Information technology, employee participation and the de-skilling thesis

Jay Charles Lacke
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Information technology, employee participation and the de-skilling thesis

Abstract
While the de-skilling of work may involve many facets, including task simplification and the degradation of manual skills, this dissertation focuses specifically on the loss of control by workers over the organization and direction ("conception") of their own work. This focus is consistent with Harry Braverman's (1974) seminal argument that the "pivot" of capitalist management, and the core of the de-skilling thesis, is the separation of the conception of work from its execution.

Employee participation strategies whereby workers exercise discretion over the organization and conduct of work are contrary to the de-skilling thesis. But their existence is compatible with post-Braverman analysis in which worker resistance and new technologies may result in de-skilling for some workers yet en-skilling for others.

Enhanced profitability and competitive position has been a documented result of employee participation. Therefore, explaining why, in a competitive economy, we do not find greater use of employee participation is a problem--one which reflects the generally unsettled analysis of the contemporary labor process.

The effect of information technology on employee participation is one of the unsettled issues. Different perspectives on this issue are developed in this dissertation through (1) an analysis of the de-skilling concepts in the history of economic thought, (2) an interpretation of the labor process under an indeterminist methodological perspective, and (3) an evaluation of the effect of information technology on worker-management trust.

I conclude that the writers in the history of economic thought documented and established theoretical support for a thesis of de-skilling technological change. Information was considered a crucial resource by which the power of a dominant group over a subordinate group could be enhanced. Information technology was viewed as a method by which to displace and control labor. Arguments that the capitalist system would evolve so as to foster en-skilling were plentiful but lacked any rigorous theoretical foundation.

Incorporation of an indeterminist methodology supports the theory that differential skill trajectories and organizational control strategies can co-exist. However, these results do not simply reflect differential responses by management to the challenges of supervising and monitoring workers. More importantly, they reflect different requirements of organizational learning under different degrees of uncertainty.

Finally, I conclude that widespread sharing of information and egalitarian access to a firm's information increase the level of trust in the organization, thus tending to support the sustainability of employee participation.

Keywords
Economics, Labor, Economics, History, Sociology, Industrial and Labor Relations, History, Modern

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INFORMATION TECHNOLOGY, EMPLOYEE PARTICIPATION
AND THE DE-SKILLING THESIS

BY

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Bachelor of Science, Lehigh University, 1964
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DISSERTATION

Submitted to the University of New Hampshire
in Partial Fulfillment of
the Requirements for the Degree of

Doctor of Philosophy

in

Economics

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June 16, 1985
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DEDICATION

I dedicate this dissertation to my wife of thirty-one years, June Spoley Lacke, who has earned three Ph.T. (Putting Hubby Through) degrees since 1964. Her encouragement, patience, and support have made the long and winding road to this degree possible. June, I love you.
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I thank Sinthy Kounlasa (Whittemore School of Business and Economics) -- as do all graduate students in Economics at the University of New Hampshire -- for her help. I thank my son, Christopher Lacke, for his assistance with the statistical analysis of empirical data.

Finally, I thank my father, Warren Albert Lacke, for his guiding vision. He was the most thoroughly honest man I have ever known. As head of industrial relations for one of the twenty-five largest corporations in the world, he was still respected and trusted by union leaders. Despite the antagonistic relations of capital and labor, he tried to be fair and honest in his negotiations and then worked to assure his corporation’s compliance with the explicit and implicit contracts it had made with its workers.
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ABSTRACT

INFORMATION TECHNOLOGY, EMPLOYEE PARTICIPATION, 
AND THE DE-SKILLING THESIS 
by 
Jay C. Lacke 
University of New Hampshire 
September, 1995

While the de-skilling of work may involve many facets, including task 
simplification and the degradation of manual skills, this dissertation focuses specifically 
on the loss of control by workers over the organization and direction ("conception") of 
their own work. This focus is consistent with Harry Braverman’s (1974) seminal 
argument that the "pivot" of capitalist management, and the core of the de-skilling thesis, 
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Employee participation strategies whereby workers exercise discretion over the 
or ganization and conduct of work are contrary to the de-skilling thesis. But their 
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technologies may result in de-skilling for some workers yet en-skilling for others.

Enhanced profitability and competitive position has been a documented result of 
employee participation. Therefore, explaining why, in a competitive economy, we do 
not find greater use of employee participation is a problem -- one which reflects the 
generally unsettled analysis of the contemporary labor process.
The effect of information technology on employee participation is one of the unsettled issues. Different perspectives on this issue are developed in this dissertation through (1) an analysis of the de-skilling concepts in the history of economic thought, (2) an interpretation of the labor process under an indeterminist methodological perspective, and (3) an evaluation of the effect of information technology on worker-management trust.

I conclude that the writers in the history of economic thought documented and established theoretical support for a thesis of de-skilling technological change. Information was considered a crucial resource by which the power of a dominant group over a subordinate group could be enhanced. Information technology was viewed as a method by which to displace and control labor. Arguments that the capitalist system would evolve so as to foster en-skilling were plentiful but lacked any rigorous theoretical foundation.

Incorporation of an indeterminist methodology supports the theory that differential skill trajectories and organizational control strategies can co-exist. However, these results do not simply reflect differential responses by management to the challenges of supervising and monitoring workers. More importantly, they reflect different requirements of organizational learning under different degrees of uncertainty.

Finally, I conclude that widespread sharing of information and egalitarian access to a firm's information increase the level of trust in the organization, thus tending to support the sustainability of employee participation.
INTRODUCTION

A. Overview of the Issues

The focus of this dissertation is on employee participation strategies in which firms delegate authority and responsibility to front line workers to make decisions about how work is organized and directed. Such strategies represent innovative workplace practices which are still relatively rare among capitalist firms in the United States. The key questions that I address in this dissertation involve the viability of employee participation strategies in capitalist firms, the effects of information technology on that viability, and the likely impact of participatory structures on employee skill levels.

Numerous types of organizational involvement by workers at the lower levels of hierarchies fall under the rubric of employee participation. Participation may involve making ad hoc suggestions about possible new products or operational changes. It may also involve making regular inputs including information, ideas and judgments to the decision-making process (e.g., through quality circles) but without any authority to make key decisions. In its generally most extensive form, however, employee participation involves the delegation of authority and responsibility for making and implementing important organizational choices. These choices include but are not limited to the organization and direction of the work flow, the supervision and possible sanctioning of peer workers, and capital investment decisions.

This dissertation studies participation in its most extensive form, as evidenced by the use of self-managing intact work teams. With this form of participation, the clear-cut
separation between the planning and coordinating of day-to-day work on one hand (the "conception" of work) and executing work tasks on the other is broken down. Such a separation between thinking about work and just doing work is a crucial element of what is referred to as the "De-skilling Thesis." Among other things, this thesis argues that the management of capitalist firms will tend to affect work arrangements and utilize the tools of automation, mechanization and computerization so as to maintain direct control over the conception of work.

Capitalist firms have a typical hierarchal structure in which capitalist owners and their agent-managers have authority over workers. The capitalists have ultimate legal control over how the firm’s human, physical and financial assets are deployed, and are the residual claimants to any surplus (profits). Consistent with the neoclassical and radical political economy (RPE) schools of economic thought as well as organization theory, the goal of capitalists and their agent-managers is to maximize the profits generated by the firm. Workers are not generally interested in whether their firms maximize profits -- but are interested in maximizing their wages per unit of their work effort.

Due to the lack of goal congruence between capitalists and workers, there is an essential conflict of interest between capital and labor. In the RPE view, this conflict is dealt with by owners exercising power over the workers (James Rebitzer, 1993). Information and knowledge about the production process is a source of power in the capitalist firm. Management attempts to secure better knowledge about workers' actual and potential performance in order to assure that output per unit of labor time is
maximized. Such knowledge is given up only unwillingly by workers if they believe that it will be used to intensify their work, reduce their wages per unit of effort expended, or otherwise work against their goals.

Given the uncertainty of demand for the firm’s products, such knowledge enables management to adjust the size of the firm’s labor force as demand for the firm’s output varies, and to adjust and deploy the skills of workers to match tasks required by a changing work load -- and to do so quickly, smoothly, and at minimum cost (Stephen Wood, 1989). These conditions and requirements are not, of course, unique to the standard capitalist firm. But how that knowledge is secured, and how workers are impacted by the informational processes related thereto, may be unique in a capitalist firm.

The outlook for extensive employee participation in capitalist firms is the subject of an almost polar debate. The most pessimistic view on the potential for employee participation within capitalist firms emanates from RPE, which argues that capitalist management responds to its inherent conflict with labor by trying to organize and direct work (with the aid of appropriate tools) so as to de-skill the bulk of the workers. Workers resist such efforts with some degree of success. To the extent that it is actually accomplished, de-skillling reduces the power of workers to resist management’s directives.

The RPE argument builds on and modifies Harry Braverman’s (1974) thesis of de-skillling technological change, in which technology is broadly conceived to include both the arrangements (structure) of work and the tools of work (e.g., computers). Any
meaningful worker participation is, by definition, en-skilling and therefore inconsistent with the RPE view of the dynamics of the capitalist labor process. In general, RPE argues that management-sanctioned employee participation turns out to be a disingenuous scheme that appears to empower workers while actually disenfranchising them organizationally.

The cause of the conflict, and the impetus for this managerial strategy of de-skilling, is the uncertainty created by the nature of the capitalist labor process. The worker grants authority to the hierarchy over his/her labor time (power), but cannot grant authority over his/her actual labor (output) to the hierarchy. The worker retains that authority and does so in a circumstance where the worker's goals are not perfectly consonant with those of the hierarchy. The conversion of labor power to actual labor involves uncertainty. Under these conditions, active control of work becomes a major concern -- for RPE, the major concern -- of capitalist management. A major tactic for securing and maintaining capitalist control over the labor process is, ultimately, the minimization of worker responsibility and authority for making decisions about the work process (in distinct contrast to any long term industrial relations strategy that emphasizes employee participation). Stripping the worker of information and knowledge beyond that necessary to perform pre-defined tasks may be contrary to the firm's interests in some ways, but is consistent with strengthening capitalist management's power vis a vis workers.

The management of any firm wants to eliminate, or at least minimize, uncertainty regarding that firm's ability to profitably fulfill the explicit and/or implicit contracts it
makes with its customers, suppliers and other stakeholders. Thus, management wants to accurately predict what the outcome(s) of its decisions will be. A crucial source of this undesirable uncertainty for the managers of a capitalist firm, as Richard Edwards (1979) points out, involves the actual level of labor productivity that is achieved. The antagonism between the interests of management and wage labor makes this conversion process particularly problematic.

To resolve the dilemma, management and/or some other source must induce labor to cooperate with management, in the sense of working hard enough and well enough to produce results which are consistent with the attainment of management's goals. Deskilling is seen, in RPE, as the method through which capitalist management attempts to maximize its ability (power) to control the conversion contest with a labor force whose goals and inclinations are at least somewhat contrary to those of management.

Control of workers is not an end in itself, and is not necessarily something that managers covet. Indeed, capitalist management (as well as labor) is widely seen as wishing to reduce conflict in the work place and increase labor-management cooperation, believing that such a change in relations would enhance performance and goodwill (Richard Freeman and Joel Rogers, 1994). Arguably, the problem is that the nature of the capitalist system and competition forces management to exercise what may be personally distasteful power and deskilling strategies. Power becomes an instrumental necessity in the struggle for surplus.
RPE posits that technology combines with the social relations of work to implement the de-skilling strategy. Paul Attewell sums up technology's effects from the de-skilling perspective:

[M]echanization and automation [are] occasions for increasing leverage over the work force...This produces cost savings, of course, but de-skilling theorists stress the implications for control rather than cost. Lower skill employees are more tractable and more easily replaced than their skilled predecessors, whose specialized knowledge and skills provide strategic resources in the struggle with management. Mechanization is therefore an occasion for removing such knowledge, skill and conceptual responsibilities from production employees, and transferring it to technical professionals or to others less troublesome from management's point of view. (Attewell 1992, pp. 52-3)

In part, then, the enhancement in control is achieved by replacing skilled workers with a combination of semi-skilled/unskilled workers and machines. As Dietrich Rueschemeyer (1986) asserts, such workers may be easier to control, even though they are specialized, because their work is open to more common sense evaluation. Since hierarchy generally bases its monitoring on the observation of worker behaviors rather than direct labor output, Rueschemeyer's argument is highly relevant.

While neoclassical economists do not take up the de-skilling debate, their conclusions about employee participation's workability in a capitalist firm is consistent with RPE. Problems of monitoring and issues of shirking render such schemes inefficient (Michael Jensen and William Meckling, 1977). If this were not the case, and employee participation were more efficient than the traditional hierarchical strategies, we would see more such arrangements in a competitive economy.

Some neoclassical economists and organizational theorists are, however, sanguine about employee participation generally, and the effects of electronic computer-based...
machine and information technology on employee participation specifically. While numerous analysts can accept the idea that mechanical and electro-mechanical technology (including some kinds of "smart" machines) can have de-skilling effects, information technology is especially envisioned as skill-enhancing and enabling of participatory strategies. Other economists and organizational theorists argue, however, that even where information technology is combined with a participatory organizational structure, the long run effect will actually be to de-skill workers and extend managerial control over them. Computer-based technology and participation may simply represent a substitute for direct ways of controlling labor.

B. Braverman and Beyond

Braverman's thesis of technological de-skilling provides the foundation for the argument about employee participation pursued in this dissertation. Braverman asserts the existence of "the general law of the capitalist division of labor" whereby every step of the labor process is divorced, so far as possible, from specialized knowledge and training (Braverman 1974, pp. 82-3). In the sense that "skill" involves job complexity, task variety, and higher-order mental capabilities -- i.e., a relatively high level, scope and integration of mental, interpersonal, and manipulative tasks (J. Paul Grayson, 1993) -- workers are de-skilled and they wind up spending their time on increasingly simple and repetitive tasks which have no intrinsic meaning.

Braverman further insists that the hierarchical, command-and-control structure of a typical capitalist firm tends to de-skill workers by separating the "conception" of work from its "execution." Knowledge of the overall process of production, and control
(autonomy) over the organization and direction of work, is stripped from workers and vested in the firm’s managerial employees. The worker loses autonomy and control over the work process, and becomes specialized in performing a repetitive task.

Braverman recognizes that workers will attempt to resist de-skilling, especially the loss of autonomy and control over their work, and will be successful to a degree. Moreover, he concludes that growth and technological change can and do open up more skilled opportunities for workers, and that a net increase in worker skill levels may occur for awhile. However, he also concludes that because of the vertical division of labor in capitalist firms, such improvements "merely mask the secular trend toward the incessant lowering of the working class as a whole below its previous conditions of skill and labor" (Braverman 1974, pp. 129-30).

Numerous authors have investigated organizational strategies which seem to hold out hope for reversing the progressive fragmentation of work, for collapsing the dichotomy between conception and execution, for breaking management’s pre-occupation with control and work intensification, and for creating high levels of worker-management trust and reciprocity. For example, Masahiko Aoki describes:

[A] recent phenomenon, the emergence of a new mode of intra- and inter-organizational coordination which is somewhat at odds with the traditional economists’ modelling of the firm as a hierarchy. This mode relies more upon participatory information processing by, and communications among, workers (shops) than does the traditional hierarchical structure, which is characterized by the specialized separation between coordination and operating tasks as well as among operating tasks. (Aoki 1990b, p. 27)

Aoki (1990b) views the economic and real-time accessibility of information and communications technology at the lowest levels of the hierarchy as the key to the
emerging participatory mode of organization. James Brian Quinn (1992) likewise argues that information technology will cause the traditional hierarchical organization to give way to other forms of coordination, and will stimulate the displacement of the vertical division of labor by a much flatter organizational structure and a horizontal division of labor including multi-functional teams.

The unresolved issue of the fate of employee participation structures is given importance by a number of findings regarding participation's effect on the firm's performance. For example, Barry Bluestone and Irving Bluestone (1992) find that all U.S. firms that have maintained their competitive strength have substantial employee empowerment initiatives in common. Also significant is the argument that the economic advantages of computer-based technology can be maximized only under participatory regimes in which the collective knowledge of the organization is effectively harnessed and mobilized (Richard Florida, 1991). Yet, it is commonly agreed that employee participation and empowerment has made little penetration (Ronald Henkoff, 1992).

The remaining sections of this introduction will summarize each of the four chapters in the dissertation.

C. The De-skilling Thesis in the History of Economic Thought

This chapter concerns whether the historical economic literature provides a supporting basis for the thesis of de-skilling technological change, and looks at the role of information technology therein. Since the historical literature was developed in an era when technology involved essentially mechanical and electro-mechanical machinery, I
could only develop conjectures about the relevance of the computer-based communications and information technology (CIT) that has been developed recently.

Information technology's historical tools are little mentioned in this chapter, except with reference to observations made by Charles Babbage who is recognized as the father of the computer. However, in the sense that economic organization at the societal and workshop levels were designed to and did affect the flow of information, a lot can be said about CIT. An interesting question is whether arguments about de-skilling under a regime of mechanical and electro-mechanical technology would be altered in any substantial way under a regime of micro-electronic technology.

The material covered in this chapter dates back to pre-capitalist and mercantilist writers such as William Petty and Thomas Mun (1600s) and builds through the work of Alfred Marshall (1920). While the ideas of these theorists regarding the impact of technological change have been discussed in various places, there is no unified tract that brings them together and focuses them on them on the issue of the workplace division of labor and technical de-skilling. Nor has any work focused on similarities and differences between the impacts of communications and information technology versus mechanical or electro-mechanical machine technology. Of particular interest is Charles Babbage, since Braverman (1974) views the "Babbage Principle" as fundamental to the de-skilling tendency in the capitalist firm. Furthermore, Babbage clearly saw the computer as a workplace tool that could replace the human mind as well as the body.

This chapter argues that technological de-skilling has been evident in the works of most figures in the history of economic thought. De-skilling was seen as a response
to conflict both among different economic classes in society and between capital and labor in the factory. De-skilling was also seen as a response to the firm's need to minimize variation in production, as variation would disrupt the capitalist system and weaken the offending firm's competitive position.

While the arrangements of work under a de-skilling regime were argued to have negative effects on efficiency and human welfare, visions that a participatory and en-skilling alternative within capitalist firms would take its place were wishful and without a rigorous theoretical foundation. Much of the hope for change was pinned on elevating individual character through education and other modes, as if it were the participants in the system, not the system itself, that caused the problems. But all reasonable analyses of the capitalist system of organization essentially concluded that natural dynamics tended to have de-skilling consequences.

D. Uncertainty, Learning and Employee Participation

In this chapter, I argue that an indeterminist and evolutionary methodology is needed to adequately analyze employee participation. Particularly useful in this light are the ideas of chaos theory, which allows for the simultaneous existence of order and disorder. This methodological position is necessary because employee participation is designed to enhance organizational learning, and that learning is both adaptive (determinist) and experimental (indeterminist). Implications for the viability of employee participation are developed within this framework.

The indeterminist view implies a world characterized not only by input and time scarcity, but epistemic scarcity as well. In such a world, where the creation of
knowledge and information become critical to the reduction of uncertainty, worker participation combined with advanced information technology may be the best way to coordinate activity so as to create order and reduce uncertainty. Professional service firms, for example, may be considered to operate in markets characterized by substantial epistemic scarcity. Confronted by information overload, the core economic problem faced by these firms involves perception and selectivity in a highly uncertain environment, in contrast to the choice of the optimal production routine made pretty obvious in a more deterministic market environment.

On the other hand, organizational learning is costly and time-consuming. The rigid adherence to routines may be the most efficient way to perform certain functions in certain environments, else the result may be disorder and greater uncertainty. In such circumstances, workers should not be engaged in the (re)conceptualization of how work should be organized and directed.

E. The Effect of Information Technology on Trust in a Participative Workplace

This chapter argues that the nature of workers' access to information in the firm will affect their level of trust in upper or top management, and that such trust is crucial to the viability of employee participation strategies. Since it is upper or top management that generally initiates participative work arrangements in U.S. firms, workers must trust that these arrangements will not be administered in a manner that actually exploits and de-skills them. Workers must trust management *as a group*. I further argue that the breadth and depth of accessible information is only one determinant of the level of trust.
Also important are the degree of control over access afforded to the workers themselves, and the efforts of the firm to help workers to understand the data. This composite proposition about the effects of information access on the level of trust in participative workplaces is subjected to empirical research which supports the proposition.

My position accords with that of numerous analysts who argue that workplaces which afford workers high levels of discretion over and involvement in decision-making require high levels of employee-management trust in order to be productive (e.g., Alan Fox, 1974, and Edward Lawler, 1986). Both David Kreps (1990) and Mark Casson (1991) support this position with regard to employee participation by envisioning the workplace as a repeated game which, by its very design, faces the threat of shirking by team members. A "cooperative" corporate culture, one in which each team member trusts all others to cooperate and to thereby enforce a social norm of anti-shirking, is needed to support a long term cooperative outcome in this game.

My empirical work especially highlights the importance of the structure of information access in creating the trust necessary to support employee participation. It is important to be mindful of this issue because the fact is that a firm's information technology regime may be intended to extend managerial power as opposed to increasing worker participation, a point lamented by Harley Shaiken:

It is ironic that computers and micro-electronics should be used to create a more authoritarian workplace. They could just as easily be deployed to make jobs more creative and increase shop floor decision-making. Rather than pace workers, systems could be designed to provide them with more information about the production process in general and their own jobs in particular. The technology could be used to bring the work under the more complete control of the people who do it rather than the other way around. (Harley Shaiken 1984, p. 287)
F. An Integration of Chapters I-III: What Has Been Learned Overall

The first two chapters of this dissertation deal with theoretical and methodological issues. The third chapter deals with both theory and empirical research regarding the issue of trust. The fourth chapter integrates the prior three, making a particular effort to relate the research findings regarding trust to the theoretical propositions embodied in chapters one and two. In particular, I argue that the empirical research supports my view that an indeterminist methodology is needed to analyze employee participation in capitalist firms.
CHAPTER I

THE DE-SKILLING THESIS IN
THE HISTORY OF ECONOMIC THOUGHT

A. Introduction

This chapter takes up three key propositions of the de-skilling thesis, and investigates the views of various writers in the history of economic thought regarding these elements. The core proposition is that capitalists arrange work and deploy machinery (i.e., utilize technology) so as to de-skill workers for the purpose of achieving greater control over the labor process. De-skilling is instrumental to the end of power over workers.

The second proposition is that this de-skilling thrust results in a less efficient firm than would be the case under alternative non-capitalist arrangements. The third proposition is that the de-skilling strategy is pursued not because individual capitalists or their manager-agents have idiosyncratic (and possibly alterable) personal needs or desires to de-skill workers, but because capitalist competition forces capitalists and their agents to do so. Thus, de-skilling is a systematic response to the antagonistic labor relations of capitalism, and the capitalist just can’t help it.

Conflict and power are recurrent themes in the works that are addressed by this chapter. Those themes, of course, have not disappeared. For example, in delineating and describing the fundamental propositions that distinguish radical political economy
(RPE) from other schools of thought in modern economics, Rebitzer emphasizes the role of power:

Key economic processes are fundamentally political in the sense that they depend, even at the most abstract level of analysis, on institutional arrangements that enforce the power and authority of a dominant group vis a vis a subordinate group. (Rebitzer 1993, p. 1395)

Capitalist management seeks power in order to resolve its conflict of interest with labor in favor of the capitalists' interests. Power, in this sense, involves the ability to impose sanctions on workers.

While RPE does generally emphasize positive and negative sanctions (e.g., pay raises, dismissals, perquisites, and other rewards and punishments) as management's power sources, I believe that RPE adherents would accept that management further derives power from three other sources -- legitimacy, interdependence, and perceived expertness. Legitimacy, or legitimate power, means that the dominant person or group is accorded at least a certain degree of power over the subordinate individual or group by the subordinate unit itself, based on perceptions by the subordinate unit that the dominant unit is rightfully (though not necessarily justly) due that power. To define interdependence and expert power, I refer to Ralph Stacey:

**Interdependence**: one individual or group is relatively more powerful than another if it controls more resources, has greater access to information, performs critical activities upon which others depend for their performance, has greater access to communications channels or to more powerful channels, has control over communications agendas or the decision making situations;

**Contribution** [expert power]: relative power increases with the personal skills and expertise of particular individuals and their ability to interpret ambiguous situations and so reduce uncertainty for others. (Stacey 1991, p. 125)
The de-skilling thesis posits that the separation of the mental labor of planning, organizing and directing work (i.e., the conception of work) from the more-or-less manual labor of executing work tasks causes labor to experience a loss of control (mastery) over the work process, and to acquire and maintain only a limited knowledge about the total productive process and the market in which it is embedded. Labor's loss of control is further affected by the fragmentation of work and the minute division of work tasks. Worker power degrades under these conditions.

A de-skilling strategy attempts to directly reduce the expert power of labor by reducing its knowledge and manipulative skills, as well as its ability to interpret and respond to ambiguous and changing situations. The concomitant result is that the power of capitalists and their top management agents to control the labor process is enhanced. Furthermore, personal de-skilling limits the worker’s ability to change jobs, and to find a new job if dismissed, which increases the power of management’s sanctions.¹

Additionally, de-skilled workers are less likely to be motivated to acquire authority over the production process, as they are aware of their lack of ability to master that process. This result may be viewed as an increase in either legitimate power or expert power. Finally, de-skilling obviously attempts to create greater information and communications asymmetries in favor of management, and to shift critical activities from workers to management, reducing management’s dependence on labor.

¹ For example, an un-skilled or semi-skilled auto worker who faces the prospect of losing his job may feel that he is unlikely to find a new job with comparable pay and benefits and, therefore, is less inclined to resist management.
Regarding the second of the aforementioned elements of the de-skilling thesis, capitalist management would seem to pay a possibly heavy price for the control that may be gained through de-skilling workers. This is not a recent revelation. Long before the present reverence for organizational flexibility and responsiveness began to emerge in the management literature, Karl Marx clearly recognized that worker inflexibility and ignorance, upon which the political control derived from de-skilling is based, is opposed to the real needs of industry:

[M]odern industry, by its very nature, therefore necessitates variation in labour, fluency of function, universal mobility of the labourer [but] in its capitalistic form, it reproduces the old division of labour with its ossified particularisations. (Marx 1967[1867], p. 457)

For Marx, this ossification was the result of the very debilitating and de-skilling effects that the capitalist division of labor had on workers:

Hence, Manufacture begets...a class of so-called unskilled labourers...It develops a one-sided specialty into a perfection, at the expense of the whole man's working capacity, [and] it also begins to make a specialty of the absence of all development. (Marx 1967[1867], p. 331)

It may be poignantly reiterated that the very things which capitalist management is presently trying to secure through employee participation strategies, and that Marx deemed necessary for 'modern industry', are systematically denied by de-skilling. These elements include labor-management goal congruence, flexibility in the production process, and workers' willingness to apply their knowledge of the production process so
as to benefit the firm. Consistent with Marxist dialectics, capitalists lose power by gaining it through de-skilling.\(^2\)

The third and final element addressed here involves whether de-skilling is a systematic or non-systematic feature. According to the tenets of RPE and its Marxian roots, competitive pressures systematically drive the continual effort to further sub-divide labor. The capitalist, locked in a Darwinian competitive struggle, must continually seek to improve his productivity and surplus relative to other capitalist adversaries, not simply out of the desire for more wealth but because it is necessary to survive (profits define fitness).

In the RPE conception, capitalist management does not really choose, in any strategic sense, to de-skill workers. Competition "selects" that strategy. The external competition of firm-versus-firm creates pressures that result in an internal competition of capitalist-versus-worker, with the capitalist trying to enforce individual and collective discipline on labor. If successful, the resultant political power can be used to accomplish two basic, profit-enhancing ends which wage labor resists: increasing labor intensity and prolonging the length of the work day.

Based on an analysis of some major as well as minor works in the history of economic thought from the mercantilist era through Alfred Marshall, I have drawn a number of conclusions regarding their ideas in relation to the de-skilling thesis. This

\(^2\) Power is the ability to do work. The idea of this dialectic is that a de-skilling strategy may increase capitalist management's power over labor time but decrease the productivity of a unit of labor time in the process. Increased capitalist control over the asset called labor degrades the value of that asset to the capitalist.
introduction will close with a summary of these conclusions followed by an outline of the rest of this chapter.

Obviously, Marx's economic theory supported the de-skilling thesis. His theory of the labor process is what the thesis is built on. However, I find that almost every other major figure (and many minor ones) in the history of economic thought who explicitly investigated the nature of the capitalist labor process agreed that it systematically tended to de-skill labor, with negative effects not only on the workers themselves but on the firms who employed them. However, Babbage (1986[1835]) was one analyst who seemed to present a well-developed and cogent view -- not simply a hope -- that de-skilling was but one alternative for pursuing control, and that an en-skilling or re-skilling option was feasible.

Furthermore, the de-skilling-as-inevitable conclusion was very disturbing to the historical writers. But except for Marx and Babbage, these writers resorted to various strategies (with weak theoretical foundations, at best) to diffuse the well-grounded distress signals that their analyses of the labor process were emitting. Maintaining a capitalist system required, ultimately, moving away from Adam Smith's "microfoundations" of purely rational (self-interested) individual motivation to a paradigm based on both self-interest and altruism, ala the socioeconomic philosophy associated with modern theoreticians such as Amartya Sen (1987) and Amatai Etzioni (1988). In particular, John Stuart Mill (1987[1848]) and Alfred Marshall (1982[1920]) advanced the view of long term employment relations based on trust and reciprocity were dominant.
I further conclude that the critical importance of knowledge, information and communication in organizing and controlling productive economic activity was clearly recognized in historical economic thought. The theorists discussed in this chapter would have agreed with David Hounsell who, in comparing Taylorist hierarchies with flatter and more participative organization structures, argues that, "...in both cases, the key is knowledge-based manufacture, and the critical question is, who controls the knowledge" (Hounsell 1988, p. 61). It is quite relevant, therefore, to conjecture about how these writers would have perceived the effects of communication and information technology (CIT) on production: some would have viewed it as de-skilling while others would have seen a more positive outcome.

