of their efforts, if the firm wishes to have workers come up with initiatives and test them.

Thus, decision-making is an important element of job enrichment.<sup>10</sup> This explains why employee “empowerment” or “participation” is so strongly associated with job enrichment programs. We can think of the two as highly complementary practices in the following way. In addition to intrinsic motivation, job enrichment gives the worker a broad understanding of a set of strongly complementary tasks. The worker gains detailed, potentially sophisticated knowledge about the production process and sometimes the product design. Empowerment gives the worker the ability to make use of this information, trying new methods to improve the process and reduce defects.<sup>11</sup> Together they allow the worker and the firm to make improvements and more readily respond to changes in the environment. We now turn to a more discussion of decision-making.

### ***Decision Making***

Personnel economists tend to think of decisions as being made within hierarchies. But hierarchy models rarely have much element of decision to them; they are usually

conglomerations of primitive production functions, with spans of control between supervisors and subordinates (Beckmann 1977; Calvo and Wellicz 1979; Rosen 1982).<sup>12</sup> Few models attempt to get a handle on decision-making. Yet decision-making is one of the most important functions of the internal organization of the firm. Location of decision-making authority (the degree of decentralization) is a major topic in behavioral fields. Moreover, decision making inherently involves processing and strategically using information, which is a building block of economic theories of organization. It is therefore surprising that economists have had little to say about decision making.

Jensen and Meckling (1995), applying Hayek's (1945) analysis of markets to internal firm organization, provide a starting point. They emphasize a distinction between "specific knowledge," which is costly to communicate to someone else, and "general knowledge," which is not costly to communicate. If knowledge is general, decisions can be centralized to ensure coordination. The more that knowledge is specific, the more will the firm locate decision rights where the specific knowledge is generated. They apply this idea to discuss decentralization, which involves a tradeoff between use of specific knowledge and coordination costs.<sup>13</sup>

We can enrich the idea of specific knowledge by thinking more specifically about what attributes of knowledge (information) make it more costly to communicate, and thus push the firm toward decentralized decision-making (Milgrom and Roberts 1992; Brickley, Smith and Zimmerman 1996). One attribute is whether the information is *perishable*. For example, information about a customer's immediate request for service must be acted upon quickly or it



loses value. In such cases the firm is likely to decentralize service decisions, because of the time involved in passing the information to a central decision maker.

Another attribute of information that makes it costly to communicate is *complexity*. If information has many dimensions (variables), with complex relationships between the variables, it may be costly to describe and convey to others. This helps to explain why participative decision-making is used in complex work environments. A diesel engine plant is more likely to use job enrichment combined with empowerment than is a tin can factory: the engine has hundreds of interacting parts, while a tin can has at most half a dozen.

A third attribute of information that may make it costly to transfer is whether or not the information is *costly to understand* once received. Two examples come to mind immediately: *scientific or technical* information, and *subjective or experiential* information. In both cases, decisions that make use of the information will tend to be decentralized to workers who have the knowledge. For example, performance appraisals tend to be decentralized to supervisors despite problems of favoritism and influence costs (Prendergast 1999), because most jobs require subjective evaluations. These are hard to do without actually observing the employee on a day-to-day basis, and costly to communicate.

A more subtle issue of the cost of transferring subjective information is that it is more likely to be *manipulable* by the holder (performance appraisals again come to mind). But that does not necessarily imply that decisions should be decentralized to the potential manipulator!

On the contrary, the opposite may sometimes be true. The possibility of gaming or manipulation of the information may alter the simple Jensen and Meckling story in interesting ways.

When information may be manipulated, we might call it *unreliable*. This is a third category of attributes of information that may have important implications for the allocation of decision-making. Another example is information that is noisy, or communicated with inaccuracy. Garbling (Geankoplis and Milgrom 1991) might also lead to decentralization of decision-making.

A further notion is the degree of interdependence of the tasks needed to produce the output. Jensen and Meckling's framework is useful for considering at what level in a hierarchical organization decision-making will be located. But it ignores the fact that tasks performed throughout the production process may be highly interdependent (Thompson 1967; Lawler 1986). Production of different parts of a car may be modularized and insulated from each other so that stoppages at one part of the process do not impact other parts. Decision making over each component can then be decentralized to sub-units. A chemical production or oil refinery process, in contrast, has much more interdependent tasks, so there are large benefits from coordination. This leads into our next topic, organizational structure and coordination.

### ***Organizational Structure***

Behavioral scholars often distinguish between "micro" and "macro" organizational structure. Micro involves individual job design, as discussed above. Macro encompasses the

firm's overall structure, including hierarchy and coordination mechanisms. (Decision-making falls in between, since it makes sense to think about patterns of decision right allocation across the whole firm, but it is also an important part of individual job design.) Here we discuss macro organizational structure, long an important topic outside of economics, but not discussed much by economists.

A key insight in this literature by Lawrence and Lorsch (1967) is that "one size does not fit all." That is, there is not one ideal organizational structure, because improving the ability of a firm to perform along one dimension will diminish its ability to perform optimally along others. For example, producing at the lowest cost for a given product design can impede the firm's ability to respond quickly to changing demand conditions: the former implies minimal R&D, while the latter implies much larger R&D. Thus, along the lines of our discussions of external fit, a very interesting issue for economists to explore is how a firm's optimal organizational structure varies with its environment, technology, etc.

Much of the behavioral literature on structure can be crudely summarized as identifying conditions under which a traditional hierarchical functional organizational form is inappropriate (Galbraith 1977, 1995).<sup>14</sup> The traditional organization puts a premium on command and control mechanisms designed to overcome principal agent problems. Workers are organized in departments according to function (manufacturing, sales, R&D, human resources, accounting, etc.). This functional structure has several benefits: (a) it is clear which department is responsible for which tasks; (b) similar tasks are bundled into the same unit, facilitating specialization; (c) there are clear career paths requiring investment in only specialized skills; (d) supervisors have

knowledge of and experience with subordinate tasks, aiding supervision and performance evaluation. The hierarchical functional organization is a natural extension of the traditional, Taylorist approach emphasizing specialization.

There are important drawbacks to organizing along functional lines. A functional organization is best suited to firms that provide a single product or type of products that can be effectively managed centrally. Firms with highly differentiated products (e.g., laptop v. mainframe computers; residential homeowner/car v. business liability insurance) may find that creating separate divisions for each distinct category of products may be more efficient, because it allows for further specialization within organizational units.<sup>15</sup>

Specialization in a functional organization comes at a cost similar to the costs from specialization in individual job design: poorer integration, use of information, and learning across tasks. Consider a classic problem: product design, say in a computer company. Sales and marketing personnel know a great deal about what tradeoffs customers are willing to make among various features and cost; these employees have rich knowledge about customer demand curves. R&D employees have technical and scientific knowledge about what designs are feasible. Production employees have technical knowledge about the implications of various design decisions on costs. All of these kinds of knowledge are, to some extent, specific or costly to communicate to others. But all are important sources of information for product design decisions. Decentralizing product design decisions to any of these three groups will result in non-optimal product design.

Thus an interesting way to think about firm structure is to build on the idea of specific knowledge that is costly to communicate. But instead of thinking about the degree of decentralization, the key issue is that there are multiple “pockets” of specific knowledge located in various units in the firm. The firm would like to make combined use of these pockets of knowledge effectively. There are two general aspects of the firm’s task (Lawrence and Lorsch 1967). The first is to *differentiate* the knowledge into different departments within the firm, so that departments specialize in developing and (to some extent using) the pockets of specific knowledge. The second is to *integrate* the various pieces of knowledge so that they can be used together. This is done through policies and processes that *coordinate* different units, allowing the pieces of knowledge to work together as needed.<sup>16</sup>

Integration could be achieved by centralization, with the usual costs emphasized by Jensen and Meckling. But it might be interesting for economists to explore more fully what those costs are, and how they may be mitigated (especially in modern times with extensive use of information technology). Integration could also be achieved by decentralization, combined with coordination mechanisms designed to get disparate decision makers to work together. There are two general approaches that firms use, incentives and coordination mechanisms, which we now discuss briefly.

### *Incentives*

The classic economic solution to coordination is incentives, to motivate agents to work in concert with each other. One approach is to give organizational units incentives to maximize

overall divisional or firm value, though this tends to have free-rider problems. Another is to incorporate the effects of a manager's actions on another division into his or her performance measure. Still another is some form of transfer pricing. In fact, firms frequently use these incentive approaches.

One point here is that performance measurement and structure (breaking up into organizational units) are intimately related. Consider the case of a divisional manager given discretion over personnel policies for the division. The manager's incentives will be strongly influenced by the divisional performance measure (e.g., cost center, revenue center, profit center, etc.). This should flow through to how incentives are structured for the rest of the division. Thus the divisional performance measure has important implications for incentives in the entire division. Moreover, the divisional performance measure the firm chooses will be closely related to how the division is defined; in fact, almost determined by how the unit is defined. Definition of the unit defines how performance data (costs, revenue, headcount, etc.) are aggregated and computed. Therefore, the division of the firm into sub-units immediately gives rise to certain performance measures and incentive effects.<sup>17</sup>

Unfortunately, it seems unlikely that the incentive approach to coordination will be completely effective in many situations, by the very nature of the problem. If knowledge is specific, or costly to communicate, it is hard to imagine how to develop performance measures (at least, *ex ante* and reasonably objective measures) that motivate agents who do not possess this knowledge to act in ways that take it into account (also see footnote 16 above). Therefore, other approaches are also likely to be important.

### *Coordination Mechanisms*

An alternative for achieving coordination across pockets of specific knowledge is to use one of a plethora of structures that overlap traditional functional hierarchy. These structures may be permanent or temporary. One example, often used in product design, is a cross-functional team, with members from various units that possess information that can be combined productively. Another is a matrix organization, in which employees have two hierarchical assignments, one functional and one by product, project, etc. Galbraith (1995) describes a continuum of lateral coordinating mechanisms:

- Informal (or voluntary) processes occur spontaneously; they are not formally established by management;
- Teams are formal groups that are used to complement the informal voluntary processes; they are established by management;
- Integrators are full-time leaders who are appointed to lead the formal groups, and are equivalent to cross-functional managers responsible for managing a product, project, brand, etc.

Galbraith describes “informal” organizations as those “characterized by voluntary coordination across units” (p. 49). He suggests that informal processes are usually preferable, because formal structures have to be designed and managed, with attendant principal agent

problems. However, this does not seem so clear to an economist. Informal mechanisms may clearly work against the firm's interests if the incentives of the initiators are not well aligned with firm objectives. In this sense Galbraith's definition of an informal organization assumes that the incentives induce only those voluntary actions that are aligned with firm objectives. A contrasting view (Lawler 2000), and one to which most economists are sympathetic, is that reward systems can create lateral interdependence by giving everyone the same fate, i.e., by explicitly aligning their financial interests with each other.

According to Galbraith, an organization can foster voluntary coordination by: interdepartmental rotation; interdepartmental events; co-location; information technology; mirror image departments, and consistent reward and measurement practices. Is there a meaningful distinction between "voluntary" and "formal" coordination? If the only distinction is the definition within the organizational chart, then the distinct may be irrelevant. But if there is really something more, then economic tools like agency theory could help better define the distinction between informal groups formed voluntarily (via consistent reward systems) and formal teams set up by management using explicit team rewards.

One insight from behavioral empirical research on coordination mechanisms (e.g., teams) is the relationship between the frequency with which a team meets, and its design. If team members meet only infrequently, they can be a cross-functional team imbedded in a firm organized along traditional, functional lines. If they have to meet frequently, then it may be better to have team members' primary reporting relationship be with the team itself, and the secondary reporting relationship be with functional managers who help monitor the roles that specialists



perform in teams. Specialization is preserved to some extent, but the efficiency of information flow between the different areas of specialization within the organization is improved and, consequently, the speed of responsiveness to the market. Thus, the extent to which a mechanism is permanent and emphasized, relative to the underlying functional structure, seems to depend on the relative importance to the firm of integration of the pockets of specific knowledge.<sup>18</sup>

In any case, this points to the basic tradeoff of coordination mechanisms: they reduce the employee's specialization and introduce monitoring and performance measurement costs, but they broaden the employee's view of tasks and facilitate learning and collaboration. In other words, optimal organizational structure, with functional hierarchy and coordination mechanisms, is based on much the same issues as is job specialization or enrichment.

### *Teams*

Teams are a topic that has received considerable attention outside, but little inside, economics. Examples of different types include work, parallel, project and management teams (Bailey and Cohen 1997). A large part of the literature is empirical, focusing on how teams can function effectively. While the topics of this empirical literature are interesting (e.g., the role of interpersonal skills as a type of human capital), it is the theoretical role of teams that is relevant for the present discussion.<sup>19</sup>

Early work on teams was motivated by the socio-technical literature, which examined how technology effects on work organization are mitigated by the social structure and needs of

the workers (Trist and Bamforth 1951; Miller and Rice 1967). This approach led to designing work to be performed by groups, to take advantage of the benefits of social interaction (Hackman and Oldham 1980).