Section B covers the Marxist foundations of the de-skilling thesis as launched by Braverman (1974) and currently debated by radical political economy. Section C investigates the Mercantilist era, demonstrating that the control and use of asymmetric information and knowledge was viewed as crucial to competitive success in economic relations that were conflictual. Section D deals with Adam Smith. Though Smith had no specific, well-developed analysis of capital-labor relations in the workshop, he offered plenty of evidence regarding the de-skilling effects of the division of labor. Section E looks at the writings of Babbage, DeSismondi, Ricardo, Senior, Torrens and Ure who did look at the labor process in organizations. Much of their analysis focused on a "displacement thesis" (the displacement of human labor by machinery), but these writers also touched on de-skilling. Section F analyzes the thought of Mill and Marshall, who built on Babbage’s concept of cooperative relationships in the workplace.
B. Marxist Foundations of the De-skilling Thesis

Like neoclassical economics, classical political economy (CPE) viewed the coefficients of labor and capital as technically-determined constants for a given production process, at least for a given scale of output. To Marx (1967[1867]), however, labor coefficients were social variables whose actual values at any given level of output were determined by a class struggle over the intensity and duration of work.

That this struggle occurred owed to the nature of the labor bargain. The capitalist purchased an often imprecise amount of labor time for a fixed wage ("labor power"). That wage really took the form of what, today, we would call a salary: it implied a fixed amount of income for the worker over a certain calendar period, during which some nominal number of hours of work were expected. Within some range, the actual number of hours worked did not affect the salary. Thus, by and large, labor costs were temporally fixed (given the size of the work force) while actual labor effort and output were variables subject to the power struggle between capitalists and workers.

Naturally, capitalists in Marx's model focused on increasing labor productivity, as measured by value-added output per worker per pay period. That is, they tried to extract as much actual labor from the acquired labor power as possible. The individual worker's productivity could be increased by: (1) increasing worker output per unit of time engaged in productive effort, (2) increasing the proportion of the time spent on the job in productive versus non-productive activity, and (3) increasing the number of hours
spent on the job within the calendar envelope (day, week, month, etc.) purchased by the capitalist.³

The first two preceding elements involve an increase in labor intensity, resulting in increased profits for the capitalist firm in the form of "relative surplus value"; the third element involves an increase in the duration of work (prolonging the working day without a compensating increase in wages), and profit in the form of "absolute surplus value".⁴

Given that workers were restricted to a fixed subsistence wage regardless of their productivity, and were alienated, Marx concluded that "capital is constantly compelled to wrestle with the insubordination of the workmen" (Marx 1967[1867], p. 346). In other words, workers would shirk to the extent of their ability to somehow hide the fact that they were under-working and therefore avoid dismissal. Marx perceived that workers with higher level skills were more inclined and intellectually-equipped to resist the capitalist’s efforts to establish discipline and order, and also had greater economic power with which to succeed in that resistance. In this regard, Marx cited the following quote from Dr. Andrew Ure’s *The Philosophy of Manufactures*:

"By the infirmity of human nature it happens, that the more skilful the workman, the more self-willed and intractable he is apt to become, and, of course, the less fit a component of a mechanical system, in which, by occasional irregularities, he may do great damage to the whole. The grand object therefore of the modern

³ The conception of productive and non-productive labor activity discussed here does not equate to Adam Smith’s view of productive labor as that which generates a surplus for capital whilst non-productive labor does not do so. Here, productive labor adds use value for the consumer while non-productive labor, though possibly necessary, only adds cost.

⁴ The terms "relative labor surplus" and "absolute labor surplus" as used here are consistent with those defined and used by Marx (1967[1867], p. 299) in *Capital*. 
manufacturer is, through the union of capital and science, to reduce the task of his work-people to the exercise of vigilance and dexterity." (Marx 1967[1867], p. 347)

In this light, the "de-skilling thesis" might be more appropriately termed the "de-resistance thesis" as that is what capitalists were really trying to do -- break down the will as well as the ability of workers to resist capitalist control. However, it should also be apparent that variability is considered to be an enemy of efficient capitalist production, and that individual worker skill and production consistency are counterpoised to each other.

One presumption in Marx (1967[1867]) is that a reduction in the skill of the average worker would lead to a change in the attitude of the average worker: docility would increase, hence inclination to resist would decline. In other words, workers would become more inclined to accept the legitimacy of capitalist power. To the extent that an increasingly minute division of tasks in the workplace lowered the required skill levels of workers, it would reduce the intelligence and will that affected resistance. Marx proposed that machinery further affected a reduction in worker resistance, by directly altering the behavior of adult male workers while opening up the possibility of employing women and children who were, by temperament, less inclined to resist:

The automaton, as capital, and because it is capital, is endowed, in the person of the capitalist, with intelligence and will; it is therefore animated by the longing to reduce to a minimum the resistance offered by that repellent yet elastic natural barrier, man. This resistance is moreover lessened by the lightness of machine work, and by the more pliant and docile character of the women and children employed on it. (Marx 1967[1867], p. 380)

The perceived impact of machine technology on the adult male worker was, indeed, manifold. Reducing worker skill and intelligence, relegating him to a mere
machine attendant, also reduced the worker's inclination to resist. Lightening the workload, physically, reduced his motivation to resist. Moreover, seemingly, the conversion of the workshop from a male domain to one of employee diversity further served to reduce his will to resist: "By the excessive addition of women and children to the ranks of the workers, machinery at last breaks down the resistance [by] which the male operatives in the manufacturing period continued to oppose the despotism of capital" (Marx 1967[1867], p. 380).

Machinery also tended to reduce the ability of workers to resist by controlling the pace of work. Part of this effect owed to the ability of machinery to systematically intensify work, in part by accelerating the speed (pace) of the machinery. Intensification of work was also achieved by increasing the number of machines that a single worker could attend at one time -- that is, according to Marx, "giving the workman more machines to tent" (Marx 1967[1867], p. 388).\(^5\)

Another reason for de-skilling labor was to separate workers emotionally, if not physically. Marx argued that, "As the number of co-operating labourers increases, so too does their resistance to the [legitimacy of the] domination of capital..." (Marx 1967[1867], p. 313). This resistance may have resulted because, in bringing large numbers of exploited workers together in one place, the capitalist created a situation in which the workers would be more aware of their common exploitation (stimulating their individual resolve to resist) and better able to conspire with each other against it.

\(^5\) Modern manufacturing management also attempts to increase the number of machines that one worker can attend to or, in Marx's word, "tent." This result is, for example, one of the features in "U-shaped work cells."
De-skilling, in the form of a minute division of labor that differentiates and isolates tasks while causing workers to specialize in one or a few of them, could make it appear that each worker "does his own thing." This result would accrue, in part, because the workers would have their own pre-assigned tasks, and because workers would not have to actively coordinate their actions or work in teams. This emotional separation, in part affected by a physical separation, would work to reduce class consciousness.

Moreover, the creation of specialized detail workers as individual production islands into themselves would, by reducing physical contact and communication, reduce the opportunities to initiate and coordinate acts of class resistance. The resultant monopolization of information by capitalists, and the restriction of access by workers to communications channels, may not only increase the power of the capitalist versus each individual worker, but also reduce the power potential of the collective worker.

The prior material in this section on Marx could be considered as his "microfoundations" of the de-skilling thesis. Marx (1967[1867]) also presented, if you will, "macrofoundations" that focused on the factory system as an integrated whole, one that required as seamless an effort as possible from the various factors of production. The different sub-processes of an aggregate production process for a given commodity would, ideally for the capitalist, "proceed uninterruptedly, simultaneously, and side-by-side [making] continuity, uniformity, regularity [and] order" as important as individual labor intensity (Marx 1967[1867], p. 326). A production system, which could be viewed to include suppliers not under direct control of one factory's owner/manager, was clearly
an integrated mechanical system that required the maintenance of a coordinated and predictable scheme of parallel and series work flows: "One of the essential conditions of the factory system...is certainty in the result, i.e., the production in a given time of a given quantity of commodities, or of a given useful effect" (Marx 1967[1867], p. 447). A lack of coordination and predictability would have adverse effects not only within the firm but also on its relationship with other firms (notably, customers and distributors), both of which would threaten the firm's competitiveness.

Marx argued that capitalists tried to promote the "training [of] human beings to renounce their desultory habits of work, and to identify themselves with the unvarying regularity of the complex automaton" (Marx 1967[1867], p. 399). However, that attitudinal change would not be enough even if accomplished. Individual variation among workers, the variability associated with craftwork, and other sources of random variation could radiate through the whole production system, affecting a magnified variability and uncertainty about the system's outcome. A firm within the system that created such instability would find its survival at risk.

Marx argued, therefore, that capitalists were driven to de-skill even docile workers in order to eliminate or minimize systematic variability and uncertainty, for the purpose of ensuring internal as well as system integrity and consistency. In this regard, Marx even envisioned Taylor's time and motion studies, and the consequent scientific division of tasks as opposed to the use of rules of thumb:

Technology also discovered the few main fundamental forms of motion, which, despite diversity of the instruments used, are necessarily taken by every productive action of the human body; just as the science of mechanics sees in the
most complicated machinery nothing but the continual repetition of the simple mechanical powers. (Marx 1967[1867], p. 457)

[Given this] the implements of labour...necessitate the substitution of natural forces for human force, and the conscious application of science, for rules of thumb. (Marx 1967[1867], p. 364)

One obvious use of modern, computer-based CIT that Marx would have envisioned would be an intensification of work by giving workmen more machines to "tent". Whether laid out in machining centers (many machines of the same kind controlled by one operator) or U-shaped work cells (one workman tends a number of different types of machines that perform different tasks in a given process), computer-based machinery has definitely increased the number of machines that a single operator can "tent". Moreover, computer-controlled production machinery wrests substantial control over the pace of work from the "machine tenter" and places it under managers who control the programming of the machines. Work intensity is increased while ability to resist is decreased. Furthermore, Marx would have not only noted CIT's power to automate work, increase intensity, and closely monitor individual workers, but also to control variability and increase the degree of seamlessness in operations both internally and externally. The reduction of set-up time and cost, and the reduction of slack where work passed from one work station to another, are particular effects that CIT has had within the firm. CIT also enhances interfirm linkages and coordination, enabling (for example) just-in-time production systems and electronic data transfer between buyers and suppliers. Here, the ability of information technology to exercise improved control over the pace of work would be a crucial function.
In a Marxian view of the world, CIT would not be used to increase access to communication channels and information among workers, but would be used to more closely monitor labor in order to strengthen control.

C. Mercantilism and the Foundations of the De-skilling Thesis

While Adam Smith is regarded as rendering the seminal exposition of the division of labor and its effects, the mercantilist writers clearly and explicitly dealt with the division of labor at both the societal level and the enterprise level. In contrast to Smith, the mercantilist writers had competition, not cooperation, being the essence of even the societal division of labor, creating a situation in which the ability of a dominant group (merchants) to exercise power over subordinate groups (direct producers) was deemed crucial to the attainment of an institution’s economic objective -- here, maximization of the surplus accumulated by a nation-state.

In the mercantilist thought, superior access to and monopoly control over market information affected the power of merchants. The de-skilling of international competitors as well as the nation’s own direct producers enabled the dominant merchants to convert the power of knowledge into economic surplus (wealth). Beginning with the mercantilists’ antagonist, Adam Smith, the essence of the societal or horizontal division of labor would shift to the implicit cooperation captured in the invisible hand mnemonic, and the societal division of labor would be associated with a skilling of the society. However, the mercantilists laid the foundations for the conflict, the search for power, and the de-skilling tendencies that would occur at the level of the workshop or vertical division of labor under industrial capitalism.
Sir William Petty, a pre-capitalist era writer, clearly established the mercantilist logic and agenda. Petty advanced an explicit and forceful view that production (labor) -- not trade -- is the underlying source of value and public wealth, as captured in his famous quote, "[T]hat Labour is the Father and active principle of Wealth, as Lands are the Mother" (Petty 1986[1662], p. 68). Such quotes undergird Cosmo Perotta’s argument that contrary to the belief that mercantilists viewed trade as the source of wealth, "During the whole pre-Smithean period economic writers never forgot that the basic cause of increased wealth was the growth of domestic production" (Perotta 1991, p. 382).

Anticipating Adam Smith’s emphasis on the limits to productivity imposed by the extent of the market, the mercantilist and other pre-Smithean writers stressed foreign trade as the antidote to the slow development of domestic markets which would constrain the efficiency-stimulating effects of the division of labor. Labor, and the efficiencies afforded by labor specialization in the production process, represented a necessary but not sufficient condition for a nation’s wealth. This wealth potential had to be converted to reality through the coordinating mechanism of international trade.

But trade would not automatically arise due to some natural tendency to truck, barter and exchange. Moreover, since all nations faced the dilemma of their limited domestic markets constraining the division of labor, mercantilists perceived international trade to be a competitive zero-sum game regarding the wealth of nations relative to other nations. The division of labor in both production and exchange was an economic
weapon, a primary source of international competitive advantage that would determine who derived the primary benefits made possible by the division of productive labor.

Petty, in analyzing the relative wealth of different nations, emphasized the importance of commercial power over production efficiencies, saying that:

"Those who have command of the Sea Trade, may Work at easier freight with more profit, than others at greater: for as Cloth must be cheaper made, when one Cards, another Spins, another Weaves, another Draws, another Dresses and Packs; than when all the Operations above-mentioned, were clumsily performed by the same hand; so those who command the Trade of Shipping, can build long slight ships for carrying Masts...And short ones for Lead... (Petty 1986[1662], p. 260)

Petty's aforementioned description of the division of labor in cloth production parallels that in Smith's pin factory, as does his description of the division of labor in watch manufacturing:

"In the making of a Watch, If one man shall make the wheels, another the Spring, another shall engrave the Dial-plate, and another shall make the cases, then the Watch will be better and cheaper, than if the whole Work be put on any one Man" (Petty 1986[1662], p. 473).

Petty, however, gave equal weight to the role of commerce, emphasizing a technological division of labor and specialization among ships, based on a variety of factors including product carried, value of commodities transported, nature of harbor called on, open sea versus inland waterway, and speed required to meet market competition. With regard to the last point about speed, Petty described "One sort of Vessels, and Rigging, where haste is requisite for the Maidenhead of a Market, another where 1/5 or 1/4 part of the time makes no difference" (Petty 1986[1662], p. 260).

Petty thus argued that specialization in distribution conferred competitive advantages in terms of (a) reducing the cost of business, and (b) increasing the
responsiveness of merchant enterprises to shifting market conditions. To the extent that the division of labor in production complemented a division of labor in exchange, such specialization conferred competitive advantage to a particular nation.

The importance attached to competitive advantages in exchange were clearly exposed in the reasons for why the Dutch, in particular, became so commercially successful vis a vis their neighboring countries. Petty argued that the specialization within the shipping business was deemed to be the principal cause:

And this I take to be the chief of several Reasons, why the Hollanders can go at less Freight than their Neighbours, viz. because they can afford a particular sort of Vessels for each particular Trade. I have shewn how Situation hath given them shipping and how shipping hath given them in effect all other Trade, and how Foreign Traffick must give them as much Manufacture as they can manage themselves, and as for the overplus, make the rest of the World but as Workmen to their Shops. (Petty 1986[1662], p. 260)

There were clearly natural advantages, such as Holland's location and its inland waterways, that gave a country and its economic agents a certain competitive advantage. But natural advantages would not suffice to maintain competitive superiority. The economies and operating advantages derived through distributional specialization, and resulting technological superiority, were the prime sources of competitive strength.

The importance of specialization in distribution is further evident from Petty's discussion of the division of labor in watchmaking. In that example of manufacture, the various steps were performed by different artisans: the watch maker was a buyer and assembler of finished component parts, not a vertically integrated manufacturer. A major source of competitive advantage for a nation arose when specialized but related production operations such as these agglomerated in certain geographical regions, in part
because of economies of scope in manufacturing and in part because of economies of scale in distribution:

And we also see that in Towns, and in the Streets of a great Town, where all the inhabitants are almost of one Trade, the Commodity peculiar to those places is made better and cheaper than elsewhere. Moreover, when all sorts of Manufactures are made in one place, there every Ship that goeth forth, can suddenly have its Loading of so many several Particulars and Species as the Port whereunto she is bound can take off. Again, when the several Manufactures are made in one place, and Shipped off in another, the Carriage, Postage, and Travelling-charges will Inhance the Price of such Manufacture...all which particulars tends to the greater Gain by such Foraignt Commerce. (Petty 1986[1690], pp. 473-4)

Production and commerce were viewed as related activities which were jointly responsible for the creation of wealth. Policy that would foster an efficiency-enhancing division of labor in each area would produce complementary competitive results for one nation versus others. However, the merchants, who made the sales, established the international communications channels, and accessed the world markets' information, were considered most important.

Since the success of the nation's merchants in the international trade competition was crucial to the nation's well-being, and since the merchant's competitive position was affected by economies of scale achievable through an extended division of labor in distribution, the merchants received monopoly privileges. Given the Us-Versus-Them view of the world of international trade, it was essentially proffered that what was good for the merchant was good for the nation. This argument provided the rationale for policies that favored the merchant class.

Philosophically, mercantilist doctrine painted economic conflict as a condition between nation-states. Between segments of one nation's society, there was essential
mutuality of interest, and national policy that seemed to favor the merchant class was really promulgated to maximize social welfare. There were, in reality, substantial intra-societal conflicts of interest, especially between the well-being of workers on one hand and the merchant class and the general public on the other.

Consistent with a labor de-skilling view, Petty suggested that such conflict be resolved through the use of power over labor via laws or policies that would "allow the Labourer but just wherewithal to live; for if you allow double, then he works with but half so much as he could have done, and otherwise would; which is a loss to the Publick of the fruit of so much labour" (Petty 1986[1662], p. 87).

Mercantilist writers, in general, favored approaches that would keep the wages of labor low. Perhaps the most extreme de-skilling position with regard to labor was advanced by Bernard Mandeville (1988[1714]), who argued that society's prosperity required that most of its citizens remain ignorant and poor. Low wages and the consequent risk of survival would motivate consistent effort by workers while keeping unit labor costs low. Worker ignorance would affect docility, hence control over workers, and keep workers from integrating forward and competing with merchants.

The economic power of those who possess asymmetric information, and the economic insecurity of individuals and organizations who are at an informational disadvantage, was made clear by Petty: "[Merchants] have more occasions than others to frequent all parts of the World, and to observe what is wanting or redundant every where, and what each People can do, and what they desire..." (Petty 1986[1690], p. 258). Petty argued that, as a consequence of this information, when one region was
suffering economic weakness, the merchants, but not the producers, could spot that condition and shift their attention to regions that were not so afflicted:

Whereas the Employment of other Men is confined to their own country, that of Seamen is free to the whole World; so as where trade may (as they call it) be dead here or there, now and then, it is certain that some where or other in the World, Trade is quick enough, and Provisions are always plentiful, the benefit whereof, those who command the Shipping enjoy, and they only. ( Petty 1986[1690], p. 259)

As a result, the wage-earning "husbandmen" of England and other countries, limited in their access to market information and in their ability to act upon market information vis a vis merchants, earned only about one-third that of merchants. While Petty did not discuss the prospect that merchants recognized this information-based source of economic power, and the possibility that merchants took steps to assure their informational monopoly, Adam Smith (1937[1776]) would later document the merchant strategies of the mercantilist era that attempted such control.

With regard to the workplace division of labor, Alessandro Roncaglia (1985) claims that Petty demonstrated that he had clearly understood the nature and importance of the division of labor. While he does not refer to it as such, Roncaglia captures the nature of Petty's de-skilling hypothesis as follows:

[It] is evident that the [policy] recommendations [of Petty] are based on a method of argument designed to support a particular objective, the maximization of labor time, which was essential for the new mode of production. We could say that Petty confronts the problem from the point of view of the active participants in the economic and political society of his time, from the point of view of those who organize production and participate in the distribution of the surplus. Although the surplus could be increased by means of improvement in the state of technology and in the organization of labor, not only within each single branch of productive activity, but also in the society considered as an integrated whole, it was also possible to increase it by reducing the expenditure on the labor force, considered as the means of production of the system which could be both
produced and reproduced. Petty considered the labor force as a commodity similar to any other commodity. Thus its costs of production had to be reduced to its minimum level in order to produce the maximum surplus, which was considered as the basic objective of society -- but of a society in which the laboring classes were not included. (Roncaglia 1985, p. 67)

Information or knowledge is also a crucial asset for Thomas Mun, the leading mercantilist figure. In the opening chapter of his primary treatise, Mun defines the requirements for "a perfect Merchant of Forraign Trade" (Mun 1986[1664], p. 1). While some of these requirements involved manual and cognitive skills, such as penmanship, navigation, and the speaking of foreign languages, most of them related to knowledge of market conditions and factors. The perfect merchant was to be fully knowledgeable of currency values and exchange rates, tariffs and other operative restrictions on free trade, supply and demand conditions in various markets, freight rates and other costs, and product characteristics and prices. In effect, Mun's perfect merchant was to possess the perfect knowledge, at least of past and present market conditions, that buyers and sellers would come to possess in the model of perfect competition.

Mun certainly did not develop a concept of perfect foresight, which is what perfect knowledge is all about in the model of perfectly competitive markets. Given the poorly or under-developed markets of his time, as well as the limited development of economic theory, perfect foresight would have been an unreasonable and unexpected assumption. But it would not be big leap from the concept of perfect knowledge of the past and present to perfect foresight.
The merchant's knowledge or information was critical to the creation and functioning of international markets in which the English, by dint of their superior knowledge, could affect a surplus of exports over imports and thereby increase England's wealth (treasure). That knowledge, in addition to providing a competitive advantage, would also enable the English to reduce the cost of imports and increase the profit margin on exports. This efficiency gain was exposed in an earlier work wherein Mun (1986[1664]) showed how the English merchants were able to reduce the cost of the Indian trade by cutting out the Turkish middlemen; the primary role of those middlemen had been the informational functions of locating suppliers and buyers, explaining customs duties and the like, etc.

While the political economy of Mun's mercantilist world was seemingly organized around the flow of products and the flow of specie, it was really organized around the flow of information. Economic power belonged to the merchant, who gathered, interpreted and utilized market information, and was thereby the organizing force in the market.

Knowledge, or information, has always been power. In a modern vein reminiscent of the mercantilist era, power in the developed economies of the late 1900s is shifting rapidly from producers to merchants (retailers and wholesale distributors). As Peter Drucker (1992) explains it, what underlies this shift of power is information, and the information technology that gathers, interprets and transmits real time information generated in the marketplace. The economy is again changing structure, away from being organized around the flows of things and money which provide indirect information
about markets, to being organized around the flow of information directly generated at
the point of final sale.

In a sense, the Turkish middlemen of Mun's time were de-skilled, not by an
information technology based on machines and electrical impulses but by an information
technology based on a superior organization of knowledge specialists, as represented by
the English merchant class. Today, individual merchant middlemen are being de-skilled
again, but now by electronic information technology: wholesalers are shrinking
dramatically in number, and wholesaling revenue is declining as a percentage of gross
domestic product, while distribution in general is becoming increasingly concentrated.

Just as many middle managers within firms (i.e., in the "vertical division of
labor") are being displaced by information technology, so are the middle men being
displaced in the societal (i.e., "horizontal") division of labor. However, the collective
wholesaler is probably being skilled, as the surviving entities take on more tasks and
upgrade their technology.

Mun's work contained no explicit reference to, or analysis of, the de-skilling
effect of the mercantilistic economic organization built around information. I believe,
however, that the observed effect on the Turkish middlemen is very significant to this
chapter. The story points out the critical role of information (and knowledge) in
economic activity, and the power accruing to those who gain control over information
and its utilization. Indicative of the importance of information as power in mercantilist
thought were the Tudor Industrial Codes, which prescribed strict standards and work
rules specifically relating to information via apprenticeship rules and labor mobility
(Tawney, 1962[1937]). In mercantilist thought, the control of labor meant controlling information as much as the means of production.

The mercantilist writers would probably view modern communications and information technology with ambivalence, in the sense that CIT might enhance or erode the power of either (i) the nation vis a vis other nations or (ii) the dominant merchant class in contrast to the subordinate producing class. On one hand, the technical specialization of information technology could parallel the specialization of ships chronicled by Petty, enhancing the competitive advantage of the "first movers" in the field. Differential advantage would accrue to a class of agents who could better exploit CIT, gaining some monopoly over information or a cost advantage in acquiring it. Government development and control of CIT might provide a national competitive advantage, as well as a favored position for certain economic classes within the nation.

On the other hand, access to low-cost CIT on the part of other nations and other agents (e.g., producers) could leapfrog the accumulated competitive strength of the merchant class that had specialized in information and distribution management.

While the effects of CIT might be unclear, the intent would not be. Mercantilists would view CIT as a tool to further the control of the dominant group(s) over the subordinate group(s).

D. Adam Smith on Competition and De-skilling

Smith argued in effect that the essence of the societal division of labor and international trade was cooperative, not competitive. Specialization in productive activity, combined with free exchange, would result in lower manufacturing costs,
increased quality, and expanded value or total output -- raising a nation’s wealth in terms of both the level and growth of consumer welfare. While the proclaimed productivity effects would certainly enhance the export competitiveness of a nation’s domestically-produced merchandise, one nation’s increasing wealth no longer necessarily resulted from disadvantaging other nations: trade became a positive sum game. And it was not necessary for one or more classes in a given society to be disadvantaged in order for the benefits of the division labor to enhance the national wealth. Given Smithian competition, the self-interested behavior of economic agents would promote cooperative outcomes internationally and intra-nationally.

Smith, of course, recognized that this economic cooperation was not the result of altruistic behavior by economic agents consciously setting aside their own self-interest and undertaking planned, cooperative efforts. Capitalists were interested only in maximum return on their investments:

The produce of industry is what it adds to the subject or material upon which it is employed. In proportion as the value of this produce is great or small, so will likewise the profits of the employer. But it is only for the sake of profit that any man employs a capital in support of industry; and he will always, therefore, endeavour to employ it in the support of that industry of which the produce may be of the greatest value... (Smith 1937[1776], p. 423)

Smithian social cooperation was the unintended result of individual self-interested behavior, the division of labor, and the leavening effect of competition in a system of perfect liberty. Such beneficent outcomes were by no means automatic. Imperfections in competition (one being the existence and use of political power, especially by merchants and "master manufacturers") existed, and they somewhat frustrated the society’s pursuit of greater wealth and happiness.
Individual and class conflicts were very real for Smith, as was the existence and use of political power to resolve conflicts, though such conflict and power issues were addressed at the level of the societal division of labor, not within specific workshops. Control over workers and the labor process was a goal of capitalist "masters", but, to Smith, the primary battleground was the field of politics proper, not the individual workshop. Smith focused on the macro-political exercise of power used, for example, to place restrictions on trade, to establish/maintain monopoly positions for certain trading companies, or to prevent workers from combining while not prohibiting such combinations among capitalists. He saw these restrictions as limiting the power of self-interest to direct economic resources into the applications that would induce maximum wealth for the society. The economic inefficiencies within the firm, which RPE sees as caused by the capitalist struggle for power over labor, were, for Smith, created within the society by the merchants' struggle for power (control) over the other economic segments of the society. Smith, therefore, dealt very little with any policy regarding the micro-political struggles between labor and capitalist managers in the workshop.

Control over labor and the labor process, based on power resources such as asymmetric information/knowledge or the de-skilling effect of automation, is not made an explicit and coherent issue by Smith. In contrast to Marx, for whom the ability of capitalist management to increase the intensity or duration of work would affect the profit of capital, day-to-day workshop management was not a primary determinant of profit for Smith:

The profits of stock, it may perhaps be thought, are only a different name for the wages of inspection and direction. They are, however, altogether different, are
regulated by quite sufficient principles, and bear no proportion to the quantity, the hardship, or the ingenuity of this supposed labor of inspection and direction. (Smith 1937[1776], p. 48)

While Smith recognized that conflict did exist between labor and capital, and that capitalists would try to disadvantage workers in the absence of procedures that could assure a system of perfect liberty, one would not expect that he would have explicitly theorized and emphasized a result (systematic de-skilling) antithetical to his basic system and purpose. Given that "the world of Adam Smith has been called a world of atomistic competition; a world in which no agent of the productive mechanism, on the side of labor or capital, was powerful enough to interfere with or resist the pressure of competition" (Robert Heilbronner 1986a, p. 58), a de-skilling thesis could be dismissed on the basis that capitalists simply did not have the power to impress it on labor. Nonetheless, the individual self-interest of "masters", the existence and extension of the division of labor as part of Smith’s natural order, and the negative effects of the division of labor on the workers added up to a conflicting vision which could spell de-skilling.

Of course, Smith’s (1937[1776]) work is well-known for contradictory views and evidence, and such contradiction is apparent in Smith’s discussions of many things that at first appear to have only beneficial effects, but which, on other reading, pose threats to certain groups, especially workers. For example, take machinery. Smith argued, in general, that machines were a positive, productivity-enhancing result, as well as an enabler, of the division of labor. Often the inventions and applications of highly-focused workmen, machines reduced the difficulty, and enabled a speedier pace, of their own work. Smith made no explicit point of machinery and capitalist investment therein being
a power play intended to enable or enhance the industrial capitalist’s control over resistant workers. Machinery was, simply, the result of the natural search for greater productivity.

One way in which higher productivity could accrue was by increasing the quantity of work that a fixed number of laborers could accomplish. Another way was by enabling a fixed number of workers to yield the same output with simpler and less expensive machinery. Regardless of the manner, Smith argued that such productivity results would not create wide-spread unemployment, whether through the substitution of machines for men or the down-sizing of given establishments:

In manufactures the same number of hands, assisted with the best machinery, will work up a much greater quantity of goods than with more imperfect instruments of trade. The expence which is properly laid out...is always repaid with great profit, and increases the annual produce by a much greater value than that of the support which such improvement requires...A certain quantity of materials, and labour...are thus diverted to another employment. The undertaker of some great manufactory who employs a thousand a-year in the maintenance of his machinery, if he can reduce the expence to five hundred, will naturally employ the other five hundred in purchasing an additional quantity of materials to be wrought up by an additional number of workmen. (Smith 1937[1776], pp. 271-2)

While an increased demand for labor implied the risk of ever-higher wages, squeezing profits and curtailing economic development, that threat was mitigated by the increase in population fostered by higher wages: enterprise managers would not have to pro-actively control the labor process so as to reduce unit labor costs or divert surplus from wages to profits.

In spite of this basically up-beat assessment regarding the impact of the division of labor and machinery, the de-skilling downside that permeated his work is captured in the following passage:
The quantity of materials which the same number of people can work up, increases in a great proportion as labour becomes more and more subdivided; and as the operations of each workman are gradually reduced to a greater degree of simplicity, a variety of new machines can be invented for facilitating and abridging those operations. (Smith 1937[1776], p. 260)

Obviously, Smith views this "vertical" division of labor as a process which de-skills labor by reducing the skill needed to perform its increasingly simplified task(s), resulting in work intensification as well as the possible displacement by inanimate physical capital. This tendency would be most pronounced in manufacturing, where labor "is capable of being more subdivided, and the labour of each workman reduced to a greater simplicity of operation, than that of farmers and country labourers..." (Smith 1937[1776], p. 641).

Smith (1937[1776]) clearly believed that an advancing division of labor de-skills when he posited that, as a result of the less advanced division of labor in the countryside, the country folk were more intelligent, as well as more ethical and more courageous, than the city workers. In this sense, Smith advanced a clear contradiction in capitalism, much like Marx. While the division of labor increased productivity in the workshop, it also degraded individuals as both workers (to the detriment of the firm as well as the worker) and citizens (to the detriment of a democratic nation).

J.C.L. DeSismondi (1966[1815]), who's goal it was to update Adam Smith, made the aforementioned point about the cost to society in moving terms. He prefaced his comments by noting that reducing the whole of a worker's activity to a simple operation would greatly increase the individual's precision and speed, and that the division of labor would result in important technical advances, but the division of labor would degrade
man's intelligence even as it caused gains in the power of producing wealth. DeSismondi argued that:

It is by the variety of its operations that our soul is unfolded; it is to procure citizens that a nation wishes to have men, not to procure machines fit for operations a little more complicated than those performed by fire or water...More lace, more pins, more threads, and cloth of cotton or silk, are the fruit of this great division of labor; but how dearly have we purchased them, if it is by this moral sacrifice of so many millions of human beings! (DeSismondi 1966[1815], p. 65)

For both Smith and DeSismondi, economic and mechanical advances thus combined to extend the division of labor, and reduce most work to simple and repetitive tasks. The simplicity of work, though a natural outcome, de-skilled labor. The exercise of individual intelligence and creativity was stultified, leaving the bulk of workers, in the famous phraseology of Smith, "as stupid and ignorant as it is possible for a human creature to become" (Smith 1937[1776], p. 734).

The de-skilling of individual workers is particularly potent when the aggregate production process nears perfection and technological change ceases. This de-skilling accrues not (or, at least, not simply) because of the fragmentation of tasks resulting from the progression of the division of labor but, rather, because of the cessation of technological change. At this advanced stage of economic development, the individual worker becomes stupid and ignorant because the few simple operations he is performing are "always the same, or very nearly the same [so he] has no occasion to exert his understanding, or to exercise his invention in finding out expedients for removing difficulties which never occur" (Smith 1937[1776], p. 734).
Note how closely this theme advanced by Smith parallels Braverman’s (1974) idea about what de-skilling represents. It is not task simplification so much as it is the almost total elimination of creative thinking about work and resultant innovation. Moreover, Braverman (1974) saw that economic growth and technological change could, for awhile, raise skill levels, but in a longer run "stationary state" the effect would be that workers get de-skilled.  

Contradictions within Smith’s (1937[1776]) work also arose with regard to the control by capitalists over workers and the conception of work. In many ways, Smith’s analysis indicated that de-skilling in the sense of the separation of conception from execution was a minor phenomenon, as many factors kept workers involved with conception. For example, in Smith’s system of natural liberty, unencumbered by the extra-market restrictions of mercantilist policy, both labor and capital were conceived of as moving to where the highest returns were possible. At times, this meant that workers would become proprietors and, therefore, would control both the conception and execution of work.

Moreover, with regard to Smith’s theoretical system, the organization (conception) of work in the establishment itself was seemingly controlled by the workmen. Smith’s pin factory and other shops were, as in the neoclassical theory of productions, naturally driven towards adoption of the most efficient division of labor. Such a division would

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6 Braverman (1974) does not use the term "stationary state" but does describe an analogous state in which growth and innovation have slowed down.
imply specialization among shop workers, but the workers themselves were motivated to organize work in that manner.

Furthermore, Smith (1937[1776]) focused on growth and development, not static equilibrium, and there were no generally stable production functions in his system. Each manufacturer had his own techniques and often his own specialized tools. Continual shifts in production functions characterized Smith's system. Given the free movement of workers and their continual development of tools to improve their productivity, every evidence was given that workers engaged in the conception of work.

However, if one investigates the primary activity of the capitalists, and recognizes that few workers were actually engaged in proprietorships, a de-skilling dynamic with regard to the separation and execution is visible. The primary activity of Smith's (1937[1776]) industrial capitalists was across-market competition, moving capital in pursuit of the highest profit: they allocated what was then mostly circulating capital to product-market opportunities. There is no evidence that workers participated in such decisions. Workers as wage-labor did not make important strategic decisions such as selecting target markets, establishing quality standards, or setting output objectives. Mostly, labor simply responded to wage offers and incentives, and executed differentiated tasks in the shop:

It is the stock (of proprietors) that is employed for the sake of profit, which puts into motion the greater part of the useful labour of every society. The plans and projects of the employers of stock regulate and direct all the most important operations of labour, and profit is the end proposed by all those plans and projects. (Smith 1937[1776], p. 249)
Prior to the development of the "factory system", workers themselves put their labor into motion. The workers made the strategic decisions that capitalists began to take over in Smith's system. In a very real sense, then, workers began to lose control over the important conceptual decisions about work. Capitalists determined what work would be done, and workers just decided whether to sign on or not. This is consistent with the separation of the conception of work from the execution of work, and the control of work by capitalists, inherent in the de-skilling thesis. Additionally, as the division of labor extended and specialization increased, other elements of control over conceptual tasks continued to disappear from the realm of the common laborer. For example, technological research and development vested in "philosophers" who invented the machines that enabled major re-organization in the patterns of work.

Smith clearly saw that the division of labor was de-skilling in the sense that the individual worker loses a knowledge of and control over the process in which he is engaged, and drops out of the realm of those who organize and direct work:

[The laborer's] condition leaves him no time to receive the necessary information, and his education and habits are commonly such as to render him unfit to judge even though he was fully informed...his voice is little heard and less regarded, except [when] supported by his employers, not for his, but for their own particular purposes. (Smith 1937[1776], p. 246)

Rather obviously, to the extent that employee participation occurs in Smith's framework, it fits into the Braverman (1974) mold: capitalists allow it if and when it furthers their ends. A visible hand attempts to guide the workers in the firm, and the brain in control of that hand must possess the coordinative knowledge that the individual workers lose as
the division of labor breaks down crafts. That brain is the brain of the capitalist and his agent-managers.

Again, what happens to workers and the organization of work in the factory is not the result of an overt political struggle for control in the workshop. It is the result of the natural development of capitalism, in which society’s productivity is advanced. Moreover, Smith (1937[1776]) developed the crucial distinction between the skilling of the "collective worker" and the de-skilling of the individual workers which was later emphasized by Marx (1967[1867]).

How would Smith have responded to the potentialities of communication and information technology? One direction can be derived from Smith’s view of "productive" effort, described as follows:

There is one sort of labour which adds to the value of the subject on which it is bestowed: there is another which has no such effect. The former, as it produces a value, may be called productive; the latter, unproductive labour. (Smith 1937[1776], p. 314)

While Smith does offer different definitions of value and productive labor, it was clear that "value-added", as we think of it today, was viewed as crucial to economic competitiveness and wealth. A more productive economy was one that created more value-added relative to its level of inputs, and minimized economic waste (anything that does not add value to a product).

Two major benefits of the extensive division of labor in the factory, for Smith (1937[1776]), were the increase in manual dexterity (not just to maximize cycle time, or throughput, but also to minimize product variation) and to reduce set-up, or switch-over, time and cost. Since CIT allows automation that increases worker accuracy and greatly
reduces set-up costs, it would relieve some pressure on the division of labor and its de-skilling consequences.

Additionally, Smith might have envisioned CIT as permitting greater economic coordination through free markets, and less through hierarchies. He would have undoubtedly approved of this outcome, in part because he perceived the discipline of the market to be more effective (as well as fairer and less intrusive) than corporate management discipline:

The pretence that corporations are necessary for the better government of the trade, is without any foundation. The real and effectual discipline which is exercised over a workman, is not that of his corporation, but that of his customers. It is the fear of losing their employment which restrains his frauds and corrects his negligence. (Smith 1937[1776], p. 129)

Moreover, open communication coupled with a freedom from political interference in economic affairs was a specifically desirable combination for Smith. The importance of these two factors was highlighted by Smith when he claimed that periods of famine and scarcity were the result of government interference in the market for corn:

In an extensive corn country, between all the different parts of which there is a free commerce and communication, the scarcity occasioned by the most unfavourable seasons can never be so great as to produce a famine... (Smith 1937[1776], p. 493)

Smith would have certainly found sympathy with Gavin Reid’s (1989) argument that effective communications among economic agents is required in order to reap the benefits of the division of labor. Reid offers that high communication costs and efforts to monopolize access to market information create conflict, rather than fostering the cooperative outcomes that result from the coordination among specialized economic resources. Modern CIT would, by distributing information widely and at low cost, break
down monopoly, reduce conflict, facilitate market transactions and, hence, improve the efficient division of labor.

A further conjecture regarding Smith’s assessment of modern CIT relates to its impact on firm size and flexibility. Smith’s (1937[1776]) theoretical economy was, again, one populated by numerous, small non-monopolies. Employing mostly-circulating capital plus a few multi-purpose tools, these firms exhibited high degrees of flexibility. However, the development of very large corporations, and the concentration of economic assets and power in those firms, would come to challenge the Smithian model of perfect liberty, and create an asymmetric power relationship between capital and labor -- a power advantage that capitalists could wield to de-skill workers. Heilbrunner described this post-Smith change in the nature of enterprises, in developed economies, that contradicted the nature of Smithian competition:

"One difference is that economic activity in the modern world is in the hands of high-technology, large-scale businesses...The quick adaption of supply to demand, and the immediate pull of personal interest that are necessary for Smith’s market mechanism to work, do not appear in vast managerial entities, saddled with expensive fixed equipment and forced to plan months or even years in advance." (Heilbrunner 1986b, p. 152)

The investment by firms in expensive, specialized, and illiquid though not fully amortized capital creates a pressure to try to de-skill labor. As competition puts downward pressure on prices (and, when the product life cycle matures, downward pressure on revenue), it stimulates an effort to reduce production costs. However, fixed-use and fixed-cost capital limits economizing on that resource or redirecting its application. Labor cost reduction remains as the possible and necessary palliative for maintaining profitability under this scenario. But CIT, along with flexible automation
technology, seem to be capable of re-establishing those elements deemed necessary for Smith's "high flex" market mechanism to work, weakening the power upon which to mount a technological de-skilling effort and the necessity for doing so. The quick adaption of supply to demand and the avoidance of capital inflexibility are what the CIT and flexible automation are arguably all about.

Perhaps the best analogy of organizations spawned by modern CIT and organizations of Smith's day is the "virtual corporation" (which, in the legal sense, may not be a corporation at all). Many, perhaps most, of the firms in Smith's time were small scale virtual corporations. Virtual corporations are created to secure certain market opportunities, and are dissolved/reconstructed as the old opportunities pass and new ones arise. Capital does not dissolve: it undergoes a metamorphosis. "Masters" don't disappear into the working class, or, worse, the reserve army of the unemployed: they move on, into the next virtuality. This would represent a major change in social dynamics, if capitalists do not have to struggle for survival by perpetuating their firms in fixed markets with immutable and sunk capital.

Additionally, CIT would have a potential impact on the level of trust between economic agents, and trust is an important issue for Smith as well as latter luminaries like Mill and Marshall. For Smith, trust placed in a person affected the wages of laborers and the salaries of managers, and the willingness of one party to transact business with another: "The wages of labour vary according to the small or great trust which must be reposed in the workman" (Smith 1937[1776], p. 185). Furthermore:

In a great many works, almost the whole labour of this kind (management) is committed to some principal clerk. His wages properly express the value of this
labour of inspection and direction...Though in setting them some regard is had commonly, not only to his labour, but to the trust which is reposed in him. (Smith 1937[1776], p. 49)

Trust is an asset which benefits individuals and the society. Smith’s system of atomistic competition and market exchange implies an essential trust among the various parties, otherwise it would break down. (As in modern organizational economics, contracting may be seen as incomplete.) But, unlike other skills and traits, trust is not subject to a cooperative division of labor. If trust is a specialized skill or asset, possessed by some but not by others, the essence of the division of labor switches back to competitive, and economic actors focus on acquiring power to counteract the uncertain threat posed by agents who are not trustworthy. To the extent that CIT provides accurate, timely information that improves the monitoring of trust, it will enhance market exchange and reduce the need for active control. As such, CIT is consistent with the framework of Smith, and would reduce the drive for power by certain market participants over other participants.

Finally, in regard to Smith, computer technology would ameliorate one of the conditions driving the division of labor: set-up costs. For Smith, set-up costs involved "the time commonly lost in passing from one sort of work to another [caused by the need for workers to physically move from job to job as well as] the habit of sauntering and of indolent careless application [when the workman] is obliged to change his work and tools" (Smith 1937[1776], p .8). As applied today in CNC machine tools, CAD-CAM systems, and other technology, CIT greatly reduces set-up time and expense, restricting the degree to which the division of labor in the factory must be carried. Such technology
has enabled job enrichment and job enhancement schemes, without reducing worker productivity by increasing set-up costs.

E. From Ricardo to Marx: the Ascendancy of Conflict Between Labor and Capital in the Workshop

For the writers that followed Smith chronologically, and can be regarded among those that Marx (1967[1776]) labelled (along with Smith) the classical political economists, technological de-skilling became embedded in the "Machinery Question."

The de-skilling dynamic is nicely described by Maxine Berg:

The economic cycle of a cotton industry rapidly becoming mechanized...rippled outwards to affect the old artisan trades. The trades, too, were now pursued by the rationalization of production and the standardisation of the product. An ever expanding supply of labour made its contribution, making possible the intensification of the division of labour and the reduction of skill. But already manifest, and dwarfing in potential significance these other forms which technical change in an industry might take, was the ultimate, the most exciting and the most threatening development of all - the replacement of man by machine. (Berg 1980, p. 2)

With respect to the effects of machinery, many writers offered a "displacement thesis" rather than a de-skilling thesis. This is the case with David Ricardo (1981[1821]), who demonstrated a distinct ambivalence about the effects of machinery on labor. Initially, Ricardo argued that the development and employment of machinery frequently resulted in technological substitution and, at least in the short run, structural unemployment, stating that "I am convinced, that the substitution of machinery for human labour, is often very injurious to the interests of the class of labourers" (Ricardo 1981[1821], p. 388). There is no hint of any qualification as to the effect of machinery in the preceding statement, but Ricardo seemingly dilutes his position, stating that:
I have been supposing, that improved machinery is suddenly discovered, and extensively used; but the truth is, that these discoveries are gradual, and rather operate in determining the employment of capital which is saved and accumulated, than in diverting capital from its actual employment. (Ricardo 1981[1821], p. 395)

In the face of a clear and theoretically-supportable threat by machinery to workers, a wishful and non-grounded theme of gradualism was offered. A similar approach was pursued by Ure, who was unequivocal about the upside of machinery:

Fortunately... the improvements in machinery are gradual. Hence the fall in the price of the manufactured product is gradual, and the extension in the demand for it, arising from the decrease in price, bringing it continually within the range of the means of greater numbers of consumers, is likewise gradual, and keeps up the demand for adult labour, and thus counteracts the effect of the improvements of machinery which operate to displace it. (Ure 1967, p. 322)

Still, Ricardo (1981[1821]) was highly suspect of the ability of machinery to create labor demand that would absorb the workers it displaced. He evidenced this doubt when he considered the relative displacement of labor by capital as the economy grows. Ricardo argued that economic growth would cause an increase in wages and, as a result, increases in capital would cause less than proportional increases in the demand for labor. Additional doubt was expressed when, despite his concerns, Ricardo did not try to discourage the use of machinery, in part because he believed that to do so would encourage the flight of capital to other countries, with an even more serious impact on the employment of domestic labor.

This ability of machinery to offset worker displacement by increasing the aggregate demand for labor was later used by Robert Torrens, who tried to dispel

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The wage increases would be due to the diminishing marginal productivity of land and the resultant increase in food.
Ricardo’s doubts by arguing that machinery enabled a more extensive and more intensive cultivation of land, restraining wage pressures:

He [Ricardo] contends, in the third addition, that the introduction of machinery occasions a permanent diminution in the demand for labour. This doctrine is altogether incorrect... Even when we concede to Mr. Ricardo that which never yet occurred in practice, namely, the construction of machinery suspends the production of necessaries, still it remains strictly demonstrable, that the introduction of machinery, after occasioning a temporary diminution, leads to a permanent increase in the demand for labour. (Torrens 1965[1821], pp. xi-xii)

In the same vein as Ricardo (in part), Torrens and Ure, Mill (1987[1848]) argued that while machinery can displace labor with negative consequences for workers, such injury is relatively rare because of the gradual pace of technological innovation. Marshall (1982[1920]) concurred in this as well.

In addition to the arguments about the gradual pace of the development of machinery and the stimulus that machine technology had on the demand for labor, a skill upgrading hypothesis was sometimes offered or at least hinted at. For example, Babbage felt that:

The skill called into action in building the new factories, in constructing the new machinery, in making steam engines to drive it, and in devising improvements in the structure of the looms, as well as in regulating the economy of the establishment, is of a much higher order than that which it had assisted in superseding; and if we possessed any means of measuring this, it would probably be found larger in amount. (Babbage 1986[1835], p. 339)

Marshall, while not making skill upgrading the general result of advances in machine technology, used watchmaking in the United States as an example of at least a partial skill upgrading dynamic:

In fact the machinery is becoming every year more and more automatic, and is getting to require less and less assistance from the human hand. But the more
delicate the machine's power, the greater is the judgment and carefulness which is called for from those who see after it. (Marshall 1982[1920], p. 214)

Ure also ascribed a skilling effect (based on the substitution of mental for manual skills), resultant higher wages, and the benefits of job enlargement to the expanded use of machinery and automation:

As his business consists in tending the work of a well-regulated mechanism, he can learn it in a short period; and when he transfers his services from one machine to another, he varies his task, and enlarges his views, by thinking on those general combinations which result from his and his companions' labours. Thus, that cramping of the faculties, the narrowing of the mind, the stunting of the frame, which were ascribed, and not unjustly, by moral writers, to the division of labour, cannot, in common circumstances, occur under the equitable distribution of industry. How superior in vigour and intelligence are the factory mechanics in Lancashire, where the latter system of labour prevails, to the handicraft artisans of London...The one set is familiar with almost every physico-mechanical combination, while the other seldom knows anything beyond the pin-head sphere of his daily task. (Ure 1967[1835], pp. 22-3)

However, quite contrary to Babbage's skilling concept and his own was Ure's vision of a fully automated factory that would establish complete control over the production process by the capitalist. Ure was intent on removing what he saw as the capriciousness of handicraft production. According to Ure:

When Adam Smith wrote his immortal elements of economics, automatic machinery being hardly known, he was properly led to regard the division of labour as the grand principle of manufacturing improvement...In fact, the division, or rather the adaption of labour to the different talents of men, is little thought of in factory employment. On the contrary, whenever a process requires peculiar dexterity and steadiness of hand, it is withdrawn as soon as possible from the cunning workman, who is prone to irregularities of many kinds, and it is placed in charge of a peculiar mechanism, so self-regulating, that a child may superintend it...The principle of the factory system then is, to substitute mechanical science for hand skill, and the partition of a process into its essential constituents, for the division or graduation of labour among artisans...on the automatic plan, skilled labour gets progressively superseded, and will eventually be replaced by mere overlookers of machines. (Ure 1967[1835], pp. 19-20)
Here, again, we see the theme of de-skilling related to the goal of reducing variability and uncertainty in production, and of developing greater control over and predictability regarding the process. This goal was critical to survival in the new era of international competitiveness, spawned by the industrial revolution and every bit as intense as in the prior era of commercial capitalism. Ure expressed this rivalry:

Nations convinced at length that war is always a losing game, have converted their swords and muskets into factory implements, and now contend with each other in the bloodless but still formidable strife of trade. They no longer send troops to fight on distant fields, but fabrics to drive before them those old adversaries in arms, and to take possession of a foreign mart. To impair the resources of a rival at home, by underselling his wares abroad, is the new belligerent system, in pursuance of which every nerve and sinew of the people are put upon the strain. (Ure 1967[1835], first page of Preface)

Even though some skill upgrading might have been predicated on advanced technology, de-skilling due to the demands of competition is clearly the preponderant effect for Ure:

It is, in fact, the constant aim and tendency of every improvement in machinery to supercede human labour altogether, or to diminish its cost, by substituting the industry of women and children for that of men; or that of ordinary labourers, for trained artisans. (Ure 1967[1835], p. 23)

Increased labor productivity, and the substitution of relatively unskilled labor for relatively skilled labor, are critical and repeated themes of Ure, who viewed automated manufacturing technology as crucial to maintaining the competitiveness of Great Britain’s industry. But Ure was concerned, as was Nassau Senior (1972[1837]), about the threats of unionism as well as adverse public opinion about the effects of machinery. In an effort to mute such threats, Ure argued that, in addition to its efficiency effects,
automation had many intended salutary effects, including positive effects on the health and comfort of factory operatives, adding that:

..on the equalization plan of self-acting machines, the operative needs to call his faculties only into agreeable exercise; he is seldom harassed with anxiety or fatigue, and may find many leisure moments for either amusement or meditation, without detriment to his master’s interests or his own. (Ure 1967[1835], p. 22)

Similarly, Marshall believed that a great many occupations had negative consequences for workers, and technological change would relieve these conditions in favor of positive attributes:

It displaces a great many operatives who have indeed acquired a very high and specialized manual skill, but who lived sedentary lives, straining their eyesight...and finding in their work very little scope for any faculty except a mere command over the use of their fingers...But the machine is intricate and costly, and the person who minds it must have an intelligence, and an energetic sense of responsibility which go a long way towards making a fine character. (Marshall 1982[1920], p. 214)

The important point in all of this is that, whether the threat of machinery was viewed as one of mere displacement or more expansive de-skilling, the rationale regarding the threat was well developed. But then, a hopeful and wishful spin was put on it, and the threat was glossed over without a cogent theoretical basis for doing so. Much the same approach would be taken with regard to the degradation of operational skills and the separation of conception from execution associated with the workshop division of labor. The possibility that, within capitalism, technological change could result in a re-skilling of the worker was problematic, as reflected in Marshall’s implicitly equivocal question, “Is it possible to educate gradually among the great mass of workers a new capacity for the higher kinds of work?” (Marshall 1982[1920], p. 35).
Mill's position on the latter point is characteristic of the conclusions of most of the major historians of thought excepting Marx. Mill (1987[1848]) averred that capitalists and workers had inherently compatible interests, and that cooperative relations between workers and employers were feasible and the natural state of affairs. Competition, in a capitalist society, was not necessarily the cause of misery and degradation of the working class, though such may have been the result in his time. But, like Frederick Taylor (1967[1911]), Mill observed that cooperative spirit and behavior between capitalists and laborers were uncommon at the time, at least in England. He further argued that the belief held by the working classes, that the interests of the employers were opposite to their own was not unjustified.

Marshall, too, had a vision in which the essence of economic activity and the division of labor was cooperation. In this sense, Marshall argued that, "The co-operation of capital and labour is as essential as that of the spinner of yarn and the weaver of cloth: there is a little priority on the part of the spinner; but it gives him no pre-eminence" (Marshall 1982[1920], p. 452).

Nassau Senior is, arguably, the first economist to have developed a coherent, unambiguous de-skilling thesis in contrast to a displacement thesis. Senior really got at the core of Braverman's (1974) de-skilling concept, which involves stripping the worker of the knowledge required to master the labor process and adjust to changing conditions therein. Senior discussed the "mental and inanimate capital" of workers, or what we today would call human capital, as well as manual skills. To Senior, mental capital was the most highly flexible and adaptive type of capital, enabling the individual who
possessed it in large and diverse amounts to shift occupations if and as labor market conditions changed:

There is a considerable resemblance in this respect (to circulating versus fixed capital) between mental and inanimate capital. Probity, industry, judgment, elementary knowledge, and the other moral and intellectual habits and acquirements to which we give the name of a "good education", are a kind of mental raw material, of which the destination can be altered at pleasure. The peculiar knowledge and habits of a given profession are like a steam-engine or water-mill, of comparatively small value for any but their appropriate purposes. In general, however, mental capital is the more transferable of the two, and becomes more and more so the more exclusively mental it is. The professional knowledge and dexterity of a weaver would be of little use to him in any other employment. A lawyer or a physician, prevented by circumstances from continuing to practise, would find the information and intellectual habits which he had acquired in his former profession of considerable advantage in any new one. (Senior 1965[1836], p. 220)

Clearly, Senior considered mental skills to be the really important skills, and the ones on which the worker could base any sense of real job security. Mill looked at the role that labor plays in the production process and concurred with Senior's assessment:

If we examine any other case of what is called the action of man upon nature, we shall find in like manner that the powers of nature...do all the work, when once objects are put in the right position. This one operation, of putting things into fit places to be acted upon by their own internal forces, and by those residing in other natural objects, is all that man does, or can do, with matter. He only moves one thing to or from another...He has no other means of acting upon matter than by moving it.... Labour, then, in the physical world, is always and solely employed in putting objects in motion; the properties of matter, the laws of nature, do the rest. The skill and ingenuity of human beings are chiefly exercised in discovering movements, practicable by their powers, and capable of bringing about the effects they desire. (Mill 1987[1848], p. 25)

Rather obviously, Senior believed that it was the division of labor in industrial enterprises that de-skilled, while the societal division of labor created higher skills. The skills that factory workers did develop became a less transferable form of human capital - less transferrable between industries as well as between functional areas of work.
Workers would be at serious risk, according to Senior's vision, if demand shifted to business areas requiring different sets of tasks:

The difficulty with which labour is transferred from one occupation to another is the principal evil of a high stage of civilization. It exists in proportion to the division of labour [wherein] two circumstances combine to render narrower and narrower the field within which a given individual can be profitably employed. In the first place the operations in which he is engaged become fewer and fewer [and] in the second place, the skill which the division of labor gives to each class of artificers generally prevents whatever particular dexterity an individual may have from being of any value in a business to which he has not been brought up. (Senior 1965[1836], p. 217)

As a case in point, Senior cited the clock and watch tool and movement makers in England, individuals who were considered to be the most skilled of workers. These individuals used tools similar to other industries, in particular the manufacturing of cotton machinery. However, Senior argued, "When those men come to be employed in making cotton machines, we find that they have almost as much to learn as if they had never learnt any working in metal at all. We found them quite insufficient to do any ordinary filing and turning" (Senior 1965[1836], p.218). Nearly a century later, Marshall (1982[1920]) held a similar view that labor engaged in the manufacture of Swiss watches required a highly specialized manual skill but very little judgment.

Senior continued his discussion of the effects of the progressive division of labor by identifying the conflict created by this inflexible specialization:

But few principles are more clearly established than that, ceteris paribus, the productiveness of labour is in proportion to its sub-division, and that, ceteris paribus, in proportion to that subdivision must be the occasional suffering from want of employment. (Senior 1965[1836], p. 219)

Other nineteenth century writers reflected this view, concluding that as the division of labor increased so did the frequency and duration of unemployment. Mill,
for example, commented that, "The manufacturer and his work people lose the benefit of the skill and knowledge which they had acquired in the particular business, and which can only be partially useful to them in any other" (Mill 1987[1848], p. 80). De Sismondi also concurred, stating that:

A workman detached from a great manufactory, where, thanks to the division of labor, he filled, perhaps with superior skill, one single function, is like one of the wheels beside which he worked, of no value detached from the machine. (DeSismondi 1966[1815], p. 66)

Marshall, however, believed that the machinery being developed in his epoch was more general purpose in nature, and that this machinery was used in essentially the same configuration in many trades, so that in spite of "a constantly increasing sub-division of labour, many of the lines of division between trades which are nominally distinct are becoming narrower and less difficult to be passed" (Marshall 1982[1920], p. 214). Unlike Senior, DeSismondi and Mill before him, Marshall did not feel that workers' skills were becoming so specialized that transferability to other industries was impossible. Moreover, the pure manual and repetitive skills that machinery could take over were seen as declining in importance:

Some kinds of manual work require long-continued practice in one set of operations, but these cases are not very common, and they are becoming rarer: for machinery is constantly taking over work that requires manual skill of this kind. (Marshall 1982[1920], p. 171)

Prior to Senior, the development of machinery had been treated as the result of the particular arrangements of work: the extension of the division of labor and specialization led to the development of tools, and the integration of tools into machines, as means of facilitating and replacing human labor. Senior, however, saw a two-way
causation between the division of labor and the invention of tools. The invention of a new mechanical instrument would lead to an increased division of labor, just as an increase in the division of labor (which Senior preferred to call a "division of production") tended to yield new inventions of instruments. Moreover, Senior seemed to be clear in his novel view regarding the dominant line of causation: "Perhaps it would be a nearer approach to the truth, instead of attributing the use of instruments to the division of labor, we were to attribute the division of labor to the use of instruments" (Senior 1972[1837], p. 227).

Senior also introduced the concept that management may pursue a de-skilling strategy in an effort to control workers. The need for control surfaces in a story about a plate glass company that had existed for nearly one hundred years, maintaining a high rate of profit while fending off numerous competitive thrusts. Senior began by crediting the firm’s longevity and profitability to the firm’s work force and its tacit knowledge:

There were about 150 people employed in its halls and furnaces and polishing rooms, whose grandfathers...had been the servants of the company. They possessed a traditional skill which probably they could not explain in words -- which perhaps they often exercised unconsciously. (Senior 1972[1837], p. 158)

However, Senior seemed also to imply that the workers' skills and tacit knowledge were a necessary but not sufficient condition for market success. The real key was to be found in management and its ability to discipline what could be an unruly work force. Senior made his point by reflecting on what happened when the firm lost its key managers: "The workpeople, no longer under strict instruction, became negligent.
Complaints were made of the deterioration of the glass, customers were lost, and bad debts accumulated" (Senior 1972[1837], p. 158).