Economists tend to view teams as a set of workers with a common task or performance measure, but say little beyond such stylized representations. Clearly there is more to teams than that. For example, empirical evidence suggests that teams are more likely to be used when firms adopt job enrichment (MacDuffie 1995). Our discussion of job design suggests a possible explanation: enriched jobs are designed to facilitate learning and continuous improvement by workers. Ideally workers need to know all aspects of closely related tasks for this purpose (that is, the job should be broadened up to the level of modularization of production). But in many cases that would imply job enrichment so broad that specialization and productivity would suffer. A balance between learning through job enrichment and specialization can be struck by using teams that work together.

There are several ways in which teams can facilitate learning. One is cross training. Another is information sharing: one worker may have knowledge that can improve the productivity or decisions of another. A third is collaboration, in coming up with initiatives, testing them, and making decisions. An interesting avenue for modeling teams would be to explore the dynamics and incentives of collaboration in a group. The economic tools of information economics, agency theory, and game theory seem particularly well suited to the task.

According to Lawler (1986), the emphasis on teams versus individual job enrichment depends on both the technology and task uncertainty involved in producing the firm's output, and on the individual's needs for learning and social interaction (H&O's "growth need strength" moderator); see Table 1. Thus, the firm needs to consider external fit, and there may also be internal complementarities between job design and personnel policies such as recruiting and training. The table also suggests how characteristics of workers (bottom panel) interact with strategic objectives (top panel). If the firm wants to produce a product that requires a great deal of interdependent work, an assembly line approach with narrowly defined jobs will not work. Two alternatives are having the product produced by teams or by individuals who do an entire "assembly" by themselves. Which is best depends on the technology, and the firm's ability to either mold the organization to the characteristics of the incumbent workforce, or to change those characteristics through a training, restructuring and turnover.

<<TABLE 1 NEAR HERE>>

## **Organizational Dynamics**

As noted in the introduction, the systems view of organizational design emphasizes that organizations are dynamic, evolving over time as their environments change. We now briefly discuss ways economists can think about organizational dynamics and design.

## *Organizational Evolution*

In Figure 1, there is a feedback from Business Outcomes to Strategy. This captures the idea that the firm's existing design may limit its optimal strategy and ability to evolve. This is a strong theme in organizational research outside economics, where "Managing Change" is considered a fundamental topic. This literature is very large; here we focus on a few basic issues likely to be of greatest interest to economists.

Consider again our hypothetical firm with an existing strategy and design. Suppose the environment changes in some important way, such as a new technological development. If we were to consider the firm's optimal organizational design *ignoring* its existing organization, the problem would be unconstrained. But an interesting question is the degree to which the existing organization *constrains* the firm's ability to change or evolve. It is quite likely that this is the case, for several reasons.

The first constraint is that the firm has made organizational investments of various kinds, some of which are costly to change or abandon. For example, the firm has made investments in matching and developing appropriate employee skills. If there are turnover costs (say, because of the legal environment, severance provisions, or search costs), then changing to a new workforce with new skills may be prohibitively costly. Similarly, many firms invest in a reputation for how they treat employees. This facilitates implicit contracting over employment. Any organizational change may undermine this reputation, giving firms an optimal reluctance to changing policies.

A second possible constraint on organizational change involves complementarity, or internal fit between personnel policies. If the firm has a bundle of policies that have been designed or evolved to work well together, and it wants to change one of them, it may find that they are no longer complementary. If so, the firm would face three options: (1) not changing policies, reducing external fit of the organizational design with the strategy; (2) changing the strategy to better match existing policies and practices; and (3) changing to a new bundle of complementary policies.

The problem with (1) is that it is likely to reduce the firm's competitiveness. The problem with (3) is that it may be costly to change multiple policies, structure and processes simultaneously (or nearly simultaneously). In some cases, the firm may instead choose (2). In fact, this is essentially the core competence idea in the strategy literature (Prahalad and Hamel 1990): a firm should craft its strategy around what the organization is already good at. This is an intriguing argument that is worthy of careful theoretical (and especially empirical) research.<sup>20</sup>

A possibly even more intractable setting for organizational change involves two firms that decide to merge for strategic reasons. Both firms have existing job designs, structures, coordination mechanisms, decision-making, employee skills, and implicit contracts. How are these two organizations to merge? If it is a merger of similar firms within an industry (i.e., a consolidation merger), this necessitates not just changing one organization, but two, and worse, blending them together. Blending is also necessary when firms in different industries merge. But the degree of blending in this case may be mitigated by the need to preserve unique aspects of the firms' original organizations in order to realize synergies. The costs of doing so effectively

suggest that, in many mergers, one firm's organization will be left relatively intact, the other's largely abandoned (including its employees), and the customer lists merged. Casual empiricism suggests that this is often the case. This would be feasible for mergers that involve marketing synergies, but possibly not for other kinds of mergers. This issue potentially could be examined empirically by collecting personnel records for merging firms before and after the merger, to see which groups of employees survive.

### ***Implicit Contracting***

Economists have long recognized that implicit contracts play an important role in the labor market. The standard economic approach focuses on the limitations of formal contracts and what that means for how wages are set and how firms elicit optimal effort and investment from workers. Classic examples include risk sharing between the firm and workers over macroeconomic fluctuations, and sharing investments in firm-specific human capital. Another is the possible use of a wage premium to elicit effort that the employee might otherwise be reluctant to put forth (Akerlof and Yellen 1986).

Despite the rich variety of applications for which economists have used the notion of implicit contracts, they typically ignore organizational dynamics. For example, a key element of the "effort" that firms want to elicit from employees includes suggesting process improvements, which in some cases might eliminate the workers' jobs. This is a significant omission, given the importance of such feedback in optimizing product manufacturing and delivery mechanisms. Evidence from the behavioral literature on high performance work systems shows that firms

sometimes use job security provisions to elicit the desired information. Job security can never be an ironclad explicit guarantee, so implicit contracts have a role to play.

Behavioral researchers have analyzed implicit contracts with renewed interest in recent years, under the heading of “psychological contracts” (Rousseau 1995). Two theoretical issues are particularly relevant. The first is that differences in the degree of uncertainty in the environment faced by organizations lead to different implicit contracts (the idea of external fit once again). A startup company (or division of a larger company) with uncertain market prospects cannot offer the same implicit long-term employment as a company with a history of stable or growing demand for its product. A small company cannot offer the same career/skill development or promotion opportunities as a large company.