Senior elsewhere discussed this need for control over a work force engaged in a common purpose and performing similar tasks, getting deeply into the issue of power generally and legitimate power specifically:

To obtain this concurrence is the object of discipline, and the means employed by discipline, are first, the appointment of a person is to give the word of command, who is to say when and in what manner the united effort is to be made; and, secondly, the training (of) those who are to make the effort to the submission of their wills to that of the person in command. (Senior 1972[1837], p. 233)

Mostly, Senior projected a de-skilling that just happened, due to the nature of technological progress and economic growth in a capitalist economy. Prior to Senior, this was the only way that writers envisioned de-skilling occurring under industrial capitalism. But, though it was subtle, Senior had opened up the prospect that the de-skilling process was the result of an actively-pursued management strategy by capitalists.\(^8\) Along with other writers, Senior would establish that managerial control of both the organization and tools of work was considered to be required to advance the division of labor and secure its advantages in capitalist firms.

There would be, of course, numerous descriptions of how the division of labor enabled management to exercise control over workers, and how management would benefit therefrom. In this regard, DeSismondi argued that by stripping the worker of

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\(^8\) To the extent that management pursued a de-skilling strategy, that outcome would still have been viewed as endogenous to the capitalist system. The capitalist couldn't help it. De-skilling would be a strategy enforced by competitive necessity, not a strategic choice of an industrial relations strategy from a set of options that would include some non de-skilling approaches. No one has posited, at this juncture, that management really wanted to de-skill labor or that managerial philosophy drives de-skilling.
skills, a minute division of labor in the workshop left the worker with little bargaining power vis à vis the capitalist employer:

The person who had limited his efforts to perform only one very simple operation in a manufacture, had made himself dependent on whoever chose to employ him...Whenever he bargained with a master workman for the exchange of labor against subsistence, the condition he stood in was always disadvantageous...whilst the master alone profited from the increase in productive power, brought about by the division of labor. (DeSismondi 1966[1815], pp. 22-3)

The impetus for de-skilling, in this regard, would certainly be heightened if skilled workers received the kind of wage premia that Mill saw accruing to the skilled workers:

But, independently of these or any other artificial monopolies, there is a natural monopoly in favour of skilled labourers against the unskilled, which makes the difference of reward exceed, sometimes in a manifold proportion, what is sufficient to equalize their advantages. (Mill 1987[1848], p. 391)

DeSismondi further argued that the division of labor would result in work intensification, enabled by the development and application of machinery: "The introduction of the wonders of mechanics into the arts, far from abridging their hours of labor, has prolonged them" (DeSismondi 1966[1815], p. 199).

Babbage might be called the first of the modern organizational theorists, since he essentially posited that de-skilling was a choice variable for capitalist management and not necessarily something endogenous to the system. He accepted Adam Smith's views of the advantages resulting from the division of labor, adding "that the division of labour can be applied with equal success to mental as well as mechanical operations, and that it ensures in both the same economy of time" (Babbage 1986[1835], p. 191).
In a competitive environment, this division of both mental and physical labor would enable the producer to minimize labor costs and, thereby, the overall cost of his product. According to Babbage:

We have seen, then, that the effect of the division of labour, both in mechanical and mental operations, is, that it enables us to purchase and apply to each process precisely that quantity of skill and knowledge which is required for it: we avoid employing any part of the time of a man who can get eight or ten schillings a day by his skill in tempering needles, in turning a wheel, which can be done for six pence a day; and we equally avoid the loss arising from the employment of an accomplished mathematician in performing the lowest processes of arithmetic. (Babbage 1986[1835], p. 201)

Babbage's ideas later became central to the de-skilling debate, but much of Babbage's thought would be contrary to de-skilling. Babbage did not propose a planned effort to further sub-divide tasks in order to use cheap labor. Moreover, for Babbage, machinery offered productivity-enhancing attributes that could benefit both the workers and the "master", though he believed that labor often resisted out of concern over the prospect of lost jobs and wages. Based on his perception that the interests of management and labor were compatible, Babbage proposed a system which had many of the elements, including profit sharing, of employee participation strategies in existence today.

Mill (1987[1848]) also predicted a broad-based development of profit-sharing work places. Mill's primary profit-sharing form of association was one with "a capitalist as chief, and working people without a voice in management" (Mill 1987[1848], p. 773). The alternative, which Mill felt would come to predominate, was the labor-managed enterprise (LME) in which labor would collectively own all capital and elect their managers. While worker participation -- an association between a capitalist as chief and
workpeople with a voice in management -- was not a scheme specifically foreseen by Mill, it would not have been inconsistent with his thought, at least as an evolutionary phase preceding the wide-spread existence of LMEs.

Babbage (1986[1835] was also in favor of gain-sharing plans and other elements of some present day employee participation programs. For example, he encouraged granting authority to workers for hiring new employees and for firing incompetent or shirking employees. Under such a regime, machinery and tasks would not be designed to control and subordinate labor but rather to enhance productivity, improve the firm’s efficiency, enhance worker security, and reduce management-labor friction. In Babbage’s words, the results of his suggested arrangements would include:

1. That every person engaged in it would have a direct interest in its prosperity.

2. Every person concerned in the factory would have an immediate interest in preventing any waste or mismanagement in all the departments.

3. The talents of all connected with it would be strongly directed to its improvement in every department [i.e., continuous improvement]....

5. When any circumstance produced a glut in the market, more skill would be directed to diminishing the cost of production; and a portion of the time of the men might then be occupied in repairing and improving their tools, for which a reserved fund would pay, thus checking present, and at the same time facilitating future production.

6. The workmen and the capitalist would so shade into each other,—would so evidently have a common interest, and their difficulties and distresses would be mutually so well understood, that, instead of combining to oppress one another, the only combination which could exist would be between both parties to overcome their common difficulties. (Babbage 1986[1835], pp. 257-8)
Since productivity depended on order, precision and the discipline with which labor was exerted in the manufacturing process, mechanization was beneficial and would not represent an effort to de-skill workers.

Babbage saw machinery as replacing mental labor, broadly construed, as well as manual labor. He is credited with being the father of the computer, which he designated a "calculating engine", and it was clear that Babbage had in mind nothing short of artificial intelligence: "Nothing but teaching the [Calculating] Engine to foresee and act upon that foresight could ever lead me to the object I desired" (Doron Swade 1992, p.10). Bruce Mazlich adds to this position:

Babbage, in contrast [to Adam Smith] placed the machine at the heart of the industrial process, which he contemplated in terms of operations research. For Smith and other predecessors of Babbage, the machine meant a substitute for the workman’s physical powers. Babbage’s great achievement was to devise an engine that could substitute for the human mental powers. However, he was never able to build a full-scale Analytical Engine [a machine that appeared to think by calculation, just as the human mind did]; the realization of his thoughts would have to wait until the twentieth century. (Mazlich 1993, p. 139)

Babbage also discussed the importance of CIT within the organization, noting the use of communication devices, such as "the simple contrivance of tin tubes for speaking through...by which the directions of the superintendent are instantly conveyed to the remotest parts of an establishment", and the use of telegraphic communication (Babbage 1986[1835], pp. 3-4). Babbage further discussed the importance of communication and information on affecting cooperativeness in the firm:

A most erroneous and unfortunate opinion prevails amongst workmen in many manufacturing countries, that their own interest and that of their employers are at variance...Perhaps its diminished prevalence in our own manufacturing districts arises partly from the superior information spread amongst its workmen. (Babbage 1986[1835], p. 250)
Babbage surely reflected the current focus of neoclassical and RPE analysis of the organizational benefits of employee participation: better information access. Specifically, Babbage stated that:

In such a factory, of course, division of labour would be introduced...It would be essential that the time occupied in each [specialized] process, and also its expense, should be well ascertained; information which would be soon obtained very precisely. (Babbage 1986[1835], p. 256)

F. Models of Long-Term Employment Relationships

The model of cooperative employment relations developed by Babbage, replete with profit and gain sharing, was extended by Mill and Marshall, who emphasized trust and reciprocity as crucial to productive relations. In contrast to this ideal vision, however, Mill believed that shirking was common among English workers of his time: "[A]ll who have ever employed hired labour have had ample experience of the efforts to give as little labour in exchange for the wages, as is compatible with not being turned off" (Mill 1987[1848], p. 139).

Furthermore, Mill believed that the attitudes and behavior of the English workers reflected a lack of trust that prejudiced management toward heavy-handed control, as conveyed by his citation the following testimony of a large cotton mill owner included in an 1840 report by the Poor Law Commissioners:

On the connexion between mental cultivation and moral trustworthiness in the labouring class, the same witness says, "The better educated workmen, we find, are distinguished by superior moral habits in every respect;...they are, consequently honest and trustworthy." And in answer to a question respecting the English workmen, "Whilst in respect to the work to which they have been specially trained they are the most skilful, they are in conduct the most disorderly, debauched, and unruly, and least respectable and trustworthy of any nation...When the uneducated English workmen are released from the bonds of
iron discipline in which they have been restrained by their employers in England, and are treated with the urbanity and friendly feeling which the more educated workmen on the Continent expect and receive from their employers, they...completely lose their balance...and after a certain time become totally unmanageable and useless....When he (the English worker) ceases to be servile, he becomes insolent." (Mill 1987[1848], p. 110)

Whereas Smith (1937[1776]) had supported education as simply a way to cope with the mind-numbing effects of a minute division of labor, Mill (and, later, Marshall) supported education largely because it would create the moral and professional culture on which long-term, trusting employee relations could be built. While Ure (1967[1835]) had advanced such a view before, Mill (1987) was the first writer to devote an extensive part of his treatise to this issue.

As with today's philosophers in the RPE school, Mill believed that the antagonistic relations exhibited in the capitalist enterprises of his era led to excessive expenditures on monitoring, and, as a result, lower efficiency:

The moral qualities of the labourers are fully as important to the efficiency and worth of their labour, as the intellectual...it is well worthy of meditation, how much the aggregate effect of their labour depends on their trustworthiness. All the labour now expended in watching that they fulfil their engagement, or have fulfilled it, is so much withdrawn from the real business of production, to be devoted to a subsidiary function rendered needful not by the necessity of things, but by the dishonesty of men. (Mill 1987[1848], pp. 110-11)

But Mill criticized both the workers and the capitalists, arguing that "The total absence of regard for justice or fairness in the relations between the two, is as marked on the side of the employed as on that of the employers" (Mill 1987[1848], p. 761). While he saw employers as displaying generosity and other traits which precluded taking maximum advantage of their position, Mill also believed that,
The capitalists] have used their power in the interest of their own selfishness, and have indulged their self-importance in despising, and not lovingly caring for, those who were, in their estimation, degraded, by being under the necessity of working for their benefit. (Mill 1987[1848], p. 754)

Under this regime of conflict, management was motivated to gain control over the labor process. However, in spite of capitalist efforts made to monitor workers and control their shirking, Mill argued that even extensive efforts at such control were not completely effective:

Nor are the greatest outward precautions more than very imperfectly efficacious, where, as is now almost invariably the case with hired labourers, the slightest relaxation of vigilance is an opportunity eagerly seized for eluding performance of their contract. (Mill 1987[1848], p. 111)

For Mill, a strategy of technical de-skilling via a minute division of labor would have outcomes contrary to the interest of employers even when it enhanced control. He argued that a minute division of labor would reduce or retard the development of intelligence, and that such a result would redound unfavorably on the "moral qualities of the labourers [that] are fully as important to the efficiency and worth of their labour, as the intellectual" (Mill 1987[1848], p.110).

Mill, as has already been made evident, believed very strongly in the importance of trust, with regard to all forms of human interaction including economic relations. He reiterated the theme by stating that the "carefulness, economy, and general trustworthiness of labourers are as important as their intelligence" (Mill 1987[1848], p. 187). Mill argued that trustworthiness would also benefit the worker, because such a worker would be considered very desirable by employers and "Desirable labourers, those
whom every one is anxious to have, can still exercise a choice [regarding working conditions and wages]" (Mill 1987[1848], p. 388).

Besides the issue of antagonistic labor relations, Mill evinced numerous other shortcomings regarding the division of labor. For example, he was concerned about the effects on quality, stating that: "It does not follow that because a thing has been done oftener that it will be done better. That depends on the intelligence of the workman, and on the degree in which his mind works along with his hand" (Mill 1987[1848], p. 124). De-skilling workers any reduce the benefits of detailed task specialization because of the effects of lowering worker intelligence.

Mill also felt that the reduction in set-up costs as the result of the division of labor were exaggerated, arguing that multi-skilled and multi-tasked workers were more skillful and harder working and that they could learn to reduce set-up time and cost to an inconsequential minimum. And Mill also posited that task variety reduced worker fatigue.

Mill argued that the labor process would evolve away from an antagonistic master-servant relationship:

…it is not to be expected that the division of the human race into two hereditary classes, employers and employed, can be permanently maintained. The relationship is nearly as unsatisfactory to the payer of wages as to the receiver...It will sooner or later become insupportable to the employing classes, to live in close and hourly contact with persons whose interests and feelings are in hostility to them. Capitalists are almost as much interested as labourers in placing the operations of industry on such a footing, that those who labour for them may feel the same interest in the work, which is felt by those who labour on their own account. (Mill 1987[1848], pp. 761-2)
But Mill’s hope for and expectation of a more egalitarian and cooperative workplace ran contrary to the actual conditions that he observed and reported on. Marshall (1982[1920]) painted a similarly divisive picture of the conditions and trends observable in his era, arguing that while social relations outside the workplace were becoming less rigid, social relations within the workplace were becoming more rigid. Marshall argued that:

[T]he sacrifice of the individual to the exigencies of society as regards the production of material wealth seems in some respects to be a case of atavism, a reversion to conditions which prevailed in the far-away times of the rule of caste. For the division of labour between the different ranks of industry and between different individuals in the same rank is so thorough and uncompromising, that the real interests of the producer are sometimes in danger of being sacrificed for the sake of increasing the addition which his work makes to the aggregate production of material wealth. (Marshall 1982[1920], p. 204)

The prior quotation points out a common thread among many economic philosophers: economic agents would take what would appear to be sub-optimal actions on the individual level because that is what the system forced them to do. In a competitive economy, individual agents cannot resist these forces and survive. The inability to work out and enforce an economic truce led to actions which reduced the welfare of the society in spite of the awareness that such sub-optimality was occurring.

Marshall decried the adverse impacts of a minute division of labor, and considered the issue to be a very important concern for economists:

It is needful then diligently to inquire whether the present industrial organization might not with advantage be so modified as to increase the opportunities, which the lower grades of industry have for using latent mental functions, for deriving pleasure from their use; since the argument that if such a change had been beneficial, it would have been already brought about by the struggle for survival, must be rejected as invalid. (Marshall 1982[1920], pp. 206-7)
In a similar spirit, Marshall asked the rhetorical question, "Ought we to rest content with the existing forms of division of labour [which cause the majority of workers to be] exclusively occupied with work that has no elevating character" (Marshall 1982[1920], p. 35). Rather obviously, his answer was no.

In spite of the circumstances of his times, Marshall (1982[1920]) felt that the general division of labor into skilled and unskilled production workers was undergoing a gradual change, and his recommendations included education which could facilitate a gradual shift away from fragmented, repetitive manual tasks. Among the capacities that Marshall felt workers should be prepared for was extensive employee participation, or "undertaking co-operatively the management of the business in which they are themselves committed" (Marshall 1982[1920], p. 35).

Rebitzer (1993), in his article on RPE, raised the question of why, if employee participation is such a good idea, we do not find more of it in a competitive economy. Marshall's answer to such a question, as well as to the question of why a re-integration of tasks in the workplace was not spontaneously occurring, was based on a biological metaphor:

[C]onsider the law [survival of the fittest] that the struggle for existence causes those organisms to multiply which are best fitted to derive benefit from the environment. [It is a] fact that a thing which is beneficial to the environment will not by itself secure its survival either in the physical or moral world. [Those organisms] that utilize the environment most, often turn out to be those that benefit those around them the most; but sometimes they are injurious. [Furthermore] the struggle for survival may fail to bring into existence organisms that would be highly beneficial; and in the economic world the demand for any industrial arrangement is not certain to call forth a supply. It must be an efficient demand; that is, it must take effect by offering adequate payment or some other benefit to those who supply it. (Marshall 1982[1920], p. 201)
The significance of the aforementioned views is crucial because Marshall believed that altruism was a more powerful gene than the selfish gene; that societies whose members behaved altruistically were more likely to survive and prosper; and that such individuals were the "most likely to rear a large number of descendants who inherit their beneficial habits" (Marshall 1982[1920], p. 202). Marshall expanded on this position, stating:

Thus the struggle for existence causes in the long run those races of men to survive in which the individual is most willing to sacrifice himself for the benefit of those around him; and which are consequently best adapted collectively to make use of their environment. (Marshall 1982[1920], pp. 202-3)

Marshall, like Mill, believed in the superiority of collective approaches like employee participation and labor-managed enterprises over the traditional capital-labor arrangements in the workplace and their focus on individual tasks and responsibilities. Like Mill, he seemed to believe that such superiority would win out in the long run, but had to explain why such arrangements, if competitively superior, were not being spontaneously and broadly generated. In this regard, Marshall (1982[1920]) advanced at least two major barriers to cooperative forms of industrial relations: the issue of trust, and the perceived need for perfectly coordinated efforts.

In his presentation on employee participation, Mill stated that the powerful stimulus it would give to worker productivity would be "nothing compared with the moral revolution in society that would accompany it" (Mill 1987[1848], p. 709). Trust and cooperation between capital and labor would, and would have to, replace distrust and feuding. Marshall concurred in this, emphasizing that modern methods of business
"imply trustfulness on the one side and a power of resisting temptation to dishonesty on
the other" (Marshall 1982[1920], p. 6).

However, in contrast to the need for trust, Marshall believed that "the modern era
has undoubtedly given new openings for dishonesty...The advance of knowledge has
discovered new ways of making things other than they are, and has rendered possible
many new forms of adulteration" (Marshall 1982[1920], p. 6). Education, and
technological change that elevated intellectual skills, were, according to Marshall, already
improving the character of workers, and a major element of character was
trustworthiness. However, the growth of large enterprises, the separation of top
management in large forms from shop floor workers, and the increased opportunities for
deceit presented barriers to cooperative relations. Marshall would have viewed CIT as
an asset that could reduce these barriers by reducing the ability to create new forms of
information adulteration.

Finally, with regard to the need for maintaining a clockwork organization,
Marshall deployed another biological analogy. He reflected on the fact that the
development of increasingly complex advanced organisms, be they social or physical,
involves an increasing subdivision of functions between its separate parts on the one
hand, and on the other a more intimate connection between them, adding that "any
disorder in any part of a highly-developed organism will affect other parts as well"

Modern production, for Marshall, was a complex organism in which a disorder
in any of the human or machine parts would adversely affect the whole system.
Standardized production systems producing large quantities of standardized products while minimizing waste would have encouraged firms to make their workers into interchangeable parts, just as was being done with machines. In a sense, that might imply multi-skilling, but it would also be consistent with a de-skilling thesis.

G. Conclusions

The extensive division of labor in production, and the conflict of interest between capital and labor, are arguably contrary to the real needs and interests of both capitalists and workers. But the capitalist system is seen as creating these results in spite of individual recognition of the attendant problems and desire to overcome them. Interfirm competition drives individual capitalists (and their firms) to attempt to increase the intensity and the duration of work, in search of surplus. Alienated workers toiling for subsistence wages tend to resist these efforts, and so capitalists and their manager-agents seek power to control that resistance.

Moreover, the capitalist system values order, precision (minimum variability) and discipline -- firms that contribute to the seamless operation of the total system are rewarded, while disruptive firms are sanctioned. De-skilling may, thus, be a dynamic even if workers do not resist capitalist power, since it may contribute to what management wants most: order and predictability.

The history of economic thought is replete with evidence of a tendency towards de-skilling and theoretical support for the proposition. It also evidences a variety of inefficiencies that result from the traditional organization of capitalist work places, including excessive monitoring costs, quality degradation, and worker failure to correct
operational problems. With regard to better and anticipated organizational strategies, the thinking is wishful and without much theoretical support.

Babbage in particular advanced the concept that alternatives to de-skilling are feasible, and that whether capital-labor relations were essentially cooperative or conflictual would depend (in part) on how technology was utilized. That is, firms had something to say about their organization regardless of competitive pressures. Mill and Marshall extended this thought. Nonetheless, de-skilling forces were more frequently cited than en-skilling forces, an example being Babbage’s view that machines (computers) could substitute for the human mind as well as the human body.

The critical importance of knowledge, information and communications was clearly recognized by the scholars documented in the history of economic thought. Under conditions of conflict, certain economic agents could and would gain power over others by monopolizing the access to relevant information and knowledge. Communication and information were viewed as vehicles that could promote extensive trust between workers and capitalist managers, thereby facilitating more cooperative workshops, but little evidence exists about any efforts to build high trust relationships.

The critical role of trust in enabling cooperative relations between workers and managers was clearly recognized, especially by Smith, Babbage, Mill and Marshall. Mill noted that labor and management wanted more cooperative relations, and believed that such relations would enhance a firm’s productivity, but overcoming the trust problem was too much of a barrier. Babbage and Marshall, however, indicated that widespread
sharing of information that could be checked might be able to create and maintain trust levels that would permit participative work arrangements.
CHAPTER II

UNCERTAINTY, LEARNING, AND EMPLOYEE PARTICIPATION

A. Introduction

In this chapter, I argue that the established economic and organizational theories applied to the firm and the labor process are seriously flawed in regard to the issue of employee participation. These theories provide only an ad hoc explanation for the existence or non-existence of participatory arrangements in capitalist firms. If employee participation exists in a particular firm, it must be because it efficient (optimal) for that firm. If it does not exist, it must the case that it is not be efficient. As such, these theories provide little explanatory or predictive power, and little guidance in evaluating policy alternatives that might affect the use of participatory regimes in capitalist firms. In other words, as Richard Nelson argues;

(T)o say that actors behave "as if" they were maximizing does not tell us much about why they are doing what they are, and provides only a start on any prediction of what they will end up doing if conditions change. (Nelson 1995, p. 51)

I further argue that any meaningful analysis of employee participation requires a shift from an essentially determinist and individualistic methodology to one that is essentially indeterminist and evolutionary in nature. This proposition does not imply that concepts like rationality and equilibrium cannot inform a situation at a particular point in time, but rather that such concepts cannot adequately explain long run economic change associated with the evolution of technologies and firms (Nelson, 1995).
I believe that an indeterminist and evolutionary methodology is particularly necessary to address the issue of organizational learning. Organizational learning may be crucial to the success of firms, as numerous authors (e.g., Peter Senge, 1990a and b, Paul Adler and Robert Cole, 1993, and Joost Muller and Diana Watts, 1993) have recently argued. How, and how well, a firm learns purportedly affects the firm's operational efficiency as well as its flexibility in adapting to change. Such a view is inherent in what Nelson notes as the "proclivity of many economists to consider individuals and organizations as entities that search and learn" (Nelson 1995, p. 49).

Unfortunately, as Harvey Liebenstein and Schlomo Maital (1994) have attested, the accumulated research on the process of learning in organizations has not been well-integrated with the theory of the firm. I suggest that this conclusion holds whether one is referencing economic theory or organizational theory.⁹

Information and knowledge considerations are crucial to explaining the effects of employee participation on a firm's performance (Geoffrey Hodgson, 1989). Since information and knowledge are key outcomes of learning, an underdeveloped theory of the organizational learning process creates a general problem for the analysis of firm performance and a particular problem in analyzing participatory work arrangements. A richer conception of knowledge and learning needs to be incorporated into the theory of the firm to adequately address the issue of employee participation.

⁹ Organizational theory encompasses a variety of disciplines including management theory, organizational behavior, organizational psychology, and sociology. In this essay, the literature on the theory of the firm that falls outside of economics will be referred to as falling within organizational theory.
The shallowness with which mainstream economics treats learning is evidenced by both its very limited concept of knowledge and the fact that it essentially dismisses any consideration of the learning process by individuals or firms.\textsuperscript{10} This issue will be covered extensively later.

Explicit and detailed consideration of organizational learning can help to address at least two important questions regarding employee participation. Rebitzer (1993) raises one of the questions, which asks why we do not find a significant trend in capitalist labor relations towards the adoption and retention of more participatory schemes if those relations indeed enhance the firm's efficiency. Rebitzer's query is quite significant since it has been frequently demonstrated that employee participation is correlated with substantial enhancements of firm efficiency (Casey Ichniowski et al, 1994).\textsuperscript{11} Yet

\textsuperscript{10} The term "mainstream economics" is synonymous to neoclassical economics, wherein the firm is basically treated as a "black box" production function. The firm converts inputs into product outputs at minimum cost. Labor is treated as a stock of input which will be entirely consumed (though not necessarily efficiently) during the period of production. The future output potential of labor is not affected by anything that happens to labor during the present period of production (human capital is exogenous to the production process). The other major school of economic thought discussed in this essay is called radical political economy, one which represents a confluence of Marxist and neoclassical economics. As will be discussed, both of these schools of economic thought exhibit a basically determinist, reductionist and individualist methodology. Working within a neoclassical framework, economists have attempted to expand the theory of the firm beyond the production function concept, but have done so without advancing a serious theory of the process of organizational learning.

\textsuperscript{11} The nature of employee participation strategies being discussed here involves more than worker cooperation with management to identify and develop improved methods of operation. These strategies involve some degree of autonomy over decisions that have for many years been the sole purview of managers, such as the autonomy granted to self-managing work teams. The work of Ichniowski et al (1994) regarding such arrangements is referenced elsewhere in this essay, and they cite other research on the topic. Additionally, Robert Reich (1994) has noted a study which found that, over the period 1990-1994, firms with "high performance workplaces" experienced returns on equity that were, on average, sixteen percent higher than the Standard and Poor's 500 stock index, and 7.5 percent higher than their industry averages.
documented examples of such participatory management are few (John Holusha, 1994).\footnote{It may also be noted that observers such as Mick Marchington et al (1993) have found that most employee participation plans introduced by management have ultimately been terminated, with the firm reverting to a more traditional, hierarchical management structure. Moreover, like numerous other researchers, Marchington et al claim that most employee participation programs are intended to be implemented without a basic change in the firm's governance structure.}

A second question involves the nature of participatory arrangements when and where they do exist. Eileen Appelbaum and Rosemary Batt (1994) have studied the so-called "high performance workplaces" in the United States, finding that two different models have both produced significant gains in productivity, product quality, market share, return on investment, and other performance criteria. One approach is an Americanized version of the Japanese lean manufacturing strategy, an approach that stresses continuous improvement through worker input to decisions about the production process. The second approach is called a team-based strategy wherein shop floor and other workers share not only information but decision-making authority as well.

Appelbaum and Batt (1994) conclude that the latter approach offers workers substantial autonomy, enhanced job security, and greater equity in sharing the gains of productivity improvement. At least by implication, the lean strategy fails to grant workers much control over their jobs even though it may increase worker-management cooperation. The lean strategy may subject employees to more severe work intensification, greater job insecurity, and relatively minor gains in compensation compared to the team model. Which model will dominate the high performance
workplaces, however many of those workplaces there will be, can also be addressed better with an explicit theory about organizational learning.\textsuperscript{13}

Section B of this chapter looks at the concept of learning that is embodied in the economic theories of the firm. Section C explains how that learning concept affects the impact of employee participation on organizational learning in the models associated with neoclassical economics as well as mainstream organizational theory. Sections D and E deal with the established analyses of employee participation in the economics literature and answers to the question about why more participation is not found in capitalist firms from those perspectives.

Sections F and G describe the determinist methodologies of the economic and organizational theories applied to the analysis of firm, and argue that a determinist view of learning is inadequate to develop useful theories about employee participation. Sections H and I argue for an altered methodology that incorporates an indeterminist perspective, discussing how such a perspective affects the conceptualization of organizational learning and how chaos theory can benefit the analysis of employee participation. Section J develops conclusions.

\textbf{B. Learning as a Construct in Economic Theory}

The limited concept of learning employed in mainstream economic analysis has been discussed by Robert Lucas accordingly:

\begin{itemize}
\item \textsuperscript{13} Appelbaum and Batt seriously question how widely either form of participatory strategy will be adopted, indicating that without the prod of a financial crisis neither system may gain much adherence.
\end{itemize}
Economics has tended to focus on situations in which the agent can be expected to 'know' or to have learned the consequences of different actions [prior to making decisions] so that his observed choices reveal stable features of his underlying preferences. (Lucas 1987, p. 218)

In mainstream economic theory, knowledge and learning precede and provide input to decision-making. How knowledge is acquired is not modelled. New knowledge may arise during the implementation phase of a decision, but such increments simply become part of the stock of knowledge to be used in the next choice process. Choice and action are essentially simultaneous, and any information or knowledge that arises does so only after the implementation is completed: there is no real-time learning and adjustment. All of this is quite consistent with the "black box" modelling of the production process which is characteristic of neoclassical economics.

Moreover, consistent with the idea of "methodological individualism" which represents a major characteristic of neoclassical economics, knowledge is something that is acquired and held by individual economic actors. Knowledge is not modeled in mainstream theory as an outcome of a co-evolutionary process by which interacting agents affect each other's models of the world: Emile Durkheim's (1938) concept of a group mind, in which knowledge structures are created, shared and acted upon by the members of a collective group, is not employed.

Furthermore, as James Wible (1990) has reasoned, economics treats knowledge in a basically positivistic manner, viewing it as objective (idiosyncratic interpretations are not made), quantifiable, and readily communicable through written and/or spoken language. Knowledge is essentially nothing more than a set of data and standardized routines encrypted in the individual's brain. Idiosyncratic learning, idiosyncratic
interpretation of knowledge, and tacit knowledge may all be recognized as existing, but they are dismissed from any rigorous analytic consideration.

Alanson Minkler (1993) confirms Wible's view, arguing that economists implicitly treat information (facts that can be acquired through observation) and knowledge (the sense or understanding of what has been observed) as identical by assuming away any problem of understanding. Thus, more information is always better than less information. The only cost associated with organizational and individual learning is the cost of access to information. Neither the individual nor the organization bear any explicit costs associated with processing accessed information, and the benefits of learning accrue directly to the greater stock of information. Thus, there are no costs or benefits attached to organizational processes that attempt to affect how individuals in the firm make sense of information.

Given this conception of learning, I will now turn to a discussion of how employee participation affects organizational learning under the mainstream paradigm.

C. Learning and Participation: the Mainstream View

The analysis of employee participation, in both the economics and organizational literatures, treats information and learning in an essentially synonymous and positivist manner. Workers have a stock of previously accumulated knowledge about the production process. At least some of this information is held asymmetrically in contrast to management and other workers.

\[14\] The term "production" is used in its general sense as the transformation of resources so as to create value for customers. Production may involve the manufacturing of a physical good, but it may also include the provision of services.
While each worker’s stock of knowledge may be somewhat unique, workers are
deemed to possess a substantial common core of knowledge about the production process.
The production knowledge possessed by one worker would be interpreted almost
identically (not idiosyncratically) by any other worker exposed to it. Moreover,
management would understand any information accessible through workers in basically
the same way that workers do.

To the extent that it exists, asymmetric knowledge in mainstream theory is
synonymous to asymmetric (hidden) information. A communications failure in the
organization or between individuals is simply a failure to make the effort to
communicate. The only issue is whether or not persons who hold information
asymmetrically will decide to let others access it.

To the extent that neoclassical economists have broached the learning process,
their construct involves the individual acquisition of more knowledge garnered from the
complete stock of knowledge available to the system. Expanding or just maintaining an
individual’s stock of knowledge involves a process of access which presents some
difficulty and incurs some cost. Costly learning is equated with costly access to
information, not costly understanding of information.

In this sense, knowledge and learning are exogenous to the production process and
determinist in nature. Moreover, organizational learning is adaptive: the basic conceptual
structure of the worker’s function(s) does not alter, but which specific tasks the worker
executes, and when and how the tasks are performed, may change in response to new
knowledge. The workers and managers will acquire and rationally adapt to new facts by
revising their probability estimates associated with the environment and the outcomes of possible choices, and then selecting the optimal (cost-minimizing) choice in the next decision cycle. Thus, the learning paradigm in established theories of the firm is "Bayesian" learning (Giovanni Dosi and Luigi Marengo, 1994).

The failure of a firm to fully utilize either the knowledge available to it or its ability to learn could be considered a source of "X-inefficiency" (Liebenstein, 1966), as it means that the firm is not achieving full utilization of its resources. Employee participation, arguably, increases the firm's access to useful knowledge held by the individual participants in the production process, participants who might now include customers and suppliers to the firm in addition to the firm's own workers, managers and owners.

At any point in time, complete knowledge of the production process is deemed to exist, and so the firm's production possibilities (efficiency) frontier also exists and is knowable. Monopoly control of asymmetric knowledge by agents of the firm can, however, cause the firm itself to operate at an inefficient point inside its efficiency frontier. In essence, such a condition implies a market failure associated with the internal labor markets embedded in a hierarchical organization.

The primary argument made for employee participation has been its ability to increase a firm's efficiency by improving the use and distribution of objective knowledge in the firm (Dennis Levine and Laura Tyson, 1990). The efficiency gains accrue

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15 Levine and Tyson (1990) argue that participatory schemes can motivate workers to use asymmetrically-held information about the work process and the behavior of co-workers to improve their individual performance, and/or to share such information with management.
because agency problems manifested by worker "shirking" (withholding of effort) are mitigated, and because of various improvements in the accuracy, completeness and timeliness of the distribution of existing knowledge.\textsuperscript{16} Such gains clearly represent gains in static efficiency as the result of correcting market failures.

Learning as a process of accessing relevant information and adjusting certainly has a place in the theory of the firm and of employee participation. To some degree, decision-makers can be modelled as using feedback from actions and their consequences to adjust the probability distribution of possible choices that might be made at any time (Nelson, 1995). But I argue that an extended and more useful concept of learning would add an endogenous and indeterminist perspective as well.

The more expansive model of learning would incorporate tacit knowledge and idiosyncratic learning in addition to objective knowledge and standardized learning. It would be explicitly assumed that the problem of understanding has not been completely solved. The access and use of existing internal and external information would be combined with the endogenous generation of knowledge by agents interacting in the firm. Search and novelty become important analytic elements.

Not all of the future is knowable in this view, even in the sense of a probability distribution. Knowledge must be created. This perspective demands that standard scientific methodology must be expanded to include the higher order mental processes

\textsuperscript{16} Tom Juravich (1985) has noted that individual workers often possess idiosyncratic practical knowledge -- i.e., technology -- that helps them perform their task(s) more efficiently and to cope with "chaos on the shop floor." Such knowledge can often be used, perhaps with some slight modification, by other workers to increase their efficiency and coping. However, the manner in which the production process is organized and coordinated may restrict the transfer of such technology, even when workers are not intent on maintaining monopoly control of their personal knowledge.
of thought, reflection, and criticism that are integral to imagining the future (Wible, 1995b).

This pluralistic methodological conception accepts a role for equilibrium, order and harmony, and the determinist view of knowledge and learning that go with it. But it also divines a role for disequilibrium and disorder. In this regard, chaos theory -- which asserts the simultaneous existence of order and disorder -- and its indeterminist perspective can be applied to knowledge and learning within the firm generally, and to the role of employee participation specifically.

The discussion and use of this methodological viewpoint will be picked up on later and applied to the analysis of employee participation. In preparation for that event, the next section will detail how employee participation has been investigated and interpreted to date.

D. The Established Analysis of Employee Participation

Intense global competition and the apparent success of Japanese production methods has stimulated research regarding industrial relations strategies. As Paul Osterman argues, "Scholars from a variety of perspectives have evinced a growing interest in how firms control and motivate their labor forces" (Osterman 1994, p. 380). Some of the recent analysis regarding this issue has resulted in up-beat conclusions in terms of the impacts on workers, as asserted by Bernard Avishai:
For the first time in the history of industrial capitalism, the interests of business are consistent with those of citizens, consistent with the yearning for intellectual cultivation, self-direction, uniqueness, and zest in work. (Avishai 1994, p.46)\textsuperscript{17}

Avishai's pronouncement would support the belief that worker autonomy, skill upgrading, and participation in decision-making will increasingly permeate firms in a capitalist economy, while worker subordination and alienation will diminish.

Avishai has accepted Wood's (1989) argument that the paradigm against which innovative methods of organizing work should be judged is that of Taylorism, a management strategy that emphasizes an extensive division of labor, a set of pre-established, simplified and repetitive work tasks, and a relegation of shop floor workers to executing their assigned tasks. In the Taylorist management model, there is no role for employee participation in decisions regarding the planning and organization of day-to-day operations, much less in strategic decisions regarding the firm.

In contrast to Avishai, there are less hopeful and even dismaying analyses regarding the potential for dislodging Taylorism generally, and for achieving greater worker autonomy through employee participation specifically, at least in capitalist firms. For instance, Rebitzer's assessment of radical political economy (RPE) finds that "a central theme in the [RPE] literature is that the political structure of capitalist firms leads management to select methods of organizing work that rely on a less than optimal amount of worker participation" (Rebitzer 1993, p. 1409).

\textsuperscript{17} While most of the published work on employee participation has dealt with what are commonly thought of as industrial firms -- manufacturers of automobiles, steel, etc. -- an increasing amount of research is focusing on "service industries," including retailing, banking and finance, and transportation. By using the term "industrial capitalism," Avishai is not limiting his arguments and analysis to manufacturing enterprises or any other particular set of firms.
Existing levels of employee participation are sub-optimal in the sense that profitable increases in access to information, worker motivation, and peer monitoring could be achieved by increasing the degree of participation. A basic proposition of the RPE school is that a more efficient level of participation requires an alternative to the archetypical organization of capitalist firms which is hierarchical and "Taylorist" in structure. The primary alternative generally presented in the RPE literature is a labor-managed firm (LMF), as argued by Samuel Bowles and Herbert Gintis:

We consider two reasons why firms should be owned and run democratically by their workers. The first concerns accountability. Because the employment relation involves the exercise of power [to resolve conflicts of interest], its governance should, on democratic grounds, be accountable to those most directly affected. The second [reason] concerns efficiency: The democratic firm uses a lower level of inputs per unit of output than the analogous capitalist firm. (Bowles and Gintis 1993a, p. 75)\(^{19}\)

RPE theorists believe that worker governance would enable an efficient re-integration of the conception and execution of work in the worker. Furthermore, according to RPE theorists, the LMF's managerial system does not depend on stripping skill (hence, power) from workers to maintain order in the production process. But within capital-owned firms, Taylorist-like organization forms will predominate in the long run. Therefore, argue RPE philosophers, highly participative organization structures are

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\(^{18}\) By a Taylorist-structured firm, I refer to one that basically incorporates Taylor's (1911) principles of scientific management, in which most workers perform (execute) fragmented, pre-defined and repetitive tasks while management essentially monopolizes the conceptual functions of planning, organizing, coordinating and directing worker activities.

\(^{19}\) There is, of course, debate about the effect of ownership. Bonin, Jones and Puttermann (1993) argue that productivity is positively correlated with joint participation in decision-making and surplus-sharing (which includes profit-sharing and gain-sharing), but they find that the relationship between ownership and productivity is unclear.
and will remain anomalies in capitalist enterprises. Such interventions will not generally survive in the long run.

While other schools of thought are not as dismissive of employee participation in capitalist firms, no major theory is unequivocally sanguine about the prospects for the spread of participative schemes. Appelbaum and Batt (1994) reflect the unsettled argument about the viability of participative work organizations. Like others, they have identified significant improvements in value-added per employee, product quality, market share, profitability, worker relations and other factors, all stemming from participatory relations. But they are not at all clear that the team-oriented strategy will be more robust than -- or even as robust as -- the lean strategy. Nor in fact are they convinced that either of these strategies will prove to be robust.

The theoretical conundrum regarding the argued pluses of employee participation contrasted to its limited utilization is similar to the questions involving labor-managed firms. Rebitzer inquires, "If democratically run, employee-owned firms are more efficient than capitalist firms, why do we observe capitalist firms, rather than employee run firms, flourishing in competitive economies?" (Rebitzer 1993, p. 1406) Jensen and Meckling (1979) have offered one genre of answer to Rebitzer's question: LMFs must be, in most instances, actually less efficient than capitalist firms. The line of argument is directly extended to the issue of employee participation:

Since (with minor exception) these arrangements are not observed, we infer that workers do not value the security, management participation, "self-realization," etc. at more than the costs of providing them...the fact that this system seldom arises out of voluntary arrangements among individuals strongly suggests that codetermination or industrial democracy is less efficient than the alternatives which
grow up and survive in a competitive environment. (Jensen and Meckling 1979, p. 473)\textsuperscript{20}

This approach is typical of the neoclassical model of the labor market, which treats labor as a commodity and employer-employee relations as exchange relations. The neoclassical conceptualization implies, as Craig Littler and Graeme Salaman, "[A] model ... consisting of opposed objectives [in which] the employer is motivated to resist worker aspirations which are liable to increase costs" (Littler and Salaman 1982, p. 252). If worker aspirations for greater autonomy and authority exist but go unrealized in capitalist firms, the neoclassical explanation must be that the capitalist owner finds the aspirations too costly to fulfill relative to any benefits that may accrue to the firm. Concluding that employee participation is an inefficient organizational strategy, the capitalist resists it, which s/he must do to survive in a competitive environment.\textsuperscript{21}

Gregory Dow (1993) is another analyst who has addressed the relatively infrequent occurrence of LMFs compared to capital-managed firms (KMFs), arguing that LMFs tend to be concentrated in professional, manual craft, and service organizations

\textsuperscript{20} Co-determination or industrial democracy, posed by Jensen and Meckling, might be taken as synonyms or as alternatives. Either way, both capitalist ownership with worker control over certain decisions, as well as labor ownership and management, are vehicles for achieving higher levels of employee participation.

\textsuperscript{21} As Dr. Bruce Elmslie has pointed out to me, if workers in the neoclassical model wanted greater participation in the operational and/or strategic decisions made by their firms, but were not granted (enough of) it, they could "vote with their feet" and find an employer who would. Any productive inefficiencies of a participatory scheme, were they to actually exist, would be offset by lower wages as workers bid for these more attractive jobs. If this desire on the part of workers was sufficiently wide-spread, participative firms would tend to gain a cost advantage, forcing non-participatory firms to switch over. The fact that we do not observe this happening indicates that workers, as a group, do not value the benefits of participation at more than the cost of providing them.
that require little asset-specificity in their physical capital.\textsuperscript{22} He concludes that the sparseness of LMF’s in market economies is a puzzle.\textsuperscript{23}

Reflecting on Dow’s puzzle, Bowles and Gintis insist that many studies regarding LMFs suffer from methodological errors and suggest an approach that:

differs from the existing literature on the democratic firm primarily in that we address problems of motivation, incentives, discipline, malfeasance, and opportunism [hence, trust]. Surprisingly, these issues are absent in most theoretical treatments by economists, yet many consider these concerns central to the evaluation of governance structures and property rights. More technically, our approach focusses on agency problems … The market failures that differentiate the performance of the democratic and capitalist firms arise because of agency problems in labor and capital markets. (Bowles and Gintis 1993a, p. 76)

Bowles and Gintis’s focus on principal-agent problems aligns the RPE analysis of employee participation in KMFs with that of mainstream economic analysis. In either perspective, "The central story found in agency theory is a conflict between the desires of senior managers and owners and the behavior of those lower down the hierarchy" (Osterman 1994, p. 380). The benefits accruing to participatory practices can be offset by their costs if participation actually exacerbates agency problems.

\textsuperscript{22} Rebitzer (1993) has a conclusion similar to Dow’s about the concentration of extensive employee participation and ownership in professional and service organizations, and raises the question as to why that is so.

\textsuperscript{23} Dow states that, "The comparison between capitalist and labor-managed firms is a special but paradigmatic case of a broader question: given free entry, why do some organizational forms survive in equilibrium while others do not?" (Dow 1993, p. 110) One answer is that surviving forms are more profitable, an answer usually advanced by mainstream economists using transactions costs logic. Dow, however, claims that there is “no necessary relationship between the size of the surplus generated by an organizational form and its long run viability” (Dow 1993, p. 110). Dow assumes that production requires an initial, non-contractible investment in a specialized asset, and that difficulty arises in capturing quasi-rents ex post; he then shows that less profitable forms can survive versus more profitable ones.
Rebitzer (1993) offers a very cogent example of agency problems confronting employee participation strategies. To help assure the employment stability and trust needed to affect viable participation, a firm will shift from an employment-at-will policy to a just-cause dismissal policy. However, argues Rebitzer, such a policy shift will give rise to adverse selection and moral hazard problems. The policy will tend to attract a disproportionately high share of workers who are inclined to provide low effort; who can avoid detection when they do so, thereby avoiding a dismissal for cause; and who will, therefore, actually and chronically shirk. The primary message here is that employee participation may not be so rare because the benefits are slight, but, rather, because the costs of establishing and maintaining such a scheme are just too high. The viability of employee participation strategies may depend not so much on finding new ways for participation to create value but more on finding ways to reduce its costs.

The principal-agent problem can be found in the work by organizational theorists as well as economists. For example, a significant positive correlation between productivity and the use of participative strategies is confirmed by Ichniowski et al (1994). They then ask "[w]hy more facilities do not have those systems of HRM policies that appear to promote productivity" (Ichniowski et al 1994, p. 4).

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24 The study by Ichniowski et al is part of a larger research project on human resource management practices and the economic competitiveness of firms funded by the Columbia University Graduate School of Business's Center on Japanese Economy and Business and by the Alfred P. Sloan Foundation.

25 Economists' findings are consistent with Ichniowski et al. (1994). For example, Hodgson cites Paul Blumberg's Industrial Democracy: The Sociology of Participation, arguing that it and other works consistently find "a positive correlation between worker involvement in decision-making and labour productivity...more heed should be given to organisational structures within the firm, centering on the control and regulation of work, and...on the policy side, increased worker participation should
Obviously, the same question about why apparently more efficient forms of organization do not spontaneously arise in a competitive economy is being raised in both the economics and organizational literatures. Moreover, similar answers are being suggested in both disciplines. For example, Ichniowski et. al. (1994) echo the hypothesis that "high performance systems" must not be efficient, suggesting that investment in these new HRM arrangements must generally have negative net present values. Investments to improve worker access to information about the productive process, to develop the skills needed for team problem-solving processes, and especially to create trust, are needed innovative HRM practices to work, but they can be very costly.

The investment cost argument is developed by other observers, such as Randy Hodson, Gregory Hooks and Sabine Rieble:

Moreover, once a factory has institutionalized an approach to recruiting and managing its labor force, there are very real costs to changing this strategy. Upgrading the skills of workers is costly; organizational arrangements are durable and inhibit changes; and an organization’s existing routines inhibit the conceptualization of a dramatic reorganization. (Hodson, Hooks and Rieble 1994, p. 100)

Minkler (1993) notes that there are costs of investing in non-participatory arrangements as well as participatory ones. Most analysis of employee participation strategies considers only the costs of switching from a traditional command-and-control structure to a participatory one. But if a firm is contemplating a switch to a participatory strategy, it would have to factor in re-switching costs if a later conversion back to a non-participatory strategy was a possibility. Factoring in re-switching costs seems prudent

be in the forefront of suggested measures to improve productivity" (Hodgson 1991, p. 119).
since even those studies that find relatively high survival rates for employee participation programs still report short term failure rates of 20-30 percent (Adrienne Eaton, 1994).

Jon Katzenbach and Douglas Smith (1993) argue that self-managing and even self-organizing teams are crucial to the creation of highly productive and innovative firms, yet remain quite aware that substantial barriers to collective performance exist and may be costly to overcome. Particularly crucial and costly is the creation of a high level of trust, which Katzenbach and Smith (1993) operationalize as a belief that others are honest, capable, and intent on pursuing the team’s purpose above and beyond their individual agendas. One of those capabilities would be what Bowles and Gintis argue is a major impediment to the broader viability of LMF’s:

First, learning to govern a firm effectively through democratic means takes time and requires a work force schooled in common deliberation and decision making. Unless the efficiency gains associated with the democratic firm are considerable, the costs of learning and the lack of a pool of workers experienced in democratic management may be prohibitive. We call this the *democratic capacities constraint*. (Bowles and Gintis 1993a, p. 95)

What Bowles and Gintis call a democratic capacities constraint could also be called, more generally, a participation capacities constraint. Such a constraint would apply to employee participation whether it occurs in an LMF or a KMF.

It should be stressed that, in spite of what has been said so far about costs, there are prospects for further increasing the benefits realizable through employee participation. In particular, the new communications and information technology (CIT) may enhance the economic attractiveness of substantive employee participation. Osterman (1991) argues that information technologies appear to coincide with higher returns when coupled to strategies that empower workers, in contrast to being used to better monitor
and control workers. He believes that firms will not be able to gain the economic benefits of the new technology unless employees can develop a holistic vision of the production process and then be permitted to act upon it. Such a vision is difficult to develop under the rigid control and limited task variety associated with a Taylorist organization. Michael Scott Morton (1991) concurs, but he also recognizes that empowering workers will require a heavy and perhaps prohibitive investment in new skills, trust, job security, and attitudes.

Neither the interest in LMFs nor the issue of employee participation are recent phenomena. John Bonin, Derek Jones and Louis Putterman (1993) note that some European LMFs are over one hundred years old, and remind us that nineteenth century economists (in particular, Mill and Marshall) supported producer cooperatives and other organizations that encouraged worker control. Also long established is the idea that greater productivity will result from a more democratic division of labor, even if such a division does not involve worker ownership of the firm. As James Barker asserts:

Almost since the beginning of modern organizational study, influential theorists have argued that decentralized, participative, and more democratic systems of control offer the most viable alternatives to the bureaucracy's confining routines and rules. (Barker 1993, p.411)

The apparent paradox between the demonstrated efficiency advantages of some participatory workplaces and the low level of penetration of participatory strategies into modern industrial relations will continue to draw interest.

Since this chapter focuses on efforts to employ participative relations within capitalist firms (KMFs), I have considered the critiques of such efforts. The most
extensively developed critique by economists emanates from radical political economy. 

Next, I turn to a discussion of that critique.

E. Employee Participation in KMFs: the RPE Critique

Among the important effects that might make a labor-managed firm more efficient than a capital-managed firm is improved monitoring:

Workers have virtually costless access to information concerning the work activities of fellow workers, and in the democratic firm each has an interest in the effort levels of other workers. The residual claimancy provides a motive for mutual monitoring. The democratic firm could thus deploy a considerably more effective monitoring structure at less cost than the capitalist firm. (Bowles and Gintis 1993a, p. 93)

This argument suggests that workers possess asymmetric knowledge about the true production possibilities of the firm, and where the firm is actually operating in relation to its efficiency frontier. The firm, as a macro-entity, may possess less knowledge of its efficiency frontier than would be achievable by adding up all the component knowledge of its agglomerated agents. Among other things, this information may reduce agency costs associated with moral hazard and adverse selection.

Moral hazard (i.e., hidden action) -- the condition under which one side to a contract can unilaterally undertake certain actions deleterious to the other side, actions which the other side cannot fully monitor or sanction -- could be reduced if workers (i) use their information to monitor other workers, and (ii) are motivated to either directly
sanction those workers found shirking or to pass information about shirking on to managers who can impose sanctions.  

Adverse selection -- the condition whereby one party to a prospective agreement knows something that the other party does not, something that if known would cause the other party to want to alter the terms of the agreement -- is also more controllable under a participatory regime. If workers have better and/or different information relative to managers about the real skills, motivations and behavioral characteristics of other workers, that information may be used to improve worker "selection" (hiring, making task assignments, discharging, etc.). Moreover, some workers, who might otherwise try to join (be selected by) a firm because they feel that they can shirk and not be caught and dismissed in that firm, will avoid the firm: worker participation in monitoring will signal to such prospects that the risk of identification and dismissal is too high.

The ability to reduce agency costs in a KMF are more problematic to RPE theorists, based on the RPE perspective which argues that all significant economic processes are inherently political (Rebitzer, 1993). Organizational structures are arranged so that power, and authority to enforce it, tends to accrue to a dominant group (e.g., management) vis a vis a subordinate group (e.g., workers). Capitalist firms involve this intensely political labor process because significant goal conflict (antagonistic relations) exists between capitalist management and labor:

26 Shirking may be viewed as the withholding of effort that, if made, would increase the firm's efficiency, or as the undertaking of effort that enhances the worker's welfare but directly reduces the firm's the efficiency. Shirking might involve task activities such as loafing instead of performing assigned tasks (withholding effort), or stealing inventory (undertaking a task that the firm disapproves of). Shirking might also involve the withholding of valuable information, or the transmission of intentionally inaccurate information.
The archetypical firm in a capitalist economy has a political structure in which workers are accountable to owners. Owners [and their agent managers]...are generally assumed to be interested in maximizing profits. In contrast, employees are generally not interested in profit maximization. (Rebitzer 1993, p. 1397)

In the RPE view, this conflict cannot be eliminated or even reduced to tolerable levels through more complete prior contracting and an agreed upon assignment of rights and claims (e.g., through profit sharing). The labor market involves a "contested exchange" in which the parties engage in personal interactions and exhibit strategic behavior designed to promote their own self-interested objectives (Bowles and Gintis, 1993b). Conflict in this exchange motivates management to establish, maintain, increase and utilize asymmetric and credible power to impose sanctions on workers.

Knowledge represents a crucial source of asymmetric power. "Employee empowerment" within a capitalist governance structure would, therefore, seem to be an oxymoron: why would capitalist management, recognizing their inherent conflict with workers, reduce their direct access to information about workers while increasing worker access to managerial information? It would appear that such action would increase the asymmetrical nature of worker knowledge while reducing the asymmetrical content of management knowledge, increasing worker power while diminishing management power.

Indeed, the basic conclusion of RPE is that where an employee participation strategy is introduced into a capitalist firm, it is just a subtle attempt to increase managerial power in order to more tightly control, exploit, and de-skill workers. Participation schemes are seen as efforts to secure worker cooperation in the competitive struggle for survival, even though such cooperation will ultimately disadvantage the workers because they impart their heretofore asymmetric information.
The RPE assessment of the capitalist labor process does recognize that capitalists must accept a certain amount of participation, since, "zones of discretion" will inevitably exist for workers even in the most Taylorized firms (Littler and Salaman 1992, p. 262). Moreover, as Michael Burawoy has argued, management requires some participative involvement on the part of workers:

Edwards and Braverman describe a similar [Taylorist] process - the advance of objectifying forces and the elimination of subjectivity...Not surprisingly, Edwards sees the major contradiction of this form of control as rigidity - the constraints it imposes on the adaption of management to the exigencies of dynamic environments ...[capitalists] cannot and must not eliminate that spontaneous cooperation of workers necessary for production...Capitalism depends on the creative participation of direct producers. (Burawoy 1981, p. 91)

The business environment is turbulent and organizations must maintain the organizational flexibility to react to change. This is nothing new.27 Given that some worker autonomy is inevitable and even necessary to prevent organizational rigidity, the challenge to management is to secure worker support for management's goals (Burawoy, 1981).

The risk associated with zones of discretion and the unique knowledge that a worker can unilaterally exercise within these zones could result in worker behavior that runs substantially contrary to management's goals.28 Management must ensure that labor performs as if its task assignments, effort levels and so forth were still tightly micro-managed by capitalists. At the least, the challenge is to make productivity-

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27 Mintzberg (1993) has updated the Chicken Little fable, with corporate strategic planners whining in exasperation, "The environment's turbulent, the environment's turbulent!"

28 In line with the arguments of others, Robert Wrenn (1982) proposes that management hopes to attain two key things via participatory schemes. One is that workers come to accept management's goals as their own goals. The second thing is management's acquisition of knowledge that was previously privy only to the workers.
enhancing changes in the process without increasing worker resistance to management's goals and key perquisites (Donald Wells, 1987). Such a challenge exists when a firm tries to enhance its flexibility and general competitiveness by empowering workers. Assef Bayat concludes, however, that employee participation schemes yield greater apparent worker control over their jobs, but management does not actually lose control of the production process:

The important feature of the network companies is said to be a tendency towards entrepreneurship and flexibility. However, one should view this feature rather carefully. In the informal workplaces, whilst workers exert a good deal of control over the organization of their work, none the less they operate within and are constrained...by the global capitalist system. On the other hand, flexibility and less bureaucratization have become an advantage not for workers per se but for the lower and middle managers. In short, the gigantic bureaucratic corporations seem to have broken down, yet on the shop floor, workers remain under the strict control of the employers. (Bayat 1991, p. 188)

Much of the essence of this radical critique of employee participation schemes is captured by Mark Young's reflections on continuous improvement or "Kaizan":

Under Kaizan, workers are required to make continuous production improvements and impart their local information to management, which can be programmed into software to drive industrial robots and replace workers. Further, because of recent downsizing, many employees [now] believe that adopting Kaizan means that they will ultimately lose their jobs or that their jobs will become even more demanding [and that management is likely to renge on] long term employment and no lay-off policies. (Young 1992, p. 685)

Other writers eschew (but do not reject) the worker displacement theme, concentrating instead on the effects on existing work. For example, Janice Klein (1989) has cautioned that lean production strategies can actually lead to a loss of worker autonomy, in addition to workplace speed-up and a greater regimentation of work. Thus, empowerment strategies may only appear to grant more autonomy to workers and
increase uncertainty regarding production. In reality, production strategies like Kaizan may create a determinist situation: worker responses to various circumstances can be essentially predicted as rational responses to the environment created by management.

Socialist critics also claim that the new methods of organizing work have the intent and effect of speeding up (intensifying) work and enhancing control. For example, David Harvey insists that "The flexibility [associated with employee participation] has little or nothing to do with decentralizing either political or economic power and everything to do with maintaining highly centralized control through decentralizing tactics" (Harvey 1991, p. 73).29 Furthermore, Graham Sewell and Barry Wilkinson argue that:

[T]he surveillance systems integral to JIT/TQM are deliberately designed such that discipline is established in a most efficient manner and the exercise of minute control is possible with a minimum of supervisors. The desired effect of harnessing these dual forces is to minimise negative divergences from expected behaviour and management defined norms whilst identifying positive divergencies and maximizing their creative potential. (Sewell and Wilkinson 1992, p. 271)

Wells also views the participative industrial relations strategies as part of a continuing effort by management to increase its control over the production process. This control is affected by establishing a better way of accessing worker information and knowledge:

The benefits management derived from its old system of control over its workers had reached its limit, yet there remained a domain of potential productivity that had not been tapped, a domain that contained the intimate knowledge that workers had of their tools and the products they made with those tools. It included the ability to report or not to report, to rectify or not to rectify, a host of production problems, and the ability to make an effort that simply could not be coerced.

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29 This theme is repeated many times over. As just one more example, Lincoln and Kallberg argue that, "Shop floor participation rarely involves real elements of industrial democracy...the idea is to diffuse responsibility without a significant change in governance structure" (Lincoln and Kallberg 1991, p. 14).
This domain lay along management's "last frontier" of control over the workers [and management] knew that this frontier could only be crossed with the voluntary cooperation of the workers. (Wells 1987, p. 105)

Employee participation is often viewed as a strategy to co-opt and deceive workers, securing their cooperation even though such cooperation may be contrary to the workers' long term interests. However, as James Lincoln and Arne Kallberg (1991) stress, if employee participation actually does increase exploitation, workers in a basically competitive economy will ultimately figure that out and then resist it. Long term survival rates for participative strategies would be low. Therefore, Eaton's (1994) finding that survival rates for participatory labor-management practices in unionized settings are 70-80% raises a question about the pernicious-effects conclusions.

Arguably, then, participative industrial relations strategies are designed in large part to cope with those inevitable zones of discretion. Littler and Salaman assert that in these zones workers can "always bargain with their obedience, effort and conscientiousness" (Littler and Salaman 1992, p. 263). Lorraine Giordano (1992) and Bayat (1991) are among those who assert that capitalist management will continue to enlist modern technology, both in the sense of tools (e.g., computer-based automation)

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30 Numerous other authors from various perspectives have dealt with this issue. For example, Levine and Tyson state that "...substantive participation [involving] formal, direct schemes like self-managing work teams...[are] arrangements [that] can actually increase managerial control over the workplace, although they may appear to dilute managerial discretion" (Levine and Tyson 1991, p. 186). This line of argument fits nicely with the Marxist roots of RPE, especially the difference between appearance and reality. Burawoy states that "...the dilemma of capitalist control is to secure surplus value while at the same time keeping it hidden" (Burawoy 1978, p. 261). With regard to employee participation, it may be theorized that the dilemma of capitalist control is to secure control while at the same time keeping it hidden.
and of organizational arrangements (including employee participation), to deal with the zones of discretion.