The second interesting theoretical issue is an assertion (Rousseau 1995) that increases in the degree of uncertainty in the environment (say, due to increased competition or technological change) are likely to lead to *increased* reliance on “transactional” implicit contracts. Such implicit contracts emphasize the immediate benefits of exchange between the worker and firm. This is in contrast to the deferred benefits available from “relational” implicit contracts, which extend over longer periods (see below). For example, industries that previously were highly regulated and/or protected typically cannot offer the same level of job security after deregulation or the lifting of protection.

Working against this logic, however, is that an environment of increased uncertainty may make implicit offers by the firm less credible. Economists (usually game theorists) analyzing

implicit contracting and corporate culture often emphasize the benefits of stability, consistent, long history, and related concepts in strengthening the *reputation* of the firm to employees (Kreps 1990; Camerer and Vepsäläinen 1988). We can think about the employee's gauging of employer credibility over implicit promises as a statistical inference problem. Stability and consistency of how the firm has treated employees mean lower variance, or greater precision, of employee predictions about future treatment. Similarly, longer history implies more data, and therefore more accurate predictions. When the environment changes suddenly, the firm may lose much of its reputational capital.

Rousseau (1995) uses two dimensions to frame the discussion of implicit contracts: expected job duration and whether there are explicitly specified performance terms for the contract. This leads to four types of contracts:

- Relational: long employment duration, performance terms not specified explicitly. Examples include technical and professional employees, and managers;
- Balanced: long duration, performance terms specified. Examples include “core” blue collar and office support occupations;
- Transactional: short duration, performance terms specified. Examples include temporary employees, contract employees, and consultants;
- Transitional: short duration, performance terms not specified. Examples include transactional employees who are auditioning for long-term employment (e.g., temp-to-perm), and employees of an organization (both relational and balanced) undergoing restructuring and/or implementing significant headcount reductions.



It has been widely noted that increased uncertainty in the environment has led many companies to decrease fixed labor costs by converting relational and balanced jobs into transactional and transitional jobs. Anecdotal evidence includes the end of “lifetime employment” at traditionally stable companies (such as IBM and General Motors), the removal of entire layers of middle management, and increased use of temporary and contract labor for jobs that formerly were staffed by “core” employees.

An interesting issue is whether such changes impact a firm’s ability to deliver the product dictated by its strategy, because of problems with external fit. If the majority of the firm’s employees were hired under a regime of implicit contracts that promised long-term job security, those same workers might not be happy with the conversion to transactional or transitional status. At the extreme, if the resistance to implicit contract changes by incumbent workers is too strong, a firm might not be able to make the transition to a new technology or process for organizing work without suffering a significant drop in productivity. The alternative is to open an entirely new site and staff it with new hires and incumbent workers who opt for the new implicit contract. This is consistent with Ichniowski and Shaw’s (1995) evidence on the greater use of the complete set of changes that make up high performance work systems by new sites; older sites, in contrast, are more likely to adopt only a subset of the changes.

### ***Knowledge Management***

At the intersection of implicit contracts and organizational evolution is the issue of knowledge management. In intellectual work, employees develop specific knowledge that is not

entirely firm-specific, but is a form of intellectual capital or trade secrets that are valuable to the firm.<sup>21</sup> For example, a software engineer may develop techniques that would be beneficial to the firm's competitors. The problem arises because of possible employee turnover. First, can the firm create effective incentives to encourage the transmission of the specific knowledge by the employee before he or she leaves? Second, can the firm protect its investments in intellectual capital from expropriation by the departing employee? Here we focus on the second issue, since personnel economics has a long history of thinking about ways to reduce turnover (see Lazear 1998).

Knowledge management and retention of key employees have received a lot of attention within the management literature (and among consultants) for two reasons. The first is the current relatively high demand (and low unemployment rate) for high skilled technical and professional employees. This has greatly increased labor market opportunities for these workers, leading to increased turnover. The usual way to reduce turnover is to offer deferred compensation that is not vested, but this is harder for firms to do successfully if the employee's outside alternatives rise rapidly. This is bound to be a transitory phenomenon, because markets will adjust eventually.<sup>22</sup>

The more relevant issue is the long-run trend toward more knowledge-intensive work. How can a firm protect its intellectual capital? One possibility is to recognize the difficulty of preventing the employee from leaving and taking the knowledge. In this view, the intellectual capital is simply a form of general human capital. But the issue becomes more difficult if the employee's knowledge is in the form of trade secrets, as seems likely in the case of R&D

employees. The optimal legal environment, restricting the employee's post-firm employment rights, is far from obvious. The issues are somewhat similar to those of patents in general. But general reluctance of employment law to restrict individual employee rights makes it more difficult for firms to protect their part of investments in such intellectual capital.

### *Designing in Adaptability*

The discussion of organizational evolution hinged on the case where the firm's environment changes unexpectedly. But there is another sense in which a firm can think about evolution. It can design personnel policies with adaptability in mind, recognizing that the environment is likely to change (in some ways that are partially foreseeable, like future technology changes, and in some ways that are not foreseeable). This focuses on Intermediate Outcomes, or attributes of personnel policies, that economists do not usually consider. Here we briefly mention some attributes that are likely to facilitate organizational adaptability.

First, our discussion of job design above emphasized the development and use of knowledge through job enrichment and related practices. Thus, job enrichment and, in some cases, decentralization of decision rights to employees, are ways that firms can develop some adaptability. Job enrichment facilitates continuous improvement by employees, which is more beneficial in settings where the firm's product, product line, or production technology change more rapidly.

“Empowerment” of certain decision rights allows the firm to tap into suggestions that may flow out of new information that comes to employees. This builds in a way for the firm to react to and exploit useful specific knowledge that arises in various pockets throughout the organization. This is especially true when what Fama and Jensen term (1983) “decision management” rights are decentralized. These are the rights to suggest new initiatives, and to decide how to implement new initiatives that have been chosen. Thus, we predict that decision management is more likely to be decentralized, the greater the change in the industry (in the sense of unpredictability, technology, competition, regulation, etc.).<sup>23</sup>

Another approach to adaptability is to invest in more adaptable employees (Lindbeck and Snower 2000). It is usually argued that giving workers a broader set of skills (either more skills, or including intellectual as well as physical skills) allows them to be redeployed more readily.

Implicit contracts with employees are clearly very important to adaptability. The firm would like to motivate employees to suggest new ideas, reveal specific knowledge, and be willing to be redeployed as circumstances change. To some extent these can be motivated by incentives and other practices, but they are likely to be affected to a great extent by implicit contracts. Thus, a firm culture that encourages suggestions, collaboration, some risk taking, and flexibility by employees would seem desirable in most cases.<sup>24</sup> Countering this is the problem of how to encourage employees’ willingness to share knowledge in those cases where the firm is not able to offer plausible long-run employment promises.