Bayat, in particular, argues that the technological tools as well as work arrangements are stripping effective control over work from the majority of laborers, who "are losing the freedom to determine the pace, design, quality and quantity of work, and the way things should be organized" (Bayat 1991, p. 3).\textsuperscript{31} Bayat further argues that modern CIT will further foster the progressive loss of control by labor:

The new technology - automation, robotization and computerization [or information technology] - is designed not only to increase productivity in the fiercely competitive world market, but also to establish the control of capital (or management) over those areas of work organization that had escaped from the influence of Taylorism and Fordism, and thus remained under the traditional control of workers. (Bayat 1991, p. 7)\textsuperscript{32}

RPE presents a view of essential conflict between workers and capitalist managers. However, care must be taken to avoid the assumption that RPE considers all

\textsuperscript{31} This theme is advanced by many others, notably Christopher Lasch (1987) and David Noble (1984). Noble's study of computer-numerically controlled (CNC) machine tools in the General Electric Company concluded that efficiency was sacrificed for control. Lasch, p.83) argues that, "Everything we know about technological 'progress' indicates...that it promotes inequality and unprecedented centralization of political and economic power...technical innovations usually appeal to industrialists not because they are inevitable or even because they make for greater productive efficiency, but because they consolidate the industrialist's power over the workforce" (Lasch 1987, p. 83).

\textsuperscript{32} The effects of computer and information technology on the labor process is the subject of much ambivalence. Andrew Feenberg cites situations where computerization has had the result of "intensifying surveillance and control [but] in many workplaces the drive to computerize has excited and sometimes fulfilled participatory expectations" (Feenberg 1991, p. 92). Giordano (1992), Douglas Kellner (1989), Brian Sullivan (1987), Walton (1990), and Zuboff (1988) are among other authors who discuss the dual potential of computers and communication technology. Interestingly, Feenberg argues that Marx anticipated (specifically in the Grondrisse) modern automation technology and that, like other innovations, it would create opportunities for democratization of the workplace that "may or may not be realized depending on the margin of maneuver of the dominated...Thus, if the information age technologies appear full of unprecedented threats and emancipatory potentials, this may be the effect of historical amnesia" (Feenberg 1991, p. 92).
labor-management relationships as conflicting. This thought is captured by Littler and Salaman:

Capitalists are faced with the problem of continuously transforming the forces of production. This, in turn, entails stimulating motivation and harnessing labour's creative and productive powers. Thus, capitalists must to some degree seek a cooperative relationship with labour. It cannot just exploit those capacities which can be brought into play by bribery and coercion. Similarly, side-by-side with labour's resistance to subordination lies the fact that workers have an interest in the maintenance of the capital/labour relation and the viability of the units of capital which employ them. (Littler and Salaman 1982, p. 253)

In this light, a reasoned analysis of employee participation strategies might indicate that, even from the RPE perspective, some degree of meaningful and viable participation may exist in the capitalist firm. Perhaps, as Klein (1989) suggests, we should not confuse management promises of workers autonomy with management intentions to create an unprecedented degree of mutual cooperation. Of course, one might be suspicious about the ultimate intent of such cooperative relationships, as implied by Bowles and Gintis:

Unlike the Walrasian model, where agents are "endowed" with preferences that they take with them to the market, contested exchanges shape the character and consciousness of the exchanging agents ... Where enforcement is endogenous, by contrast [to Walrasian exchanges], the value of the exchange depends on the commitments of the parties to the exchange. Because the exchange is durable and personal, the exchange parties have an interest in shaping the structure of the transaction to mold the personalities, objectives, and other characteristics of the other parties to the exchange, and at least one has the capacity to do so. Thus, for example, high wages or job security may be offered to foster goodwill... (Bowles and Gintis 1993b, p. 89)

This section has argued that RPE views knowledge as basically objective and as a stock that has been acquired prior to individuals making choices. Fuller use and distribution of that knowledge could enhance firm efficiency by reducing two kinds of
errors: (1) negative divergences from expected behavior and management norms, and (2) the failure of individuals in the firm to use their knowledge to rectify problems and thereby create positive divergences from anticipated outcomes. Negative divergence error is primarily associated with the failure to utilize worker information to improve monitoring (hence, reduce shirking by other workers) as well as allow better reaction to random shocks emanating from the environment. Organizational learning in the firm, within an RPE framework, involves an adaptive error elimination process. The firm acquires access to existing but untapped knowledge, using that knowledge to better adapt to existing conditions as well as to changing conditions caused by internal random variation or external factors.

The RPE conception poses significant problems for the workability of management-introduced employee participation programs in capitalist enterprises. To the extent that they reduce the asymmetry of worker knowledge, they reduce the power of workers, something which cognizant workers will resist if they perceive an essential antagonism of interests with management (which RPE argues to be the case). To the extent that participatory structures yield real power to workers, they would be resisted by management unless it gains at least a compensating increase in power. Since knowledge is an existing stock in the RPE model, employee participation simply redistributes knowledge. A redistribution of knowledge would cause a power shift, and would be resisted by the agents who view themselves as the potential net losers of power.
This chapter argues that an altered methodology will enhance the understanding of employee participation, primarily by altering the view of knowledge and learning. On that note, I turn to a discussion of methodology.

F. Analyzing the Labor Process: the Methodology of Mainstream Economics, RPE, and Organizational Theory

Kenneth Arrow (1994) asserts that a major foundation element of neoclassical (mainstream) economics is methodological individualism. The explanations of the outcomes of economic processes are to be found in the interaction among all of the independent decisions and actions of all of the individuals engaged in those processes. That individual agents' choices constitute the explanatory variables in mainstream economics points out another cornerstone of neoclassicism -- its reductionist approach to science. Reductionism attempts to comprehend and explain an aggregate phenomenon by decomposing it into elemental and recombinable parts, enabling more focused observation and greater control of the process.

The neoclassical side of RPE is clearly evident in its treatment of the labor process. Production is the result of a set of processes which exhibit both cooperative and conflicting purposes among the parties engaged in them. Comprehending production requires the investigation of those component processes. Moreover, production is generally a team process whereby team output essentially represents an adding up of the individual members' outputs. This concept prevails even though not all the individual outputs may be directly separable and observable. Maximizing aggregate output means maximizing the output of each individual worker and task.
RPE also approaches issues from a basically determinist viewpoint. Equilibrium, order and harmony represent the norm in the aggregate production process, though conflict may characterize the relations within the process, forces of disorder may be ever present, and shocks may occasionally disturb the equilibrium. Disturbances (shocks) affect only a dampening, or negative, feedback procedure and outcomes are essentially predictable (though subject to random error).

Furthermore, in keeping with a basically determinist perspective, uncertainty regarding the production process is not the radical uncertainty associated with Frank Knight (1985[1921]). Rather, things that are not certain exhibit parametric uncertainty. The structure of the problem and general outcomes are known but the values of the input and output coefficients are subject to incomplete information and probability distributions. That is, the production process is modelled more or less as one of risk rather than radical uncertainty. Key elements and relationships are knowable and measurable but knowledge and measurement is imprecise.

As Neil Kay (1984) points out, managerial theorists coming at the subject from the perspective of mainstream economics see the management problem as one of constrained profit maximization analyzed within a deterministic framework. Among other constraints, information about worker capacities and behavior is imperfect and costly to access but management uses the best available information to make decisions. Like the RPE school, neoclassical theorists also view the potential benefits of participation in terms of enabling decisions based on a fuller utilization of information available to the firm.
The scientific bent of organizational theorists is, like economics, based on methodological individualism. As Paul Steidelmeier puts it:

Traditional management thought in the United States has focused on the individual and his or her economic rationality in meeting the demands of self-interest. Institutions and the social order have been predominantly viewed through the prism of individualism and as an opportunity for rational individual optimization of goals and preferences. (Steidelmeier 1993, p. 189)

Stacey offers a complementary view, arguing that the management literature presents two basic models of a firm. One is an "entrepreneurial model." The other is a "rational model" which views the firm primarily as an information processing machine:

The rational model is deterministic and reductionist, like classical physics. Greater understanding and greater control of the production process is secured by breaking down the whole into smaller and smaller components for individual and detailed analysis. The primary concern expressed by the rational models is with order and harmony. (Stacey 1991, p. 114)

In the rational model, any disorder is classified as either endogenous random variation or exogenous random shock, both of which can destabilize the firm. The role of management in these models is to react to and redress any destabilizing elements affecting the production process so as to re-establish order and maintain profitability. Disorder is seen as having no useful function in a rational model of management, as is the case in economic models.

Stacey’s entrepreneurial model of the firm is depicted as "a pro-active or reactive sensing device seeking equilibrium with the [external] environment" (Stacey 1991, p. 134). Shocks emanating from the external environment still require the firm to react, but relative to the rational model’s conditions, the external environment here has a high level of parametric uncertainty. The firm cannot scan the environment and make reasonably
accurate probabilistic estimates of the states of nature in advance of making all important decisions, as is implicit in the rational model. Moreover, as events unfold, it may be difficult to determine which state of nature has actually occurred. The firm must sense the environment in real time, and apply trial and error methods of decision-making.

In the entrepreneurial model, wide-spread employee participation is supported as a way of maximizing the organization’s contact with the environment (to enhance sensing) and improving its decision-making processes by increasing the flexibility needed to undertake trial-and-error efforts. But the entrepreneurial model also recognizes the potential loss of management control in participative strategies. Stacey suggests that, under the entrepreneurial model, control is maintained as follows:

Visions and fanatically shared core values damp out the disorderly effects of widespread participation and the empowering of people. The model operates to overcome conflict and differences in perspective. It does not use confusion and conflict in an essential way, as part of a process through which organizations innovate and develop new directions. (Stacey 1991, p. 134)

Stacey’s models of management is akin to the mainstream economic models of the firm. Moreover, if political power is incorporated into the rational model (as it is in the RPE conception) not much changes regarding the methodological implications. Stacey clearly views the mainstream organizational theory methodology as essentially identical to that of neoclassical economics and RPE:

Both [the rational and entrepreneurial/power models] focus on success as the establishment of an equilibrium adaption to the environment [which is] a separate reality out there to be scanned and discovered and adapted to...Both model [types] see the only source of open-ended uncertainty confronting a successful, competently run business as random shocks coming from the environment...Both are deterministic in the traditional sense of the cause in the environment leading to an [fixed] effect in the organization...They are both squarely built on the computing machine paradigm. Political power models of management
choice...are about predictable choices flowing from stable patterns of power distribution. (Stacey 1991, p. 132)

Most of the analysis of employee participation schemes does not basically alter the aforementioned methodological approaches. In particular, a determinism is apparent. Participation simply increases the flexibility of the firm, enabling a better sensing of the objective environment and a better adaption to exogenous shocks. Wells, for example, offers this deterministic rationale for the adoption of employee participation strategies in capitalist firms that had previously been using traditional hierarchy:

Despite the advantages, there were considerable costs associated with this kind of industrial relations....The costs of supervision were also large. Not least in importance, the job classification system was too rigid to permit flexible adaption to changing technology, skill requirements, and levels of product demand. (Wells 1987, p. 104)\textsuperscript{33}

In addition to the methodological similarities between RPE, mainstream economics, and organizational theory, it can be established that these various disciplines describe the mechanics of the capitalist labor process in essentially the same way. Both RPE and mainstream economics envisage the owners as basically having legal control over governing the firm and deciding how its assets will be deployed. All strategic and tactical decisions are made by, or with the authority of, the capitalist owners. Workers are hired and maintained as agents of the owners, and, as such, are expected to carry out

\textsuperscript{33} Similar analyses are found elsewhere. For example, Ken Kusterer discusses the firm's goal of retaining "control on the shop floor so that management can respond to rapidly changing external conditions of the market" (Kusterer 1978, p. 171). Also, Giordano argues that confronting environmental turbulence, "management's overriding concern is in maintaining work organization forms that sustain and reinforce the flexible use of skill" (Giordano 1992, p. 209). Mario Morroni (1991) argues that the flexibility of production processes, which relates to the capacity to adapt to changes in the environment, has assumed a prominent role in the analysis of the firm due to an increasingly rapid evolution of market conditions.
the instructions of the firm's owners. Workers generally have little or no ownership interests in the firm and, therefore, have no governance authority.

Rebitzer (1993) argues that this authority relationship between owners and workers plays out in basically the same way in both mainstream economics and RPE. The RPE conception of the political structure of the firm gives central focus to the manner in which owners exercise authority over employees. The clearest expression of the RPE conception of authority relations within the firm is found in formal models of the use of dismissal threats to elicit high levels of work effort from employees. The most fully analyzed version of these models considers the use of dismissal threats when information about the activities of workers is either imperfect or costly to obtain.

Although they were independently developed, the formal structure of the dismissal based incentive models in the RPE literature is no different from those found in the mainstream literature on "efficiency wage" or "effort regulation" models. Firms monitor employee work effort and threaten to dismiss those found to be working in a substandard manner. Thus, economics positions the firm as a goal-seeking institution which establishes a governance structure, policies and procedures so that internal conflicts do not prevent goal achievement. The same picture is painted by Stacey with regard to the different management models:

The task which both models address are exactly the same: to secure internal harmony among people in the organization as a precondition to securing the adaptive equilibrium with the environment which ensures survival, success, and consistent streams of profit. (Stacey 1991, p. 145)

In all of these models, the relation between capitalist owners/managers and the firm's workers is one of conflict. Workers are treated as if they were standardized
bundles of work potentials, as if they were not different in terms of mental or physical dexterity. Sub-standard work is not the result of inferior worker skills, nor of random variation in effort levels, but, rather, the withholding of effort. A given level of effort will produce a given level of output. The conflict deals with the level of effort that workers will actually make, and exists because management can only imperfectly monitor worker effort and output. Workers differ ex ante on their willingness to expend effort and ex post on the effort they actually did expend, and management addresses the conflict by working on ways to increase the ex ante propensity to give effort and to increase the actual level of effort expended.

Thus it has been argued that the determinist and individualist foci of the paradigms discussed so far imply some serious problems for the firm that adopts participative strategies. These problems are discussed in more detail in the next section.

G. Problems Associated with Employee Participation in the Various Models of the Firm

A primary concern of theorists who analyze exchange within a neoclassical framework involves what Armen Alchian and Harold Demsetz (1972) identify as shirking by individuals engaged in team production. Neoclassical production theory posits that output, whether organized by markets or hierarchies, is determined by technological possibilities and the ratio and amount of factor inputs. A major source of uncertainty in a hierarchical production process is shirking by those agents providing the labor inputs.

Shirking, in this case, is the act by which a worker in the production process provides a lesser quantity and/or quality of effort than s/he agreed to deliver for the
contracted wage. Key attributes of the worker, in this regard, are the worker’s propensity to shirk and the worker’s ability to keep shirking behavior hidden. The possibility of shirking implies the presence of non-certainty with regard to actual amount of labor input that is made to the production process: actual input may fall short of planned input.

While it is assumed that the firm will pay the agreed-to wage with certainty, the firm cannot be certain that the actual effort expended by a worker is what the firm and the worker had initially agreed to. To the extent that shirking occurs, it reduces the actual level of labor input below the intended level, reducing actual output, leaving some amount of capital redundant, and increasing the labor cost per unit of output. Shirking will cause realized profit to fall short of anticipated profit, with the shortfall being some positive function of the degree of shirking.

If shirking was simply a tendency to make less than the maximal effort possible -- what Taylor (1967[1911]) referred to as "natural soldiering" -- and if information about such behavior were symmetrically distributed, the issue would be moot. Wage offers would be tied to expected net effort, adjusted for variability of net effort within the labor force. Shirking is much more of a problem when it is a strategic, self-interest seeking action taken by a party -- Taylor’s (1967[1911]) concept of "systematic soldiering" -- under conditions of asymmetric information regarding that behavior.

34 The worker’s ability to hide the evidence of shirking behavior will, of course, be one of the determinants of the worker's propensity to shirk.
Alchian and Demsetz argue that a basic and possibly severe problem of output measurement -- and, hence, the accurate identification and sanctioning of shirking -- exists in team production:

With team production it is difficult, solely by observing total output, to either define or determine each individual's contribution to this output of the cooperating inputs. The output is yielded by a team, by definition, and it is not a sum of separable outputs of each of its members...The production function is not separable into two functions each involving only inputs $X_i$ or only inputs $X_j$. (Alchian and Demsetz 1972, p. 779)

Markets are one method of coordinating economic activity, relying on information in the form of separable measurements of value (unit prices). When a team production process suppresses such measurements, or makes them costly to secure, alternative forms of economic coordination may find a place. The hierarchical firm serves as one such alternative, especially when observing and controlling the behavior of workers is viewed as a substitute for directly measuring their outputs.$^{35}$

From a neoclassical perspective, employee participation strategies can create various managerial problems. First of all, job enrichment, job enlargement, decision-making by work teams, and other facets of employee participation programs generally make the identification and monitoring of relevant input behaviors much more complicated. This further muddles the clues to each input's contribution to the team's

$^{35}$ In effect, Taylorism is an organizational strategy that attempts to mimic the market. By subdividing, simplifying and standardizing tasks, and assigning specialized workers to each task, Taylorist strategies attempt to create individual and separable loci of output which, when summed, will yield the desired aggregate output. James Tomlinson has argued that the market generates and reacts to prices and quantities that represent "positivist [information]: a set of facts, indifferent to any problems of the conceptual frameworks which are necessarily involved" (Tomlinson 1986, p. 239). Taylorism tries to establish behavioral arrangements that generate information which is just as positivist as prices and quantities, enabling the firm's work stations to operate as if they were a series of bilateral exchanges conducted in a market.
output -- a result contrary to a major rationale for using hierarchy in place of market coordination.

The hierarchical firm and a Taylorist structure uses reductionism to identify information about individual output and behavior that the market does not efficiently enable. That information is then used to monitor the participants and affect control. Employee participation strategies risk the suppression (hiding) of information on both individual input and individual output. As a result, the opportunity to engage in undetected shirking may increase when an intent of hierarchy is to reduce shirking.

Moreover, where self-managing work teams are part of the picture, monitoring itself now becomes more of a team product rather than the specialized work of management. There is an increase in the number of conceptual frameworks brought to the monitoring task, which may result in a multiplicity of interpretations about what certain behaviors imply. Additionally, as Richard Saavadra and Seog Kwon (1993) point out, assessments by active participants in a work team may differ from those made by an observer from outside of the work group, and may tend to be comparative and not absolute. Mainstream models treat information as objective and so make no allowance for idiosyncratic monitoring, but in reality, idiosyncratic monitoring is an issue.

Besides possibly increasing the opportunity to shirk and avoid sanctioning, employee participation might also reduce individual incentive to improve one’s productivity. Roland Kidwell and Nathan Bennett (1993) indicate that this conclusion would be based on the standard analysis of shirking common to the economics and organizational theory literatures. Therein, rational workers make utility maximizing
choices to free ride where possible. Strong incentives to the improvement of workers' individual performance require task arrangements that will enable a worker to clearly demonstrate his or her individual contributions to output, and be duly rewarded for those contributions. Team-based reward structures may well make the identification and reward of individual performance difficult to accomplish, and create free-rider problems.

Alchian and Demsetz (1972) position the firm as a substitute for the market, an institutional solution to the problems of team production. The firm replaces the market if it can better monitor the efforts of team workers and reward their individual contributions to productivity. Employee participation schemes seemingly risk recreating the monitoring and sanctioning problems within the firm that existed in the market and led to the creation of the firm in the first place. As Stacey observes, the management literature on employee participation generates similar concerns regarding organizational control and the maintenance of efficient operations:

The entrepreneurial model prescribes widely dispersed power which runs the risk of creating organized anarchy. It prescribes wide-spread participation which does not necessarily improve learning ability and therefore decision-making. It prescribes strongly shared values which might block perceptions [hence learning]...It prescribes unclear structures which might make tight short interval control impossible. (Stacey 1991, p. 146)

Both the economics and management literature analyze employee participation basically from an individualistic and deterministic perspective. Both focus on an adaptive learning process whereby employee participation may increase the firm's ability to reduce error through a more complete use and distribution of available knowledge. Whether knowledge is modelled explicitly as a power resource, or simply as a commodity to be exchanged, the organizational learning outcomes of participatory schemes are not
theoretically clear since participation may increase or decrease the asymmetry and utilization of knowledge. This fuzziness in the determinist economic and organizational theories regarding the impact of employee participation on organizational learning is an important factor that leads me to suggest an altered methodology. That issue is addressed next.

H. An Argument for an Altered Methodology

I conclude that the determinist frameworks of economics and management leave the issues of the viability and impact of employee participation in capitalist firms unresolved. Therefore, following Wible's (1990, p. 142) advice that "methodological considerations are useful if they help to alleviate unresolved issues surrounding economic theory," I suggest the inclusion of an indeterminist perspective in the analysis of employee participation. Coupling the determinist and indeterminist perspectives will lead to a richer analysis and better explanation of participatory strategies.36

My position is consonant with Hodgson (1988), who argues that a firm would be able to deal with parametric uncertainty through contingent contracts. If there were only parametric uncertainty, there would be no need for a firm in the hierarchical sense that we know it. Hodgson insists, therefore, that an indeterminist perspective is needed in order to develop an appropriate theory of the firm: "[I]t seems that an answer to Coase's question as to why firms exist is emerging in terms of some radical and non-probabilistic concept of uncertainty" (Hodgson 1988, p. 285).

36 My suggested approach is consistent with Hodgson's (1988) argument that an indeterminist perspective does not imply a wholesale dismissal of the rational choice perspective.
An indeterminist perspective would demand a major change in the view of organizational learning and knowledge. It would partially retain the neoclassical modelling of the firm as a "probabilistic version of general equilibrium theory" (Hodgson 1988, p. 205). Such a framework "has agents sharing one expectational model with unknown parameters, acting upon the parameters' currently most plausible values" (Arrow 1994, p. 7). Some things such as near-term production requirements may be modelled as if they were essentially predictable. However, uncertainty as formulated in the indeterminist perspective would also imply that at least some of the structure of the production problem and some of the states of nature cannot be known with certainty ex ante.

This dual condition of some essential order and predictability mixed with some essential unpredictability (though not necessarily disorder) expands the scope of the learning challenge. The firm must still pursue adaptive learning which, Senge (1990b) argues, represents the prevailing concept of what a learning firm is all about. That is, the firm must import and use knowledge created exogenously to the firm, as well as knowledge embodied in the firm's own agents, to correct errors caused by unsystematic internal variation and/or environmental randomness. Additionally, however, the firm must respond to the indeterminist form of uncertainty through experimental learning which emphasizes the endogenous creation of new knowledge. From a study of long-term corporate survival, Senge concludes that such learning is crucial:

Interestingly, the key to their survival was the ability to run "experiments at the margin," to continually explore new business and organizational opportunities that create potential new sources of growth...leading firms are focusing on generative
learning, which is about creating, as well as *adaptive* learning, which is about coping. (Senge 1990a, pp. 19-20)

Where uncertainty is fundamental, in contrast to certainty or risk, learning is not characterized by reason, but by "unreason" (Charles Handy, 1990). Imagination, not calculation, dominates decision making in the firm when true uncertainty is being dealt with, a difference postulated by Jack Amariglio:

This is the sense, then, of Shackle's treatment of uncertainty. Since we cannot know what we do not know, we must concern ourselves with the creative process -- decision-taking -- whereby imagination, and not Reason, rules. Decisions are taken as a creative acts in the face of uncertainty. These acts reflect subjects' desires to pursue paths that will bring about an outcome that they feel to be possible. (Amariglio 1990, p. 38)

The kind of decision making that Amariglio has referred to is not so much concerned with improving the firm's productivity in its established product-market arena, but improving productivity through growth via product and market diversification. Since sustained growth is as much an objective for firms as it is for the overall economy, Arrow's comment and question are apropos:

While dissemination of existing information can certainly account for some gains in productivity, it is clearly necessary for sustained growth to have information new to the system, not merely learned from others. Where does this knowledge come from? (Arrow 1994, p. 7)

In addition to the explicit emphasis that an indeterminist view puts on the growth of knowledge, there is a need for a more subtle treatment of existing knowledge. In particular, knowledge should be treated as either basically objective and determinist -- "reproducible knowledge," in Arrow's (1994, p. 6) terminology -- or basically tacit.

Tacit knowledge is individually-held knowledge which the possessor finds difficult to codify and communicate. Therefore, tacit knowledge is difficult to interpret and
evaluate, and compounds the epistemic problem created by radical uncertainty. As Gunnar Eliasson states, "Tacit knowledge defies the notion of full information and optimization behavior. With it, economic filtering and experimental behavior enter" (Eliasson 1990, p. 180).

The answer to Arrow's aforementioned question, as confirmed by Senge and by Eliasson, is that new knowledge in the face of uncertainty (generative learning) comes from experimentation. In this sense, management is truly a science. Stacey (1991) also presents a management view that is similarly in tune with the indeterminist perspective, in the sense that it focuses on the critical importance of perception and selection to deal with strategic uncertainty. He considers a firm confronting an indeterminist condition of open-ended change and emphasizes the process of discovering (detecting and selecting) key issues to be dealt with:

It is dangerous to confine the discovery of open-ended change to the top levels of the management hierarchy because small beginnings are more likely to be noticed first by those lower down in the hierarchy at the front line of business. The detection of open-ended changes and the initial selection of those to be pursued therefore have to rely on the spontaneous initiative and intuition of individuals everywhere in the organization. People detect open-ended change when they are sensitive to the anomalies and different interpretations of what is going on. (Stacey 1991, p. 50)

There is a strategic function for scanning the environment, detecting environmental change, and incorporating that knowledge (which is not particularly sensitive to different interpretations) into the decision-making process. In other words, the determinist view and adaptive learning are not irrelevant. However, this determinist perspective does not apply to open-ended disturbances, which can be characterized as
"ill-structured and unclear, small and ambiguous, giving rise to confusing preferences and objectives" (Stacey 1991, p. 273).

In the case of open-ended disturbances, decision-makers must form and test new mental models about the process and its structure, not simply better parametric estimates regarding established models. Such a process requires real-time learning in the face of a changing environment. Moreover, open-ended disturbances involve an evolutionary process, whereby the firm responds to the environment and the firm affects the environment. That is, the firm not only reacts to change but also creates change.

Eliasson presents a similar picture in which firms do not select and implement optimal plans from a well-defined and complete set of choices; rather, they learn by making hypotheses and checking them out in real time. For Eliasson, "[C]ompetition is synonymous with testing a hypothesis about one's own competence through setting up an experiment in the market" (Eliasson 1990, p. 180). The hypotheses are either rejected (they fail) or temporarily accepted (they succeed, for the time being), which results in learning. This view is similar to that of Henry Mintzberg (1993), who considers learning in which agents experiment and integrate the findings of those experiments to be one way of creating new strategies. Eliasson's emphasis on experimental learning stands out in his argument that:

[T]he state of full information is at each point in time unattainable, leaving individual agents, at each point in time, partially and differentially informed. This also establishes the experimental allocation of organizational competence as the rationale for the firm. (Eliasson 1990, p. 181)
Brian Arthur discusses this experimental learning process in terms of the inductive learning methods that modern psychologists agree human beings use in complicated and ill-defined situations:

In problems of complication, then, we look for patterns; and we simplify the problem by using these patterns to construct temporary internal models or hypotheses to work with...As feedback from the environment comes in, we may strengthen or weaken our beliefs in our current hypotheses, discarding some when they cease to perform, and replacing them as needed with new ones. (Arthur 1994, p. 406)

An additional and complementary view of organizational learning under an indeterminist perspective is presented by M. Mitchell Waldrop in his description of complex adaptive systems: "...every complex adaptive system is constantly making predictions based on various models of the world -- its implicit or explicit assumptions about the way things out there are" (Waldrop 1992, p. 146).

Another knowledge and learning issue that an indeterminist perspective highlights is the persistence versus the decay of knowledge. The mainstream economic and managerial models treat knowledge as a stock that is continually added to. While it may be implicitly recognized that technological and other change may make some prior knowledge obsolete, no explicit consideration of this matter is evident. These views are also consistent with Wible's assessment that, under an indeterminist perspective, markets and hierarchies are not substitutes but rather complements that serve to reduce disorder and fundamental uncertainty. Wible deems this complementarity to be quite important, as markets have confounding effects:

Yet the market not only creates order but also destroys it. Markets that adjust too rapidly may destroy much more useful information than they create. Markets continually construct order and annihilate it into disorder. (Wible 1995a, p. 312)
Thus, knowledge is not only subject to creative construction but to creative destruction as well. Entropy alone does not destroy knowledge. The firm may actually have to participate in bringing order into the market -- creating new models and discarding old ones through their continual strategic experimentations -- not simply to avail themselves of knowledge-based opportunities but also replace a raw material subject to spontaneous obsolescence.

This result is contrary to the basic neoclassical view in which individual firms are price- and knowledge-takers: they do not possess market power. But it is consistent with the new growth economics, since what is happening is agent-driven innovation. Firms will attempt innovative strategies with a view to earning an economic profit and, as William Nordhaus (1969) notes, a patent, trade secret, or some other source of monopoly power is needed to generate an economic profit: innovators do have the power, for awhile, to set prices.

The world view that emphasizes indeterminism supports employee participation in a few ways. In the long-run strategic sense, wide-spread participation puts lots of people in touch with the environment and gives them a more holistic view of the production process. These factors facilitate the early and accurate detection of the open-ended disturbances which might become the firm's important strategic issues. Moreover, employee participation not only creates a wide net of detection points, but also helps workers shape their individually vague perceptions of the beginnings of change by increasing communication among the workers. This reduces the chance that an important issue fails to move beyond the initial detection stage. Participation can also detect the
closed-end parametric disturbances which require no new conceptualization of the structure of the production problem and the possible states of nature, but do enable better adaption to the environment.

Not only does the integration of indeterminist and evolutionary perspectives with the standard determinist models help to better explain the organization of work; it also helps in the analysis of the impact of that organization on skills and learning, an area which currently suffers from employing only a determinist and individualist methodology. As Charles Darrah notes:

...the concept of skill requirements largely separates people from the contexts in which they work by treating the workplace as a backdrop to the actions of individuals. The workplace as a context for skilled performance becomes a given: it is simply there as a constraint upon the human actions that are performed within it. Absent is the idea that workplaces are shaped by human choice and the actions of those who work in them...how the workplace structures learning that occurs there [is excluded and] the person as an active coproducer in the workplace is missing. (Darrah 1994, p. 67)

But the indeterminist perspective also implies some limitations on the extent and nature of employee participation, as will be addressed in the following section.