## Methodological and Empirical Issues

### *Complementarities?*

Personnel economists have recently become very interested in internal fit, or complementarities among organizational policies. Much of this interest has been theoretical, stemming from Milgrom and Roberts's (1990, 1995) application of lattice theory. There has also been a strong interest in empirical work on internal fit in recent years, both inside and outside personnel economics (Ichniowski, Shaw and Prennushi 1997; Levine 1995; MacDuffie 1995; Cappelli and Neumark 1999). Of course, at some level, it is inarguable that a firm should design personnel policies taking other policies into account, *ceteris paribus*. The real question is whether complementarity (or substitutability) between two or more specific policies has important effects on firm objectives like productivity.

We think the interest by economists in complementarities is warranted. If the view that internal fit among policies can be an important source of organizational efficiency is correct, then this is important for us to understand and teach. Moreover, behavioral scholars have argued for decades that this part of the systems view is important. Much of their argument is based on case studies and their experiences working with real organizations. This is not the kind of source for empirical insights that economists are used to using. However, there are many instances where economists have learned of important empirical insights or topics from other fields in this way (in the spirit of the first quote at the beginning of this chapter). Given the strength of this thread through the behavioral literature, economists should take this idea seriously.

Some surveys have argued that there is now strong evidence for the impact of internal fit on organizational effectiveness. While we believe that existing evidence is provocative and promising, we remain somewhat more skeptical, and argue that we have some way to go before we can be confident about the empirical validity of this concept. Consider, for example, the case of Lincoln Electric Co. (Berg and Fast 1975), the best-selling Harvard Business School case of all time. Economists often describe Lincoln Electric as an example of the value of internal fit. Lincoln makes extensive use of piece rate incentives. They also have other policies designed to deal with classic problems with piece rates, such as poor quality, lack of cooperation, etc. In particular, Lincoln's success is often attributed to its ability to use complementary implicit contracting practices that ensure effective subjective performance evaluations (Baker, Gibbons and Murphy 1994). These practices are said to be especially effective because of Lincoln's long and consistent history. Indeed, Lincoln has experienced strong economic success, and few of the classic incentive system problems, for many years.<sup>25</sup>

However, consider another case study on piece rate incentives, Safelite (Lazear, forthcoming). Safelite instituted piece rate incentives for automobile windshield installers. Lazear's analysis indicates that productivity skyrocketed 20-40%, depending on how the effects of worker selection are estimated. These numbers are similar to the productivity differentials attributed to Lincoln's set of personnel policies. Yet Safelite did not obviously institute a system of complementary policies of the form seen at Lincoln. Nor did the company have strong implicit contracting and subjective performance evaluation, or a long history of consistent treatment of workers on which to base implicit contracts.

The disparity between these two case studies immediately makes one wonder if complementarities are really so important to the effectiveness of personnel policies or not. Of course, these are only two observations, and the Safelite case was not written with a broad description of other policies in mind. Much preferred would be systematic empirical research with larger datasets, such as the works cited above.

One problem with empirical research on complementarities stems from the lack of strong theoretical analysis of the issues. Unless we can develop a convincing *ex ante* theory of precisely what policies are supposed to be complementary with each other, empirical work has little guidance for what set of policies to look for. Suppose, following the literature on strategic human resource management, we observe that firms that use a certain set of policies together tend to have higher productivity, lower costs, lower turnover, etc.<sup>26</sup> Are we to conclude that these policies exhibit complementarity or internal fit? Another possibility is simply that the policies are correlated with something else. Perhaps the policies just are often intelligent ones to use, so their use in practice is driven by correlation with managerial talent. Another possibility is that they are driven by some environmental variable. Perhaps a number of policies are all well adapted to certain production environments, but are not complementary with each other per se. Then a firm that uses this bundle of policies will have higher productivity, but not because of internal fit.

Therefore, before further empirical work on complementarities is done, we urge economists to think more carefully about the theory behind it. We need to develop more rigorous

theories of exactly which policies are complementary with each other, and why. We also need to think more carefully about how to disentangle complementarities empirically from other effects that might drive mutual adoption of a set of policies (though consistency of empirical patterns with a well-respected theory would be a substantial step in that direction).

One way for theorists to tackle this problem is to consider Baron and Kreps's (1999) assertion that internal fit can lead to *patterns* of organizational design. If we can develop a theory that suggests that policies A, B and C should be observed together, while policies D, E and F should be observed together, but that firms should rarely use A, B, or C with D, E, or F, this would be an interesting and new test.<sup>27</sup> But that still begs the question of what determines whether a firm adopts one pattern or another. An even stronger theory would yield predictions on this dimension, so that we could test whether the incidence of any observed patterns (if there are such organizational design patterns) varies as predicted.

Thus, we also need to think about factors that might drive patterns of policies. We think the answer here is to consider external fit. For example, our discussion of job design suggested that there might be two rough patterns, enrichment (with decentralization of some decision making) or specialization. It also suggested that the enrichment approach is more valuable in information rich environments, where there is large scope for on-the-job learning. We described several examples of when a firm might have that kind of environment; e.g., when a firm has made less use of industrial engineering; if the product line is relatively new; the product is complex; or technology is rapidly changing. These are testable predictions about the relationship



between the firm's environment and its the adoption or effectiveness of a pattern of personnel policies.

### ***Empirical Research***

Personnel economics is a productive and empirically relevant field. Great strides have been made, particularly in developing a theoretical structure that provides a rich framework for analyzing organizational issues. However, empirical work in the field is sparse and too narrowly focused. There are a large number of empirical studies of careers and compensation, but limited work on most other topics. For personnel economics to continue to grow and be influential, it is paramount that researchers focus more on empirical research.

There has been growing interest in collecting new types of data, especially personnel databases (e.g., Medoff and Abraham 1980; Lazear 1992; Baker, Gibbs and Holmstrom 1994a,b; Lazear, forthcoming). Such databases are rich sources of information on the internal workings of firms. However, they have two limitations. First, these datasets are usually collected from a single or small number of firms, so generality of findings is an issue. Second, by their nature personnel databases focus on some variables (those collected for personnel computer systems) but exclude others.

The most common approach to solving the generality problem is to collect personnel data across a large sample of firms, typically in the same industry (Ichniowski, Shaw and Prenzushi 1995). This substantially reduces the problem, though it does not entirely eliminate it if the data

are from only a single industry. Unfortunately, such data collection is difficult and expensive, since it involves contacting and collecting data from many firms at once. Nevertheless, we hope to see more projects along these lines in the future.

A second problem with existing empirical work by economists is that it tends to ignore a wide variety of important and interesting issues, such as those discussed above. Some of the most interesting empirical work will require collecting *new kinds* of variables. Many of these variables are difficult to measure by traditional means. Others are subjective by nature. Nevertheless, it is important for economists to find ways to collect and analyze such data systematically, instead of leaving this area solely to behavioral researchers.

The most likely way to collect such datasets would be to write and administer surveys. Survey research is standard in most fields outside economics.<sup>28</sup> By using surveys, economists can begin to do empirical work on decision-making, job design, organizational structure, implicit contracting, etc. For example, Cooper (1998) used survey techniques to measure employee cooperation, linking that to compensation contracts and other variables.

Behavioral researchers have developed a variety of methods to measure subjective dimensions of employment. For example, job satisfaction and commitment measure worker perceptions of the employment relationship; organizational citizenship behaviors (OCBs) measure the ways that they express their perceptions through taking actions that help the organization even if there is no immediate monetary reward (Mobley 1982; Hom, et al, 1992). It would be interesting to interpret such data from the perspective of economic theories of implicit

contracting, corporate culture, and repeated games. More generally, an extensive body of work by behavioral researchers links motivation and both effort and job performance (e.g., Whyte, et al. 1955; Steers and Porter, 1991). It might be interesting to relate such variables to how incentive contracts are designed, along the lines of typical economic studies that link incentives to quantitative output and cost measures.

## **Conclusion**

Economics has added much to our understanding of personnel, and more generally of organizational design (as have behavioral approaches). Economics uses formal mathematical modeling more than other fields. Such modeling has the benefit of providing a systematic way to derive conclusion about topics that otherwise might be too difficult on which to make a determination. In the process, though, economics sometimes ends up throwing out much that is interesting. It does this in two ways. First, economic theory may be applied in areas where economists have already developed extensive insights. Thus, we have a vast literature on incentive theory. Second, empirical work in economics tends to follow traditional econometric methods, and focus on traditional econometric databases. Unfortunately these rarely have much interesting within-firm information.

Behavioral researchers tend to take a systems view of organizational design, which is one reason that they approach the field differently than do economists. Economists have shown increasing interest in part of this view, internal fit (which they term complementarity), in recent years. This is an important concept that deserves careful scrutiny. However, economic work on

the idea of complementary has far to go. Empirical work is suggestive, but hardly conclusive. The theoretical underpinnings are scant. This issue would benefit from more thorough mathematical modeling, and more data collection.

In order to make progress, a logical starting place would be to bring in the related concept of external fit. It is sometimes argued that complementarities imply we should observe *patterns* of organizational design. Presumably, each pattern would be more useful for some purposes than for others. Considering how a firm's policies help it achieve various intermediate outcomes, such as learning, adaptation, cost reduction, etc., might be an important way to begin modeling internal fit as well.

Economic theory of the internal design of firms would benefit from a richer view of *what actually happens inside firms*. Economic theory is highly abstract about jobs and other features of organizations. Of course, this has great value in developing generalizable insights. However, it means that economists have little to say about a great many important and practical topics. Economics could learn from other fields by paying attention to what behavioralists have found to be interesting topics.

We described several areas of organizational research where there is (yet) little economic work. These include intrinsic motivation, job design, decision-making, coordination, and more specificity about implicit contracting. Notable about this list is how fundamental these issues are to organizational design. Moreover, most of them have to do with information, communication,

and incentives. Economists should have much to say about these topics; we sketched only a few starting ideas.

Our discussion of how to conceptualize the firm had a theme: it is useful to view the firm as a *developer and processor of knowledge*. Many economic models use a physical task metaphor (such as the emphasis on eliciting “effort” in incentive models). Yet much of what is interesting about organizations is intellectual. If firms can effectively invest in industrial engineering, perfecting the process in advance, and if the product and market are stable, then it is reasonable for the firm to use a Tayloristic approach. The firm should then look much like Adam Smith’s pin factory. But that does not apply to the majority of firms. There are fascinating and fundamental issues involved in collecting, processing, learning from, and communicating information within the firm. These issues are also important in understanding how organizations adapt and evolve.

The most interesting progress in personnel economics is likely to occur in empirical research. There are many important and interesting topics about which we still know little to nothing empirically. And, as Lazear (1999) argues, personnel economics must be empirical to be relevant in the long run. We need to *collect more data*. We need to *collect more interesting data*. In order to do so, we also will sometimes need to employ less traditional data collection methods, such as surveys. These are not always easy or low cost tasks, but the returns can be enormous.

## Footnotes

1. We are thinking about several overlapping fields. Lazear's (1999) definition of personnel economics is best for our purposes: "The use of economics to understand the internal workings of the firm."

2. Behavioralists distinguish between "policies" and "practices." The former indicates norms that are formally codified as officially sanctioned, while the latter indicate norms that may or may not be formally codified. Economists do not make such distinctions. We use either term to refer informally to both.

3. A notable exception is the long line of research in labor economics that tries to explain why workers with easily identifiable characteristics (union status, exempt status, race, ethnicity, gender) have different observed outcomes (wages, turnover, training). The motivation for this lies primarily with governmental policies on collective bargaining, overtime, benefits, and anti-discrimination laws. However, this objective has led economists to use nationally representative data sets to the virtual exclusion of within-firm analysis. Of course, there are exceptions, such as Doeringer and Piore (1971), and Levine (1995).

4. Of course "policies" themselves may be explicit or implicit, and intentional, historical, ad hoc, or accidental.

5. The "pins" were actually nails. Interestingly, Smith's analysis of specialization may trace back to Persia 900 years ago (Hosseini 1998).

6. As we were completing this draft, Lindbeck and Snower (2000) published a very interesting analysis of multi-task job design that is closely related to our arguments. Their analysis provides a modeling framework for thinking about these issues, and shows how changes in four factors can lead to greater use of job enrichment: changes in production and information technologies

that promote task complementarities, changes in worker preferences, and advances in human capital that make workers more versatile. The first two are most closely related to our arguments. Our analysis is complementary to theirs in several ways. They present a stylized, technological view of multitask production, while we provide some theoretical underpinnings about intrinsic motivation, learning on the job, and what might specifically drive task complementarities. Our emphasis on learning and complexity of the work environment also more fully fleshes out an explanation for why there has been a recent trend toward job enrichment.

7. H&O have a related idea in their model, “Task Significance,” which they do not emphasize. This can mean several things. They describe it as “the degree to which the job has a substantial impact on the lives of other people”; obviously this might affect the worker’s utility function through altruism. Task Significance could also mean the degree to which the job affects utility directly (Murdock 1998). An economist might add that a task could be significant to the worker if output affects the worker’s pay, through incentive compensation.