I. Chaos Theory, Learning, and Participation

Chaos and complexity, and theories related thereto, are increasingly finding their way into the economics and management literature. There has been a recent mushrooming of interest in the theories of chaos and complexity as related to economic phenomena, stimulated by developments in the natural sciences. This development is described by David Freedman:

[J]ust as managers have become preoccupied with the volatility of the business environment, scientists have also become preoccupied with the inherent volatility
of nature and with the dynamics of unpredictable and unstable systems in the natural world...Put simply, while traditional science focused on analysis, prediction and control, the new science emphasizes chaos and complexity. Today scientists are developing powerful descriptions of the ways complex [adaptive] systems...cope effectively with uncertainty and change. (Freedman 1992, p. 26)

Freedman is arguing that instead of explaining order in a reductionist manner, as something that results from the careful design and control of the parts of the system, scientists increasingly focus on how order emerges out of the interaction of those parts as a whole. Indeed, this approach is what Senge (1990b) encourages through the application of systems thinking, and it is a focal point of chaos theory. The chaos and complexity perspective is used extensively by Richard Priesmeyer (1992), who analogizes business firms to complex adaptive systems that identify and manage evolving patterns of activity.

Scientific chaos is a crucial and instructive concept to bring to the theory of the firm, in part because it posits the simultaneous existence of order and stability with disorder and unpredictability, but also because it demands this co-existence. Disorder and complexity are seen as not only inevitable but also as useful to the firm in its competitive struggle for survival. Innovation springs from the choices made by economic agents when they do not have clear preferences and cannot predict the specific outcomes associated with choice alternatives. To extend on Friedrich Hayek (1967), the systematic construction of new patterns is not only the business of mathematics but the business of business!

Nonetheless, the existence of radical uncertainty can be very destabilizing for the human organization, and so feasible forms of order and control assume major
importance. The implications of the chaos perspective for the organization and management of firms are spelled out by Stacey accordingly:

"...long-term unpredictability, the uncertainty this gives rise to, and the reactions it provokes in people in an organization, all make realistic forms of stability more important...the short-term development of the organization is reasonably predictable...tight, short interval control demands simple, clear-cut hierarchies of managers and that means stable but unequal distributions of power increasingly concentrated with movement up the hierarchy. (Stacey 1991, p. 189)"

Authoritarian structures which exert hierarchical control of the firm's short run operations serve a valuable function by maintaining tight control over day-to-day operations. Such control is particularly important from a chaos perspective in which positive as well as negative feedback exists.

With negative feedback, the tendency is for small changes to die away. But positive feedback creates a particular sensitivity to initial conditions where small changes can result major, explosive changes in outcomes. Maintenance of some order is possible, and is an important counterweight to the disorder, but it requires constant and uniform attention. To risk losing the order that can and does exist is not a trivial matter.

Stacey (1992) argues, specifically, against the use of self-managing work teams with significant power over the firm's strategic decisions. Stacey (1991) also argues, generally, against widespread participation in decision-making. For Stacey, hierarchy imposes and maintains needed order, not only fostering efficient production but also reducing anxiety levels to the point where people are comfortable enough to function effectively and cope with change. Participation risks loosening the reins on feasible and useful order. Masahiko Aoki (1990a) makes a similar point, arguing that a hierarchical organization in which the planning and conduct of operations are separated is appropriate
in highly uncertain environments, because decentralized decision authority is too destabilizing. Authoritarian hierarchies are also apropos of highly stable environments, where learning at the operational level does not add much critical new knowledge to the firm.

The symbiotic relationship of order and disorder implied by a chaos theory of the firm has a counterpart in biology. As Kay argues, neoclassical economics uses a struggle-for-survival concept to support the profit maximization criterion, but one that focuses on emulation (similarity and repetition) and neglects the role of divergence which was important to Darwin:

interestingly for economics, diversification was viewed by Darwin as a basically competitive strategy; 'the more diversified the descendants from any one species become in structure, constitution, and habits, by so much will they be better enabled to seize on many widely diversified places in the polity of nature, and so be enabled to increase in numbers.' (Kay 1984, p. 34)

This line of thought argues that the firm must be both an efficient emulator and an effective diversifier in order to survive. The firm must learn how to better manage what it already does, and it must learn what new things it should do. These, however, are different functions which require different learning processes. Indeed, Dosi and Marengo assert that "[T]here is no reason why, in general, efficient design structures for allocation and control should coincide with effective design for [experimental] learning" (Dosi and Marengo 1994, p. 168).

Imitation (or emulation) is a symmetry-making and enforcing process. Successful imitation depends on the effectiveness of routines, that is habitual and predictable patterns of activity in production, marketing, investment analysis, etc. (Nelson and Sidney
Winter, 1982). Routines also include regular and patterned ways in which an organization modifies its operations over time. Knowledge is generated by executing the routines, by adapting to environmental changes and errors, and accumulated knowledge is stored in the organization’s (modified) routines. These routines are equivalent to the habitual behaviors of individuals or hierarchically structured entities such as firms, as described by Wible:

Habitual behaviors are really hierarchically organized, repetitive personal actions which...pattern our lives. The epistemic cost-reducing aspects of individual habits should not be underestimated. Repetition of any behavior or phenomenon must be a fundamental source of all knowledge and information [though they] are far from sufficient for managing the chaotic indeterminism of the world in which we live. (Wible 199, p. 322)

With regard to such routines, learning involves what Marina Bianchi describes as "a knowledge that grows with positive confirmations until the final correct result is reached" (Bianchi 1992, p. 45). Competitive success, in terms of emulation, derives from the repetition of existing routines and the imitation of effective routines utilized by other firms.

According to Nelson and Winter (1982), routines are not only an efficient way to affect and preserve the memory of the organization but also a "truce" that mediates between divergent interests of the members of a firm, not all of whom are personally committed to the smooth and profitable performance of the firm. Conflict, of course, continues to exist, but manifestations of that conflict follow predictable patterns and remain within known limits. Changing the established set of routines, however, disturbs

37 The view of the economists Nelson and Winter (1982) is consistent with that of the management theorist Stacey (1991) who argues that meaningful learning is stored in memory more as procedures (i.e., software) than as data.
this truce, especially among those individuals and groups who perceive their interests to be at risk. Nelson and Winter argue that disturbing the truce generates negative consequences: "...attempts to change routines often provoke a renewal of the conflict which is destructive to the participants and to the organization as a whole" (Nelson and Winter 1982, p. 134). This fragility may present senior management with a serious threat to the very survival of the firm if it attempts to modify key routines.

Routines are important to all organizations to some degree. They create and maintain tolerable order, and sustain a truce where some degree of goal conflict exists among the firm's various agents. The performance and improvement of routines is a key source of organizational knowledge, and involves adaptive learning skills. Significant alterations in existing routines have unknowable and unintended consequences. To the extent that hierarchy can maintain and reinforce existing routines, it may better serve the firm than extensive participation that risks fracturing routines.

Certainly, where established routines are providing adequate services in terms of organizational learning, the maintenance of useful order, and an acceptable truce, tearing them asunder is a risky undertaking. Developing a "high performance workplace" at a "brownfield site" (i.e., at an existing operation) will be resisted because doing so will annihilate currently useful knowledge and knowledge-producing routines without the assurance of their effective replacement. Even if one is contemplating a "greenfield" site (a new operation that will have to create its own routines) one should ask how routines that will create and maintain needed order will be facilitated. It may be that extensive
employee participation in operational decision making is not the most efficient way to ensure such routines.

Strategic decision making might be quite something else, however. The strategic learning challenge involves dealing with what Senge (1990b, p. 27) refers to as "dynamic complexity," where the linkages between actions undertaken and results generated are "distant in time and space" and highly uncertain. Strategic learning occurs through the experimental development and testing of hypotheses regarding the firm's competencies (Eliasson, 1990). This learning is indeterminist in nature, with, as described by Erich Jantsch (1980), symmetry-breaking experiments as the source of order. Strategic learning, and the strategic decisions made in these complex environments, are best modelled as team-oriented rather than individual-oriented.

In regard to strategic management, Richard Klimoski and Susan Mohammed argue that a team mental model is not merely a metaphor but a valid and useful construct. They view this team mental model as a knowledge structure created by groups using, conceptually, the same kind of cognitive information processing that occurs for individuals, and argue that:

Such structures are postulated to aid interpretive processes by enabling individuals to screen out information in order to prevent information overload and intolerable levels of uncertainty...Because they are the bases upon which one relates knowledge, attributes meaning, and fashions understanding, these structures are central to the sensemaking process and much of the work relating to group cognition. (Klimoski and Mohammed 1994, p. 405)
Senge (1990b) argues that the senior management's real leverage involves making strategic choices in the face of complexity and uncertainty. Stephen Hill also supports this view, arguing that "senior managers regard labor as less salient for the success of the firm than getting its management processes right" (Hill 1991, p. 398).

Appelbaum and Batt's (1994) conclusion that employee participation strategies may be unlikely in the absence of a financial crisis supports the points of Senge and Hill, even if knowledge and learning are treated as individualistic, objective and determinist. The potential improvement in the use and distribution of information may not be perceived to have much impact on the firm's performance.

An indeterminist perspective would raise additional concerns. Most current employee participation strategies can be described as strategies which involve the horizontal coordination of operations "based on the sharing of ex-post information (learned results) that become available during the implementation period" (Aoki 1991a, p. 1). To the extent that workers have joint autonomy to plan as well as execute operations, a shared mental model of the production process is required. As Klimoski and Mohammed argue, a lack of a shared understanding would require that workers make joint efforts to communicate their beliefs, understandings, preferences, and choice sets with each other, because:

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38 Senge (1990b) contrasts "dynamic complexity" to "detail complexity," with the latter term referring to situations where there are many variables and, hence, a plethora of possible outcomes. Dynamic complexity presents a knowledge problem in the sense of structural uncertainty, a problem of understanding the structure of the problem itself, and of defining a complete set of possible choices that may be selected from. Wible (1995a) has referred to this as epistemic scarcity. This is the complexity that strategic choice is primarily involved with, and it involves creating order from disorder. Detail complexity involves what I call "epistemic confusion," a difficulty in determining what the best choice is. Short run operational problems deal mostly with detail complexity.
[It] is hypothesized that the greater the overlap or commonality among team members' mental models, the greater the likelihood that team members will predict the needs of the task and team, adapt to changing demands, and coordinate activity with one another successfully. (Klimoski and Mohammed 1994, p. 421)

If this sharing and model construction must be done in real time, inefficient choices may result and tight control over operations may be relinquished. The problems created by the need to fashion and maintain a shared understanding could be particularly severe if the workforce is diverse and changing.

The issue of shared mental models is assumed away in the determinist economic and management models of the firm. In those frameworks, workers are assumed to share a common expectational model, and knowledge is treated as perfectly fathomable and not subject to different understandings. An indeterminist perspective will admit to the possibility that some knowledge may be modelled this way, but that other knowledge is very idiosyncratic. The existence of different mental models and problems of mutual understanding can hamper coordination among workers if they engage in joint decision making. Imposing, in effect, a common mental model on workers through hierarchy may be more efficient than having them develop a shared model themselves.

Employee participation strategies experience costs of investing in cross-training, building trust, and developing cooperative skills. The level of benefits, the level of costs, and the uncertainty about how well the process will be managed are all issues of importance. But beyond these issues is the general question of if and where employee participation in decision-making is the right thing to do. Most firms are engaged both in reproducing and refining its existing knowledge as well as annihilating existing
knowledge and creating new knowledge. Participative decision-making is certainly appropriate to the latter, because what this knowledge and learning is all about is creating (imagining) new mental models and subjecting them to experiments. But reproducing and refining existing knowledge may involve most of the things that a firm does, and here participation may frustrate the organizational learning process as much effort will be needed to create shared mental models among the interfacing workers.

Professional service firms, such as law firms and consultancies, are held out as examples that are highly participative. Within a determinist framework, this phenomenon is explained by arguing that observing a professional at work cannot give good clues about his or her level or quality of output. Moreover, since little physical asset specificity is involved in such work, agency problems are less severe (Dow, 1993). Additionally, however, it should be recognized that professional service firms are not basically (re)producing standardized goods and services, but are engaged in creating new knowledge. Participatory arrangements are appropriate to their learning needs. Routines are less important to organizational learning in such firms. But the great bulk of firms that engage for prolonged periods in the production of more-or-less standard products will find routine learning much more significant, and an extensive use of hierarchy more appropriate.

Given the considerations that I have discussed, I believe that some generalizations can be made about the circumstances under which employee participation will be truly viable. The remaining portion of this section will do that.
If the environment is perfectly stable, the refinement of established routines and operational efficiency will take precedence. There is no pay-off to the search for novelty and risk-taking. Participation will involve efforts to reduce asymmetric information and will tend to die away over time as informational symmetry becomes essentially complete. Perfect stability in the environment is an unlikely scenario, of course, but there may be enough stability to model it as if it were so.

Highly unstable and unpredictable environments will require participatory strategic (experimental) learning. Upper level management will, however, specialize in this learning. Especially when environmental change is rapid, product life cycles short, and speed a critical competitive weapon, the firm will stress performance control at the level of operational workers, who will be directed to rigidly adhere to robust organizational routines. Workers may still engage in adaptive learning, but even that may be quite individual rather than participative. To the extent that employee participation strategies are pursued, they will be "lean" (continuous improvement oriented) ones in which information but not authority is widely shared.

One reason that highly volatile and unpredictable environments are inconsistent with any significant degree of employee participation is that the shop floor can be a source of much needed order and stability. Moreover, the processes required to reconcile divergent representations of the environment are costly, and coordination cannot be guaranteed by utilizing some set of commonly known rules.

Coordination in this indeterminist situation is also time consuming. Windows of opportunity may be missed, and on-going change may make recently created
representations obsolete before they can break even. Another issue, especially in an established firm, is that the risk of provoking a renewal of conflict by shifting to a new organizational strategy compounds an already unstable situation caused by environmental flux.

These extremes leave a middle ground in which the external environment shifts but not too fast and not too unpredictably. Here, the costs of allowing lower level groups create and take action on their own mental models are relatively low. The resulting disorder does not exacerbate an already critical level of uncertainty, and coordination can be guaranteed by utilizing a simple set of commonly known rules (Dosi and Marengo, 1994). Windows of opportunity remain open long enough for the organization to get its act together (i.e., to detect patterns and identify opportunities that can be exploited), and reformulated representations remain valid long enough to permit opportunity exploitation to yield a payback.

As demonstrated in the figure below, there is an intermediate level of speed and unpredictability associated with environmental change that is commensurate with highly participative systems. Here, significant decentralization of authority to lower levels in the hierarchy can occur. Workers engage in both operational and strategic decision-making, and Appelbaum and Batt’s (1994) "team" system is supportable.

As one moves "down the hill," subordinate groups are granted less and less authority to form their own autonomous mental models and to define and exploit opportunities generated from those representations. Participatory relations at first migrate towards operational self-management (decision-making) within a framework
GRAPH 1

DETERMINANTS OF EMPLOYEE PARTICIPATION

Ratio of Employee Participation to Traditional Management

Speed of Environmental Change

Predictability of Environmental Change
specified by management, then towards a circumstance where workers no longer have autonomous decision-making authority but still contribute to the choice process.

Thus, the ratio of employee participation to traditional management in a firm is a function of the ratio of indeterminist knowledge to determinist knowledge that the firm must deal with. In concept, this proposition is empirically testable. For example, one might gather data on the percent of sales accounted for by new products, R&D spending per unit revenue, the rates of firm formation in and exit from the industry, and similar data that could be proxies for environmental uncertainty in given firms and markets. An analysis of participatory relations contrasted to traditional management structures might then determine if and how structure is related to environmental turbulence.

J. Conclusions

The established economic and organizational theories that have been applied to the analysis of the structure of the firm include a very limited concept of "learning." In these theories, learning is basically modelled as the acquisition of new information and the subsequent updating of an existing probability distribution regarding the outcomes associated with different possible choices. Learning occurs within a given framework or model of the environment. The learning problem is to overcome or reduce the cost of accessing and distributing asymmetrically-held but basically objective information that resides in the firm's employees. Overcoming that problem improves the quality of decisions and reduces shirking among the "team members" in the hierarchy.

This learning paradigm is inadequate to fully address the key benefit of employee participation -- improvements in organizational knowledge and learning. The unsettled
questions regarding the limited development of participative organizational structures in the face of evidence that they increase firm performance, and the kind of participation that might take hold, will not be resolved with this limited conceptualization of learning.

Employee participation is quite problematic in the standard economic and organizational theories of the capitalist firm. There is an essential incongruence of goals, and therefore conflict, between owners/managers on one hand and wage-earning workers on the other. Yet both sides also have a mutual interest in the survival and success of the firm. Information is a vital productive resource for the firm, but it is also a strategic resource for agents engaged in an intra-firm power struggle. If the culture of the firm is cooperative such that agents believe information and authority will be used to benefit the firm, participative relations can be sustained. But if conflict and a justifiable lack of trust dominates the culture, information and authority will be wielded to benefit certain agents at the expense of others. Truly participatory regimes cannot make it in such an environment.

This determinist view of information, knowledge and learning results in an indeterminate and indiscriminate position regarding employee participation. Beyond some limited cases, one cannot theorize much about where and how participatory schemes will succeed. All that can be said is that if benefits of participatory strategies exceed the costs of creating and maintaining high-trust and reciprocal labor-management relations, they will develop and survive. If the costs exceed the benefits, they will not.

The incorporation of an indeterminist and evolutionary perspective into the theory of the firm and, specifically, the analysis of organizational learning will improve the
theorizing about employee participation strategies. This improvement results from the maintenance of a role for adaptive learning and objective knowledge while adding a role for experimental learning and idiosyncratic knowledge. Both calculating and imagining have their places, but they are different processes that are differentially affected by the nature of the organization structure.

The specific inclusion of chaos theory emphasizes the duality of organizational learning. Essential order and predictability co-exist with essential disorder and complexity. Adaptive learning is very important in the sense that it supports realistic forms of stability. But inductive experimental learning is also crucial as it allows the organization to make strategic and innovative choices in the face of disorder and uncertainty.

I have argued that organizational learning involves the utilization and improvement of symmetry-making routines which are habitual and predictable, and symmetry-breaking experiments which may actually increase uncertainty and complexity (at least for a while). In regard to the former, coordination and incentive schemes are needed to address informational asymmetries and efficiently allocate information among agents in the firm -- and employee participation has a role to play here.

The experimental learning issue presents a different coordination problem. This is the need to coordinate the learning processes of many individuals who will, in general, have different mental models (representations) of the environment that they are facing. This divergence requires mechanisms to reconcile actual or potential conflicts, and
creates a need for a common knowledge base that includes shared representations and information with clear meaning (Dosi and Marengo, 1994).

The requirements of managing an experimental learning dynamic are costly, and the coordinating mechanisms of shared values and mental models can reduce the potential to learn from environmental cues colliding with employees' diverse representations. Things that enhance a dynamic and co-evolutionary process of learning can cause a loss of control and inefficiency in terms of static profit maximization. Obviously, the payoff to experimental learning must more than compensate for these actual or potential costs.
CHAPTER III

THE EFFECT OF INFORMATION TECHNOLOGY ON TRUST
IN A PARTICIPATIVE WORKPLACE

A. Introduction

This chapter investigates the relationship between the nature of the firm's information and communication structure and the level of trust by workers in upper management. It includes the results of empirical research conducted in the form of a case study of a small set of firms that have established participative strategies which include self-managing work teams. The proposition of the research is that the level of worker trust in the firm is positively affected by worker access to, and ability to make sense of, important company information.

A newly-designed and tested survey instrument was used to assess the level of worker trust in top management within the respondent companies. The instrument attempts to treat trust as a key organizational climate dimension, measuring it as a collective phenomenon rather than individual perception. Interviews with management were used to assess the nature of information access in the companies. The results of trust survey are compared to the access profiles to determine if the expected correlation exists.

The organization of the chapter is as follows. First, a brief overview on trust and information is given in Section B. Then, since an obvious requirement of measuring trust is to operationalize the concept of trust, this issue is addressed in Section C.
Sections D and E look at the role of trust in economic transactions generally, and in participative labor-management relations specifically.

Section F develops the theory of information as a determinant of the level of trust between groups, while Sections G and H discuss the role and nature of communications and information technology (CIT) in affecting high-trust versus low-trust relations.

Sections I-K discuss and support the research methodology used to conduct the empirical work. Section L provides detail on the respondent companies, while Section M covers results of the empirical research and suggestions for further research.

B. An Overview on Trust and Information

While a widespread desire exists among both management and workers to substantially alter the way work is organized and directed, and to reduce conflict in the workplace, that desire is frustrated by a lack of trust by workers in upper management:

No labor issue is more central today than labor-management cooperation. Each side favors a greater role for workers in decision-making. The big question has been how much independence and power workers should have in decision making, so that they can speak out without fear of consequences like losing their jobs. (Louis Uchitelle 1994, p. 10)

The preceding citation was taken from a study directed by Harvard labor economist Richard Freeman and University of Wisconsin sociologist Joel Rogers (1994), one which involved a survey of 2400 workers. It is particularly interesting to note that some sixty-three percent of those surveyed evinced a desire for much greater participation in decision making. Moreover, seventy-six percent believed that increased employee participation in production and operations decisions would enhance the competitiveness of their companies. But, only thirty-eight percent trusted their firms to
keep the promises they made to their workers. It would seem that the "big question" has not been adequately addressed.

Trust is fundamental to all sorts of economic processes and transactions because the parties involved cannot specify in advance all contingencies and how they will be handled. Each party may be rightly concerned that, when a contingency does arise, it may be disadvantaged by self-interested behavior on the part of the other party. This condition of uncertainty and potential disadvantage exists in the specific case of the labor agreement between workers and their firms. In this sense, David Kreps’ description of the handling of contingencies in a hierarchy is quite relevant:

Transactions can be characterized by the adjudication processes that meet unforeseen contingencies. In particular, some transactions will be hierarchical in that one party will have much more authority in saying what adaption will take place. The firm (or other organization) is meant in this theory to play the canonical role of the authoritative party: when I am employed by a firm, I accept within broad limits the firm’s right...to specify how my time will be spent as contingencies arise. (Kreps 1990, p. 92)

While empowered workplaces may be flatter hierarchies, they are still hierarchies. While trust goes both ways in a participative management structure, the asymmetry in authority remains in tact.39 Kreps’ (1990) argues that for workers to accept the canonical authority role of their employer, they must trust that it will be discharged fairly. The authority asymmetry thus emphasizes the directional importance of workers trust in top or upper management (in whom the firm invests its authoritative power), while not denying the importance of management trust in workers.

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39 A not atypical observation in this regard is found in Rothstein: "[S]enior managers need to realize that empowerment is not about increasing the power of employees; rather, it is about releasing the knowledge and motivation that employees already have" (Rothstein 1995, p. 30).
Kreps (1990) further argues that workers must believe that the firm has good reason to maintain or expand its reputation for acting fairly, and that workers must be able to observe whether the firm acts according to principles of fairness (however they are defined in the organization’s culture). Any ambiguity or uncertainty in this regard will tend to create distrust.

Since the structure of the firm’s information and communications processes will affect worker access to "observables" that might confirm or reject the appropriateness of trust, those processes are critical to the viability of participative schemes. Lawrence Rothstein quotes the CEO of Mack Trucks Inc. in this regard:

A key to achieving this kind of involvement has been maintaining a complete, consistent, and accurate flow of information about our business, from monthly performance indicators to ongoing strategies...If employees are to become stakeholders in the success or failure of a company, communication is absolutely necessary. Without it, misunderstanding, mistrust, and resistance will block the efforts of a team... (Rothstein 1995, p. 29)

C. The Concept of Trust

Diego Gambetta (1988a) asserts that cooperation between two parties is predicated on the belief of trust. Gambetta (1988b) further reasons that trust involves two essential elements: (i) one party has trust in the second party, and (ii) the first party believes that the second party has trust in it. This chapter investigates the first of Gambetta’s two elements by assessing the level of trust that workers (as one party) have in upper
management (as the second party) in situations where the firm emphasizes extensive employee participation. ⁴⁰

Worker trust in management is particularly important because employee participation is typically initiated by upper management at the plant, division or corporate level, and workers might perceive it as a self-interested ploy by management. Moreover, while upper management may have decreed the delegation of some self-management authority to workers, upper management generally retains the right to exercise control over worker behavior and to adjudicate all unforeseen contingencies that may arise. ⁴¹

Following Philip Bromiley and Larry Cummings, trust is defined as a three-dimensional belief held by one party about the behavior and motivation of another party:

[The other] individual or group (i) makes good faith efforts to behave in accordance with any commitments both explicit and implicit, (ii) is honest (truthful) in whatever negotiations preceded such commitments, and (iii) does not take excessive advantage of another even when the opportunity is available. (Bromiley and Cummings 1994, p. 4).

As Bromiley and Cummings (1994) point out, the first of the preceding dimensions is synonymous to the implication that the party will attempt to fulfill his or her commitments. The second dimension implies that the party’s true desires and actual facts, as the party understands them, affect his or her negotiation actions. The third

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⁴⁰ By extensive employee participation, I mean that front line workers, who do not have any significant decision-making authority in a traditional hierarchy, do have such authority. All the firms that I will be looking at have self-managing work teams at the level of the “factory floor.”

⁴¹ In addition to self-managing work teams, many firms -- including the ones that I investigate in this study -- also have cross-functional teams that are organized to solve specific problems. These teams disband (though they may reform at some later point) once the issue at hand is dealt with. Trust among and within these groups is also important to the success of participative workplaces, but I do not deal with that topic here.
dimension, referred to as relational contracting (Oliver Williamson, 1985), suggests that the party will not take full advantage of unforeseen contingencies at the expense of the other party.

The aforementioned conception of trust accords with numerous others. For example, Katzenbach and Smith (1994) define trust as involving the belief that other parties are honest (they adhere to their agreements, and they do not lie), competent (capable of performing their roles and tasks effectively), and committed to pursuing the goals of the team over their own personal goals. Mishra and Mishra (1994) define trust in terms of openness, competence, caring and reliability.

While this chapter deals with the role of trust in regard to labor market transactions, I will expand on the role of trust in economic exchange generally. This issue is important to understanding why hierarchy exists, and why the devolution of authority in employee participation schemes may be consistent with a flatter but still hierarchical authority structure.

D. The Role of Trust in Economic Exchange

Rebitzer (1993) investigates how mainstream economics and radical political economy differ in their analysis of the labor process in capitalist firms. He argues that under either paradigm, the concept of employee participation emphasizes long term relationships in which trust and reciprocity are major determinants of the effectiveness of the firm. These relationships contrast with the low-trust, command-and-control style of management associated with Taylorism. The focus on long term relationships by Rebitzer is consistent with the management literature as exemplified by Chester Barnard
(1938), who argues that viable cooperative relationships depended on foresight and long term commitments.

Numerous other commentators echo the importance that Rebitzer attaches to the role of trust in the organization of the workplace and in labor market transactions. For example, Alan Fox (1974) analyzes work arrangements in which employees have varying degrees of autonomy, and finds a positive correlation between the level of discretion exercised by workers and the importance of trust. Additionally, Charles Sabel (1993) asserts that mutual trust between parties to the labor agreement and other exchanges is crucial to competitive success, a point echoed by the Freeman and Rogers (1994) study. Eaton (1994) posits that whether the perspective applied involves organizational development theory or economic theory, trust is crucial to achieving good labor-management relationships required to make employee participation succeed.

Samuel Culbert and John McDonough (1985) generalize beyond the labor process, and emphasize that trust among and between various internal parties is extremely important to organizational effectiveness and success. Mark Granovetter extends even beyond the boundaries of the firm, stating that "A central theme in economic sociology is the necessity of trust and trustworthy behavior for the normal functioning of economic action and institutions" (Granovetter 1992, p. 28).

The importance of trust in the labor process is linked to the reason why firms exist in the first place. As Gary Miller (1992) points out, firms can be viewed as institutional substitutes for markets as coordinators of the economic transactions in society. Indeed, Knight (1985[1921]) referred to firms as coordination specialists. The
thrust of these arguments is that firms exist because they can coordinate economic activity in such a way as to correct market failures, thereby reducing the cost of economic transactions. As Dennis Quinn and Thomas Jones (1995) assert, these imperfections may involve externalities, information asymmetries, and production coordination issues such as agency problems.

Coordination occurs in all social production, be it organized by the market, the capitalist firm, the government or a government-chartered monopoly, or some other institution. One particular problem with the coordination of economic activity by markets is that a high level of mutual interdependence among participants can result in undetectable or costly-to-detect opportunistic behavior by the participants. Just the prospect of such "shirking" can short-circuit transactions which would otherwise be to the advantage of both parties. Opportunistic behavior that is difficult to monitor and sanction in market transactions may be more amenable to hierarchical control exercised by a firm. Moreover, as Williamson (1981) points out, the firm may affect an organizational culture that is effective in protecting its members from the exploitation which would occur in arms-length market transactions.\(^\text{42}\)

Numerous economic theorists have specifically and closely linked trust with effective coordination of economic activity. Reid (1989) argues that reducing the level of mistrust between economic transactors should be a major issue in the theory of economic coordination. Gary Becker and Kevin Murphy (1992) stress that the costs of

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\(^{42}\) As Granovetter (1985) has argued, cultural values create boundaries within which competition takes place, and limits the actions which the parties will deem to be viable choices. The concept of corporate culture includes behavioral norms which delimit such choices.
coordinating economic activity depend on whether economic operatives trust each other. Bayat (1991) indirectly argues the point about trust by positing that an atmosphere of collectivity and community will lower the costs of coordinating economic activity.

Trust is crucial because, as Partha Dasgupta (1988) and Kreps (1990) both point out, cost and cognitive limitations make it practically impossible to pre-specify and enforce every potential aspect and contingency of an economic transaction. If transactors cannot trust each other to make efficient and fair adjustments when contingencies arise, or to abide by the spirit of the agreement when one side discovers an opportunity to take a "hidden action" contrary to the interests of the other side, then many otherwise beneficial transactions will not take place. Again, this result accrues regardless of which institution is acting as the coordinator of economic transactions.