8. It is worth noting that there is a debate over the causal factors behind intrinsic motivation; see Ryan and Deci (2000) for a (brief) review. According to Ryan and Deci, self-determination theory holds that intrinsic motivation is an innate propensity of the individual that can only be enhanced or diminished by external factors. According to this view, “all expected tangible rewards made contingent on task performance ... undermine intrinsic motivation” (p. 70). If indeed this were the case, then job enrichment undertaken to enhance intrinsic motivation would be doomed to failure.

9. In the Tayloristic approach, workers are a source of variation and error; thus they lead to quality problems and cost increases. In its ideal form, industrial engineering squeezes humans

out of the process and uses mechanization instead. This is in striking contrast to the more modern view: workers can be a source of ideas for improvement, quality, cost reduction, etc.

10. Note that it has nothing to do with intrinsic motivation and psychology. Further, the kind of intrinsic motivation that H&O argue is increased by job enrichment (mental involvement in the work) is ideal for decentralization and learning by workers. Thus, the H&O model overall has less to do with psychology than might initially seem apparent.

11. For an interesting economic view of Total Quality Management programs (which usually employ “quality circles” or other forms of teams) as attempts to have workers engage in the scientific method to develop process improvements, see Jensen and Wruck (1994). In our view TQM is a special case of more general job enrichment methods designed to get employees to generate and use knowledge to improve quality and efficiency.

12. See Garicano (forthcoming) for an interesting approach emphasizing costs of processing and transmitting knowledge.

13. Fama and Jensen (1983) provide an interesting extension, distinguishing between different types of decisions. They describe a four-stage process: generating ideas or initiatives; choosing/ratifying initiatives; implementation of choices; and monitoring of implementation. They term the first and third decision management, and the second and fourth decision control. The distinction gives a richer way of thinking about decision-making and decentralization, but space limits prevent us from exploring it here. As a quick point, note that firms tend to use relative centralization of decision control, to improve coordination, combined with relative decentralization of decision management, to improve use of specific knowledge.

14. Galbraith (1995) provides a light treatment targeted toward practitioners, sufficient for an overview. Galbraith (1977) is a more academic treatment.



15. Firms often organize along lines other than functional, e.g., product, geographical, or customer divisions. However, such structures almost always have a strong element of functional hierarchy within them. Breaking up into sub-hierarchies in this sense appears to be due to limitations on the optimal size of a hierarchy, such as communication costs, garbling of information, limits of managerial talent, etc.

16. The need to integrate economic activity across several decentralized agents with specific knowledge may be one reason for the existence of firms instead of markets. Price mechanisms may be inadequate for coordination when pockets of knowledge are costly to communicate but need to be integrated. This same logic suggests that incentives (internal substitutes for the price system) are unlikely to fully achieve coordination inside a firm. If they could, it would beg the question of why the activity is internalized instead of using markets.

17. See Lawler (2000) for a discussion of the tradeoffs involved.

18. At the extreme, if such cross-functional teams perform a majority of the critical work of the organization, then they may become the principal unit that defines the organizational structure (Mohrman, et al, 1995).

19. See Bailey and Cohen (1997) for a detailed review of the empirical literature.

20. A flip-side to this argument is that if organizational investments are costly or time consuming, they might be a source of competitive advantage (a barrier to entry) if they are well matched to the firm's environment. For example, firms with long histories in relatively stable industries should have competitive advantages against new entrants, *ceteris paribus*.

21. Thus, the intellectual capital is firm-specific in the sense that it involves specific knowledge of the firm's technology, organization, methods, or products. But it is general in the labor market sense that it increases the employee's outside market value, because competitors can benefit from

learning this knowledge. It is different from the usual general human capital case, because the benefit to the departing employee or competitor comes at the expense of the firm. Thus, there may be an efficiency loss when the employee departs, similar to firm-specific human capital. In this way it is similar to the transferable skills described by Stevens (1996).

22. David Finegold points out that, in the specific case of the demand for technical workers in the U.S. (especially software programmers), rapid and substantial rises in hourly wage rates during the 1990s did not lead to an adequate supply response. Lags and rigidities in the education system and immigration policy are the most likely reasons.

23. The method of evaluating initiatives also has implications for the firm's adaptability, since it affects the number of projects that are evaluated, the percentage that are accepted or rejected, the likelihood of Type 1 and Type 2 errors, and the overall "creativity" of firm projects (Sah and Stiglitz 1986).

24. Not all of these elements are desirable in all circumstances. For example, encouraging suggestions on process improvements from the cleaning staff at a factory producing explosive chemicals can be beneficial; but encouraging risk taking among these same staff could be quite detrimental. Similarly, changes to the production process at such a factory are only valuable if they can be codified and replicated (through the identification of best practices). So it may be optimal for management to limit the number and duration of times during which suggested deviations from standard operating procedures are vetted.

25. Though the Lincoln Electric case is now 25 years old, it remains relevant to the company's U.S. operations today. The policies in place in the U.S. as late as 1998 were almost identical to those described in the case. Though Lincoln had substantial difficulty in its overseas operations

in the last decade or so, for a variety of reasons, its U.S. operations continue to operate with very high productivity, etc.

26. Huselid (1995); MacDuffie (1995); Lawler, et al, (1998); Guthrie (forthcoming).

27. An additional test would be to look for cases of organizational change, and see if firms adopt theoretically complementary changes simultaneously, or if doing so increases effectiveness of the change. This approach has yielded mixed support for the theory of internal fit so far (Ichniowski and Shaw 1995; Lazear, forthcoming).

28. In fact, most large datasets used in labor economics are also collected by government surveys, but economists have been insulated from the data collection process.

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## APPENDIX

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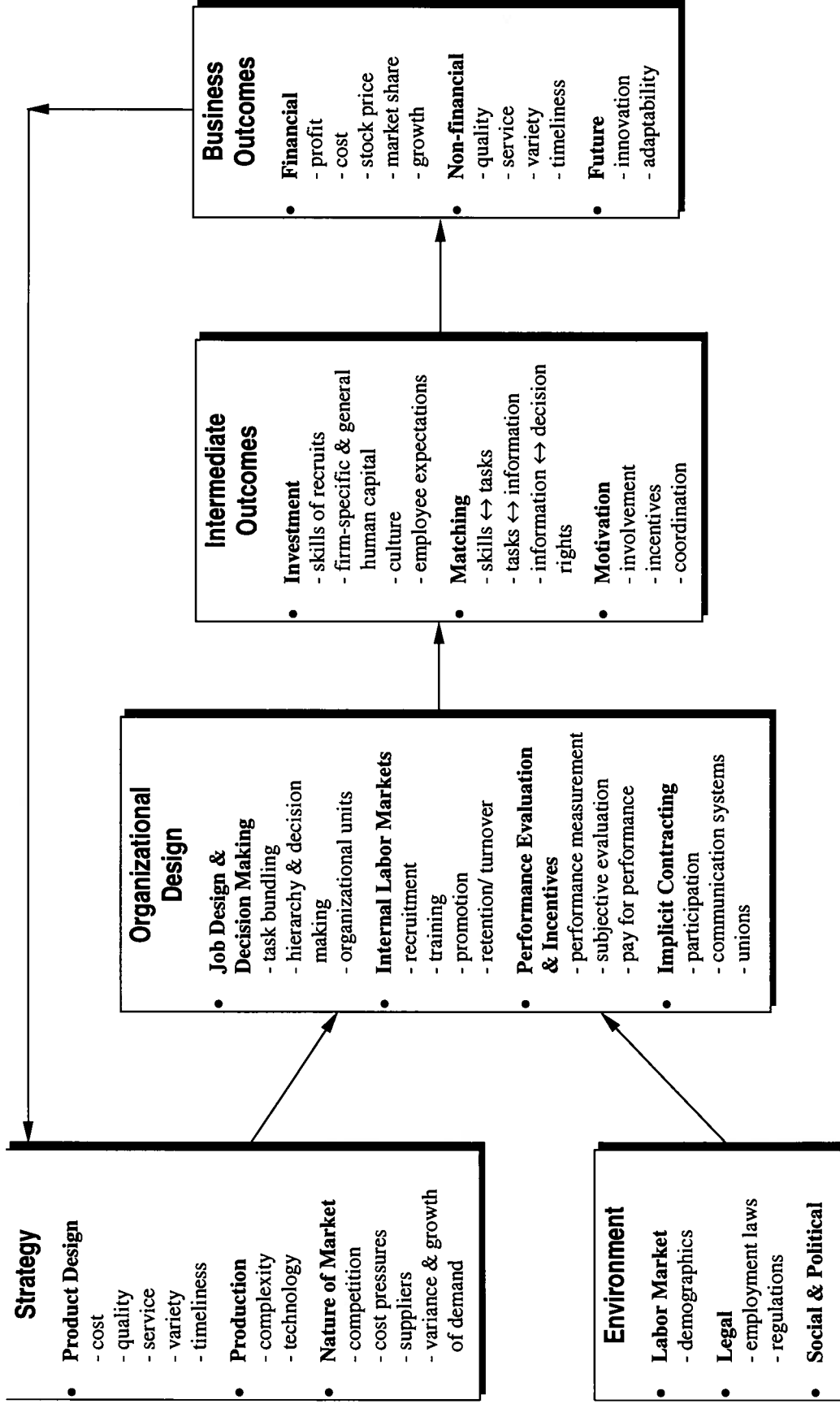


Figure 1. Systems View of Organizational Design (based on Beer, et al)

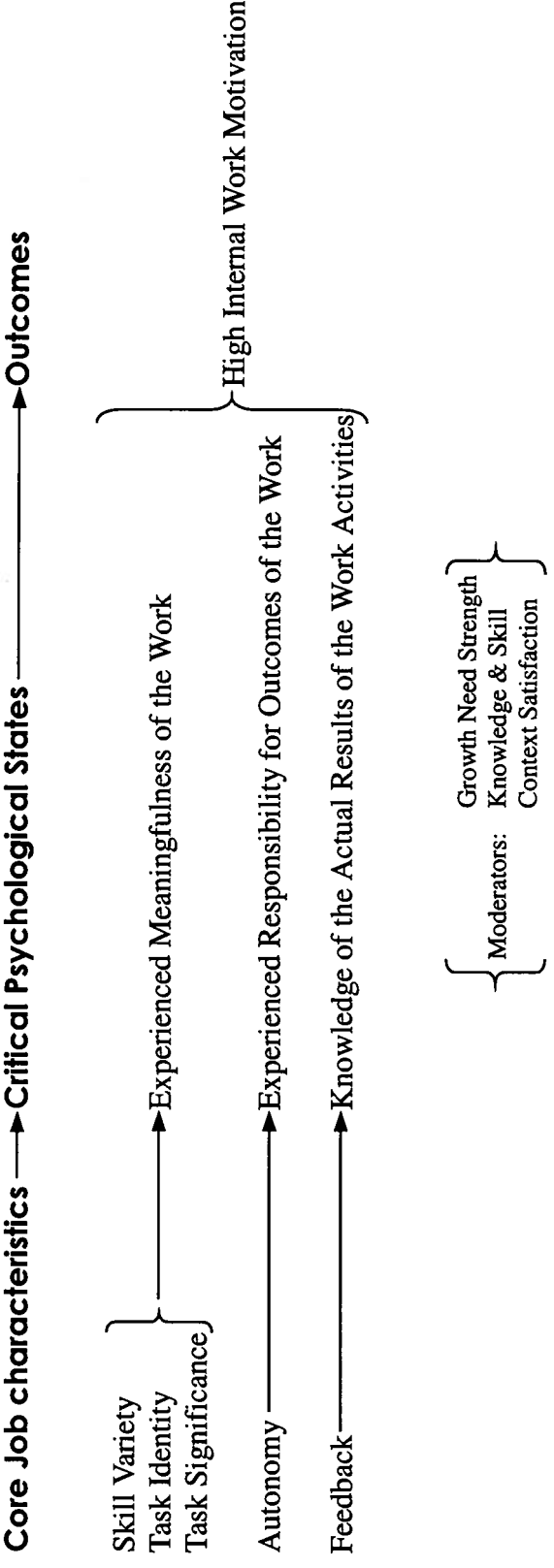


Figure 2. Hackman-Oldham Model of Intrinsic Motivation Through Job Design

<i>1. Technological Requirements</i>		Technical Interdependence:	
		Low	High
Task Uncertainty:	Low	Traditional job design	Traditional group design
	High	Job enrichment	Self-regulating teams
<i>2. Social/ Psychological Requirements</i>		Social Needs:	
		Low	High
Growth Need Strength:	Low	Traditional job design	Traditional group design
	High	Job enrichment	Self-regulating teams

**Table 1. Determinants of Emphasis on Job Enrichment or Team Production (Lawler)**

## **The Economic Approach to Personnel Research**

*Michael Gibbs & Alec Levenson*

University of Chicago & University of Southern California

Forthcoming in *The Expansion of Economics and Other Disciplines: Towards an Inclusive Social Science*

NY: M.E. Sharpe, ed. by Shoshana Grossbard-Shechtman.

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