Participatory employee relations strategies involve numerous elements of trust. For example, in order to encourage workers to use their asymmetrically-held knowledge and information to enhance the firm's productivity, management grants certain authority to the workers either individually or in groups, and then backs away from close monitoring. Management must trust the workers. In turn, the workers must trust that management will not use the new access to worker knowledge and information to de-skill and/or displace workers.

I will now move to a detailed analysis specifically of the role of trust in employee participation regimes.
E. Trust and Employee Participation

Firms that are pursuing extensively participative employee relations strategies run the risk of recreating the conditions that justified using hierarchy (the firm) in place of market coordination. If workers have a tendency to behave in an opportunistic manner towards the firm and its management, creating a structure in which workers organize and supervise their own work could expose the firm to extraordinary exploitation. In effect, the market failures created by asymmetric information and subsequent opportunism could be replicated within the firm.

The firm, of course, will recognize this potential for trouble, and will want to establish effective procedures and incentives to control the tendencies toward opportunism. The traditional procedure for minimizing worker shirking in the firm has been to develop fragmented and simplified work tasks, assigning each worker a specialized and observable task (or set of tasks), and having management closely monitor worker activity. These facets are characteristic of a Taylorist organization strategy.

Monitoring can involve direct observation and measurement of individual output. Alternatively, monitoring may involve the observation of worker behavior where output is the result of a team effort and individual contributions to team output are difficult to isolate. The low-trust Taylorist-style organizational structure makes particular sense if, as Williamson (1985) has pointed out, it is difficult to identify trustworthy individuals and corroborate trustworthy behavior.

Employee participation strategies attempt to move towards a high trust scheme in which significant responsibility and authority is delegated to workers to organize and
monitor their own work. The amount of direct management supervision over work tasks is greatly reduced because, as Anne Smith and Howard Aldrich (1991) and Rebitzer (1993) have affirmed, close monitoring of one party's behavior by another party signals mistrust and undermines any existing trust.

Of course, firms pursuing participative strategies must often cope with the legacy of past low-trust structures. Darrel Ray asserts that management often overestimates the level of trust employees have in management and argues that:

The primary difficulty management faces as it makes the transition to true employee involvement is a profound lack of trust in the ranks of employees. Employees have very little reason to trust management...Most employees have many personal experiences of arbitrary and apparently unreasonable behavior by management. Whether real or imagined, these experiences affect the level of trust between management and employees. (Ray 1994, p. 64)

Ray's point about workers having little reason to trust management is reflected in a recent survey of executives by the Towers Perrin Company (1995). While seventy-three percent of the three hundred executives surveyed asserted that their employees were their firm's most important asset, these same executives ranked investing in people fifth on a six item list of key priorities. Towers and Perrin conclude, as many workers might, that a significant gap exists between the "talk" and the "walk" of management.43

The recognition of the importance of trust in participative systems is certainly not limited to academic researchers. The aforementioned quote by Mack Truck's CEO is evidence of that. Additionally, Eric Bolm reports that senior management at Hussey

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43 I will not comment on the validity of the Towers Perrin conclusion. It is not necessarily the only conclusion that can be drawn from the data. However, a stylized fact in this regard is that real top management commitment to worker empowerment concepts is frequently lacking, and that many participatory arrangements therefore fail.
Seating Corporation, a family-owned manufacturer of stadium seating in North Berwick, Maine, believes that "Trust is the most important and difficult part of making a self-managed team work" (Bolm 1990, p. 18).

It has been mentioned that close monitoring or supervision may reduce trust. Other than that one factor, however, the determinants of trust have not been identified and discussed. One of those determinants, shared information, is a focal issue in this chapter and is addressed next.

**F. Information as a Determinant of Trust**

A major proposition regarding trust involves the role of information and communication, as expressed by Arrow:

> In a world of pure self-interest if one person is dealing with another and knows something the second does not, the first person, instead of conveying that information, may take advantage of it, not for cooperative purposes, but for what might be called exploitation...What might be even more serious to the economic system in the long run than this exploitation is the creation of distrust. If you know that somebody knows more than you do, you may not pay attention to messages from that source, even though they would be helpful to you, because you may fear being manipulated. (Arrow 1979, p. 162)

Gambetta (1988b) asserts that even when all parties to a transaction have ample self-interested reason to cooperate with each other, the result may still be non-cooperative and suboptimal behavior and outcomes. The key problem, he argues, is that the communication needed to build and maintain trust is often insufficient.

Richard Langlois (1984) also asserts that communication and information asymmetries destroy trust, while symmetries support it. He models the participative
organization using game theory.\textsuperscript{44} Langlois argues that both managers and workers have the potential to behave opportunistically, in the sense of reneging on agreements when it would be in their self-interest to do so. Given the uncertainty as to whether the other side will renege, trust becomes a critical determinant of action. Access to timely and accurate information increases the level of trust that the recipient has for the party who might otherwise monopolize that information. Aoki (1990a) adds that participatory information processing between workers and management at the operational level is needed to create and maintain trust. Exactly what information must be shared might include financial data, performance goals, new product information, technical innovation and operational improvement plans, market share and other marketing data, and global strategy.

Miller (1992) offers one of the few empirical investigations about behavior and trust in work groups. Using a game theory framework, he argues that a stable cooperation requires that members of a work group must strongly believe that the other group members are pursuing a tit-for-tat strategy. Under this strategy, each group member cooperates as long as the other members do likewise. In his study of the Lincoln Electric Company, Miller concludes that labor and management attempted to create and maintain a common knowledge about each side's intentions to cooperate with

\textsuperscript{44} Numerous other theorists such as Axelrod (1984), Coleman (1990) and Kreps (1990) model the transactions between workers and management within the firm using game theory constructs. Repeated transactions are carried out as a prolonged process of bilateral exchange with no last round. Provided that reliable and timely information is available to help verify the trustworthiness of each party, norms of cooperation and trust may evolve. Kreps argues that such circumstances create the potential for "self-enforcing implicit contracts" (Kreps 1990, p. 105).
the other side, in order to support the firm’s strategy of worker empowerment and self-management.

Numerous organization theorists concur with the economists’ view of the relationship between trust and communication. For example, Douglas McGregor (1967) argues that open communication and mutual trust are concomitant factors which are crucial to effective organizational performance. Dan McCauley and Karl Kuhnert (1992) cite evidence that workers’ trust levels respond to perceptions about how their organization communicates. Indeed, Ray (1994) argues that new patterns of organizational communication are required to establish the openness and understanding required for high trust in participative industrial relations strategies.

Especially significant for high-trust participative strategies is David Krackhardt’s assertion that trust has a particularly strong impact on a firm’s ability to adapt to conditions of severe environmental change and extreme uncertainty: "People resist change and are uncomfortable with uncertainty. Strong ties create a base of trust that can reduce resistance and provide comfort in the face of uncertainty" (Krackhardt 1992, p. 218). Trust-based participatory organization structures are often adopted because they are thought to possess a greater capacity for dealing with the kind of environmental ambiguity that Krackhart discusses. Participation and the trust that it is designed to motivate also represents a response to declining worker loyalty.

As Charles Heckscher (1995) argues, workers were once willing to extend their loyalty to the firm in exchange for a guarantee of job security. Downsizing and radical uncertainty have eroded that loyalty. Workers find it increasingly difficult to trust that
their firm has the capability to offer job security. Participation at least offers a vehicle to build trust in the sense that workers believe that management is making honest, sincere efforts to secure job opportunities. Access to information about the firm's goals, strategies, financial and operating performance, etc., helps to determine whether trust in management's goodwill is justified.

Access to information is, of course, not an end in itself. Rather, it is a condition that affects the ability of an agent to make timely and valid decisions. The structure of information access will affect the quality of the information that is gleaned, and therefore the ability to make appropriately informed decisions. Therefore, I move next to a discussion of the impact of the information and communications system structure on trust.

G. Information Systems and Trust

Macro-level information and communications structures and activities have not been focal points in previous studies on intra-organizational trust. McCauley and Kuhnert (1992) report that prior studies have mostly investigated the effects of aspects of an individual worker's job and interpersonal relations. The nature of a worker's job (participation in decision making, the degree of worker autonomy, etc.) as well as certain dyadic relationships (the depth and frequency of performance feedback, the nature of a supervisor's behavior towards a worker, and interpersonal communication) are typical of the aspects investigated in prior research.45

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45 An example of this approach is found in Daniel McAllister (1995) who investigates cognition-based trust (e.g., peer reliability) and affective-based trust (e.g., reciprocal caring between individuals).
Task characteristics and dyadic relationships are certainly important to trust. However, with regard to worker trust in upper (i.e., top) management, McCauley and Kuhnert argue that "organization-wide variables are important to explaining trust in management because employees are more likely to associate system-wide variables with top management" (McCauley and Kuhnert 1992, p. 271). Specific mention is made of opportunities for professional development, assurances of job security, the perceived accuracy and fairness of the performance evaluation system, perceptions about the compensation system, disciplinary procedures, and methods of resource distribution.

One organization-wide variable not specifically analyzed by McCauley and Kuhnert is the firm's communication and information technology (CIT). Nonetheless, many analysts argue that CIT can play an important role in regard to trust by facilitating the generation and distribution of shared information. Jose Tauille (1991), for example, argues that the intensification of CIT at the grass roots level is giving workers access to information generally denied them under traditional organizational practices -- information that is deemed critical to the success of employee participation strategies. Such access enhancement is vital for Ruth Milkman (1991), who asserts that employee participation is primarily about shared and improved information flows, and for Giordano (1992) who argues that employee participation is intimately connected with information processes that increase access to data.46

46 Milkman and Giordano thus make points earlier touched on, such as by Arrow (1979) and Aoki (1990a and b), while dealing specifically with the role of CIT in creating openness and providing access.
An important methodological point is captured by Gambetta's argument that "Trust is a peculiar belief predicated not on evidence but on the lack of contrary evidence" (Gambetta 1988a, p. 234). Complete, accurate and symmetric information sharing and understanding by management and workers will not prove that parties are trustworthy. Rather, such a regime affords an opportunity to uncover evidence that would be contrary to the premise that a party is trustworthy. If a party can withstand a continuous and rigorous assessment with no uncovering of contrary evidence, the belief that it can be trusted will be greatly strengthened. While not directly referencing it, Gambetta is applying Karl Popper’s (1965) scientific methodology of falsification to the question of trust.

Smith and Aldrich (1991) support Gambetta’s stance. They work within a transactions cost framework that relates the level of trust to the amount and kind of information sharing between parties to exchanges. They argue that information sharing will reduce the potential for undetected evidence of opportunistic behavior, and that it is the lack of evidence of opportunistic behavior -- in an environment where such information would be widely distributed if it existed -- that supports the belief of trust.

In addition to being perceived as accurate and complete, shared information should not suffer from substantially different interpretations by the parties involved. As Williamson attests, things that cause greater distortion of information will result in reduced levels of trust and organizational commitment:

[Opportunism is] self-interest seeking with guile. This includes but is scarcely limited to more blatant forms such as lying...More generally, opportunism refers to the incomplete or distorted disclosures of information, especially to calculated
efforts to mislead, distort, disguise, obfuscate, or otherwise confuse. (Williamson 1985, p. 47)

The communications system by which information is made accessible is very important. As James Coleman argues, "The structure of communication that confronts potential trustors may have an important effect on the expansion and contraction of trust" (Coleman 1990, p. 189). Even if there is no asymmetric access to data, the methods by which it is distributed and accessed can lead towards faulty knowledge or understanding. This consequence will be particularly likely if data recipients do not have, and are not trained in, the capacities to accurately and efficiently make sense of the data.

Thus, overcoming the problem of asymmetric information may not be identical to overcoming the problems of asymmetric understanding and asymmetric knowledge. If workers sense an information overload because they have not learned the appropriate analytical tools and routines for handling new data, they will feel disadvantaged vis a vis top management. If they detect the threat of systematic bias in their judgments because they have not been skilled to make sense out of information newly accessible to them, they will feel further disadvantaged vis a vis top management. Such circumstances will conflict with the existence of trust even if workers have unprecedented access to "information".47

47 There are, of course, some semantic problems with the use of the terms data, information, understanding and knowledge. Data is often equated with information, and information with knowledge, and knowledge with understanding. However information is a more limited concept than knowledge. Information implies a more or less random set of inputs which have not been organized and synthesized. Knowledge includes empirical information (data) and information derived by the synthesis of empirical information. Understanding implies a comprehension of the nature and significance of something -- not just what is (knowledge), but what it means.
H. Alternative Applications of CIT

Numerous observers argue that the structure of communication and information technology can combine fruitfully with participatory working relations. Others are careful to point out that alternative scenarios are possible. Richard Walton (1990), for example, presents a trust-based "commitment model" in which CIT is used in coordinating work. This model is compatible with the argument that information distributed to and utilized at the lower levels of the organization becomes the basis of upgrading decision-making in the firm. But Walton also argues that a "compliance model," wherein the technology is deployed to increase the intensity of monitoring, is an alternative low-trust possibility.

Walton does not find a preponderance of evidence that would indicate which of his models will prevail in the future. Moreover, it is possible that what appears to be a commitment model might really be a compliance model -- a low-trust wolf in high-trust sheep's clothing. Such a result may accrue because of management's desire to control key assets such as worker loyalty along with managerial authority (in order to attain their operational and strategic goals), as expressed by Coleman:

This process follows the overall purpose of increasing one's realization of interests under the assumption that those interests can be better realized if one controls something than if one does not. Ordinarily, it may be assumed that control of a resource by an actor makes it possible to realize whatever interests that actor has in it. (Coleman 1990, p. 32)

In substantive employee participation schemes, management appears at times to be unilaterally transferring some control of authority back to the workers. Ostensibly, to use Coleman's argument, management would not unilaterally transfer such control
over its resources (i.e., managerial prerogatives) unless it believed that worker self-exercise of control would further management interests better than direct management control of the workers. If management really wants to maintain control while only appearing to transfer it, CIT may be viewed as a tool to accomplish that objective. Such an application may be further promoted if eroding loyalty increases the chasm between management’s right to control worker behavior and its actual success in affecting that control through traditional command-and-control structures.

Shoshana Zuboff confirm's Walton's point that communication and information technology may reduce worker autonomy and increase hierarchical control, stating that: "A technology that informatizes can have a corrosive effect on the hierarchical organization of work, but its transforming power finally depends upon a series of crucial managerial choices" (Zuboff 1984, p. 285). Zuboff further argues that the effects on trust within the organization will be dramatically different depending on the strategy that is followed:

In this context, access to information is critically important; the structure of access to information expresses the organization's underlying conception of authority. Employees and managers can hardly be partners in learning if there is a one-way mirror between them. Techniques of control that are meant to safeguard authority create suspicion and animosity, which is particularly dysfunctional when an organization needs to apply its human energies to inventing an alternative form of work organization better suited to the new technological context. (Zuboff 1984, p. 392)

Zuboff adds that giving workers access to the same data that managers have will reduce the workers' sense of close monitoring that they might otherwise feel. Ceteris paribus, such access should therefore promote trust in management. Minkler, however, argues that "What economists have typically posited are problems of costly observation, implicitly assuming that the problem of understanding has been solved" (Minkler 1993,
p. 17). Being informed about something is not necessarily equivalent to being knowledgeable about it. Eliminating informational asymmetries does not necessarily eliminate knowledge asymmetries.

Parties to an economic exchange may have unequal sense-making capabilities, and without an investment in knowledge, a less capable party will not be able to emulate the more capable party's performance even with identical access to information. Under such conditions, trust cannot be built simply by developing a common data base that everyone in the firm has access to, nor by some other broad form of information sharing between management and workers. Workers need the knowledge and skills to appropriately interpret the information they gain access to. Without such skills, the result of increased access to information may be information overload, and, as Emmanuel Lazega argues, "Uncertainty can arise from information overload as well as a shortage of information" (Lazega 1992, p. 2). Zuboff makes a similar point:

One element involves egalitarian access to the emerging electronic text as it increasingly represents the full spectrum of organizational functioning. The second element involves the presence of a sufficient depth of intellective skills so that those who have access to data also have access to their meaning. (Zuboff 1984, p. 356)

It would seem that the development of high levels of worker trust in upper management requires a communications structure that not only provides broad and open access to the firm's information, but that also allows workers to satisfy themselves that no crucial information is being withheld. Furthermore, the communication structure should promote understanding and learning so that ambiguity and uncertainty about "what
it all means" is minimized. Worker perceptions of restricted access or insufficient understanding will threaten the belief that trust is warranted.

Given the importance attached to the role of trust in participative industrial relations strategies (as well as in economic relationships generally), one might expect to find extensive research and theoretical conclusions about "the trust thing." In fact, however, there has been little empirical work that attempts either to measure worker trust in management or to relate the level of trust to the nature of the firm's information and communication structure. This paucity of research will be discussed in the next section.

I. Comments on the Lack of Research on Trust

Despite its importance, trust seems to a topic that suffers from little empirical research. Rebitzer concludes that, "Economists know very little about high trust incentive schemes" (Rebitzer 1993, p. 1414). Dasgupta adds, "Trust is central to all transactions, yet economists rarely discuss the notion" (Dasgupta 1988, p. 49). Gambetta (1988a) argues that almost everywhere in the social sciences the importance of trust is frequently acknowledged but hardly ever studied.

Management and organizational theorists echo this theme regarding trust. McCauley and Kuhnert (1992) assert that the importance of trust in organizations is theoretically accepted but the understanding of that construct is quite limited. They argue that this condition may be due in part to a lack of validated instruments for measuring trust between workers and top management. Mishra and Mishra (1994) argue that while the literature on organizational trust contends that trust is crucial to leadership, organizational change, and long-term success and survival, empirical studies have not
investigated the role of trust in important organizational issues like downsizing, change, or financial performance.

This essay includes the results of an effort to assess the level of trust by workers in top management in firms that are attempting to create high-trust participative employment practices. The research has been enabled in part by the development and validation of a new assessment tool designed specifically to measure trust by a group of agents in another focal group. The design of the study is discussed in the following section.

**J. The Research Design**

The study reported on herein involved the assessment of trust that workers have in upper or top management of the company, division or plant that they work for. The trust levels were measured with a survey instrument called the "Organizational Trust Inventory" (OTI), developed and validated by Cummings and Bromiley (1995, in press). A copy of this instrument appears in Appendix A. The OTI includes sixty-two statements and uses a seven-point Likert-type scale on each.\(^{48}\) Statements with a positive valence such as question 1 are analyzed so that higher scores imply greater trust. Questions with a negative valence like question 3 are reverse scored (e.g., an answer of "1" is assigned a value of "7") since lower values on these questions imply higher trust.

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\(^{48}\) Likert scales generally include either five (1-5) or seven (1-7) discrete numbers reflecting a range from low to high of (a) the degree of concurrence by the respondent to a statement, or (b) the respondent's valuation of some attribute. The scoring might be reversed with low numbers representing high concurrence or valuation. Such scales were first developed by the psychologist Rensis Likert and bear his name.
The development of the OTI offers an exciting opportunity to improve research in the realm of trust between workers and upper management which, as Ichniowski et al (1994) assert, has been hard to measure. Instruments have been developed to measure the level of trust that one individual, such as a worker, has in another "focal" individual, such as a supervisor (Steven Currall and Timothy Judge, 1992). However, as McCauley and Kuhnert argue, "Scales measuring lateral trust between an employee and top or upper management are not prevalent" (McCauley and Kuhnert 1992, p. 273). The OTI is one effort to improve such measurement.

The OTI instrument was applied to workers in a small and non-randomly selected set of three Maine-based firms, divisions and production facilities where employee participation strategies that include self-managing work teams have been adopted. None of the facilities are unionized.\textsuperscript{49} In two of the firms, all workers participating in teams have responded; in the other firm, team members were randomly selected. These firms and their attributes relevant to employee participation and trust are described in section L.

For each firm, an overall index of trust is calculated by using the mean score over all 62 questions equally weighted (since the range of values on each question is 1 - 7, the potential mean score is bounded by 1 and 7). Additionally, five sub-measurements are made by combining the sixty-two questions into five mutually exclusive groups (again,

\textsuperscript{49} Cooke (1994) has found that employee participation programs have contributed significantly more to performance enhancement in unionized firms vis a vis non-union firms, while gain-sharing and profit-sharing plans have boosted performance in non-union firms more than unionized firms. To try to avoid complications that might arise from these differences, I decided to conduct a case study of either all unionized or all non-unionized firms.
the means are calculated using equal weights for each question). The five subgroups, which are described in Appendix B, include: (1) fairness in negotiation, (2) honesty in negotiation, (3) honor, in the sense of behaving according to commitments, (4) beneficence, in the sense of not taking excessive advantage of others, and (5) dependability, in the sense of not requiring close monitoring.

Some 340 individuals completed the OTI as part of this study. Eight of the completed instruments were removed from consideration based on various factors (e.g., one had every question with the same number, 4, circled; another left twenty items unanswered), leaving 332 usable completed instruments.

The survey instruments were all completed by workers on site at their employer's place of business. A series of meetings were established during normal working hours at which subsets of the respondents met in a room and individually completed the instrument. In most cases, I met with and instructed the respondents, and collected the completed instruments. In some cases (accounting for about 60 of the 340 responses), a company representative who had met with me beforehand coordinated the surveying. In each case, the firm's communications and information structure was investigated through in-depth interviews that I conducted with company management. The degree of worker access to information, the modes of access, and the level of training that could affect comprehension of the accessible data were determined from these discussions. Perceptions of workers regarding the firm's CIT structure and their ability to make sense of the data were not assessed in this study.
Variables other than information and communications can, of course, affect trust and they need to be controlled for. One element which Levine and Tyson (1990) argue as promoting effective employee participation is the existence of a variable compensation scheme (such as gain-sharing and/or profit-sharing) that rewards workers for productivity improvements and efficiency. Also considered important are a long-term view of worker relations, as perhaps evidenced by a "no-layoff" pledge and "just-cause" dismissal policies that increase perceptions of fairness. I have attempted to control for these variables by selecting firms that are comparable along these dimensions. I have not attempted to measure the perceived fairness of each organization's appraisal system, how egalitarian the wage and authority structures are, the perceived fairness of the dismissal policy, or the effects of other policies and procedures that could be viewed as cohesion-building activities carried at the macro-level in the firm.

The methodology used in this essay, combining a direct survey approach with a case study approach, is unusual in economics. Given this methodological uniqueness, a discussion of methodology is appropriate. The next section covers that issue.

K. Methodological Considerations

Mark Esterby-Smith, et al (1991) identify two main research traditions in the management and organizational behavior field: positivism and phenomenology. The qualitative and non-positivist "phenomenological" approach develops ideas through induction from the data, and involves small samples investigated in depth or over time. The traditional methods of management research, however, have been quantitative and positivist. This description holds for economics as well, where the dominant research
methodology is described by Alan Blinder (1990) as involving the use of data from randomly selected samples which are large enough to enable generalizable statistical analysis.

Blinder’s description is consistent with Mark Blaug’s (1980) view that economic explanation entails the positivist methodology of developing theories and then attempting to validate those theories by empirical evidence. David Colander (1991) also classifies mainstream economic methodology as positivist, using formal modeling to create empirically-testable hypotheses followed by actual testing that uses sophisticated econometric techniques. All of this argumentation is consistent with Milton Friedman’s (1953) description of economics as a positivist science.

In spite of their similarities, the dominant economic and organizational methodologies differ significantly with regard to how quantitative data is collected. Interviews, questionnaires, and direct observation are commonplace techniques in the management field, but are not widely utilized in economics. As Blinder argues:

In the other social sciences, the notion that you can learn things by asking people would hardly be a revolutionary message. Yet it is something that economists not only do rarely, but often actually sneer at. (Blinder 1990, p. 297)

Colander (1991) agrees with Blinder, asserting that survey methodology is a novel technique for economists to use. Economists tend to gather their quantitative data from archives and data banks. However, as Blinder (1990) insists, most of the data which is used in economic studies comes originally from interviews or mail questionnaires. A recent example is the Freeman and Rogers (1994) study on worker participation. Their work demonstrates the confluence of attitudes regarding survey methodology in
economics and organizational science. Richard Freeman, a noted labor economist at Harvard University, and Joel Rogers, a sociologist at the University of Wisconsin who heads an institute on industrial upgrading, directed this survey of 2408 non-supervisory personnel and low- to mid-level managers. They asked the people engaged in worker participation efforts to assess its impacts. In addition, they used "focus groups" to assess certain issues.

Another difference between economics and organizational methodologies is the use of case studies in the field of organizational research, where a given research effort focusses its observation on a small number of units. Blinder (1990) argues that legitimate questions may be raised in any discipline about the representativeness and size of samples when the research involves case studies of only a few firms: such studies cannot yield statistical generalizations which are useful. However, Blinder asserts, imperfect knowledge derived from case studies may still be useful when compared to "the imperfect knowledge that non-experimental scientists can deduce theoretically or glean from econometric studies" (Blinder 1990, p. 238). Indeed, Denis Collins claims that his study of employee participation programs "demonstrates the importance of grounding the findings of large empirical data analysis with case study analysis and vice versa" (Collins 1995, p. 58).

Case study is used extensively in research on organizations. Moreover, numerous case studies involving few (1-4) firms have been conducted specifically to analyze the nature and impact of employee participation: examples include James Driscoll (1980),

Robert Yin (1984) agrees that a case study does not represent a scientific sample, and argues that the research purpose in a case study is not to enumerate frequencies (i.e., develop statistical generalizations) but to expand and generalize theories (analytical generalization). Survey strategies or the analysis of archival data are appropriate when the purpose of the research is to describe the incidence of a phenomenon, or when it is to be used to predict outcomes. However, case studies are appropriate when how and why questions predominate.

Yin describes case studies as empirical inquiries that investigate contemporary phenomena within a real-life context when the boundaries between phenomena and context are not clearly evident. Such a description fits the circumstances regarding intra-organizational trust. Moreover, with trust being so little analyzed, especially with validated trust-measurement instruments, the case study methodology used here can help to expand and generalize theories about how and why the organization of work affects trust in the workplace.

In summary, the survey and case study approaches used to gather data for this chapter represent the most appropriate methodologies given the research purpose.

L. Discussion of Respondent Company Characteristics

1. Similarities Among the Participating Firms

   The three firms in this case study share many relevant characteristics. For example, each firm is using self-managing work teams on the shop floor -- that is, front
line production workers who have traditionally been positioned at the lowest level in the organizational hierarchy are now authorized to make decisions and exercise resource control that were previously reserved for higher positions in the organization.

Each firm is using a combination of core full-time workers and part-time workers. The part-time workers bear the brunt of variations in product demand in terms of temporary or permanent lay-off. However, new full-time workers are almost completely chosen from the part-time pool. In part due to this strategy of using a contingent work force, the full-time core workers have been offered similar forms of job security and an implicit long-term employment relationship with their firms. The part-time workers at least have a sense of a long-term potential.

As mentioned earlier, none of the firms are unionized. All three firms have essentially the same "just-cause" dismissal policy for core workers, though none of the firms has established mandatory arbitration or some other dispute resolution device through which it has formally yielded its authority to dismiss workers at will. That is, none of the firms has actually established guaranteed individual rights.\textsuperscript{50}

All of the firms have instituted some program of increased information access for its front line workers, though the depth and breadth of accessible information and the methods of access differ widely. But none of the firms practices representative participation wherein elected representatives from the teams are joined with higher

\textsuperscript{50} High trust participative working environments are inconsistent with perceptions by workers that they may be penalized because of the outcomes or style of their participation. Formalized just-cause dismissal procedures may help in this regard, though workers may also perceive due process even when the dismissal policies are informal.
management to resolve issues about gain sharing results, worker suggestions for operational changes, etc.

None of the firms have made any apparent effort to compress wage differentials or institute group pay schemes as part of their overall strategy of employee participation. That is, the firms seem to be alike with regard to any measures undertaken to increase group cohesiveness. Whether the firms differ substantially in the degree to which their pay scales are egalitarian could not be determined. However, one firm has made an effort to move toward a more egalitarian authority structure by classifying all workers as "associates." Each firm has instituted training in terms of operational issues such as participatory skills, total quality management, goal setting and group communication. No firm has specifically instituted training in business finance, competitive analysis, or other strategic issues.

In sum, these three firms seem to be quite similar with respect to most characteristics other than information access that Levine (1992) and others have identified as crucial to successful participatory systems. Therefore, differences in the level of trust between the firms should not be affected by differences in these factors. One key departure from this condition is the existence of a gain-sharing and profit-sharing program in one firm but not the other two; another is that the amount of training actually done to date varies substantially.

2. Specific Characteristics of the Firms

Company A is a manufacturer of parts for the automotive industry. It is a wholly-owned subsidiary and strategic business unit of a large, international and
privately-owned firm. Company A currently has seven self-managing work teams with an total of about 80 workers in those teams, including "core workers" (full time employees) and part-time workers. Seventy-four of these individuals have completed the OTI. Three responses were deemed invalid, leaving 71 useful completed instruments to be analyzed.

Company A plans to add eight more self-managing teams by the middle of 1995. These teams will have a total of approximately 90 - 100 workers in them. Eventually, the entire production work force will be organized in teams. Team members participate in the establishment of performance measures, and share in some of the firm's planning and budget numbers. The firm's mission statement has been widely shared with the work force. Workers do not have access to balance sheet and income statement data, or head count data and plans. Workers have no on-line data access.

Workers in company A have actually received little training in terms of working in teams to this point. Supervisory level personnel have received some training and are now beginning to work at the team level. Workers have received operational skills-based training, and training in quality management techniques.

Company A has been experiencing high growth over the past few years, and has a high ratio of temporary to full-time workers. Management believes that these conditions offer core workers a strong sense of job security.

Company B is a manufacturer of electrical and electronic components which are sold directly to equipment manufacturers and through distributors. The company, one of five plants in a division of a global corporation, employs about 300 people of which
about 200 are direct production workers. The company is the only one of about 30 operations in the corporation that is using team-based methods.

Company B has five separate business units which are organized as self-managing teams. The teams include mid-level employees like production engineers, maintenance supervisors and quality managers. Front-line production workers are pretty much dedicated to working for one team, but are cross-trained and occasionally shift to other units as the mix of product line demand changes. At this point, the production workers participate in shop-floor decision making but do not select team leaders or otherwise exert group self-supervision. In this sense, they only partly participate in a team-based system, while the mid-level workers are fully engaged. However, the production workers have been informed that they will be integrated into self-managing teams in the near future.

Teams were started up in Company B by using mentors as coaches and de facto supervisors. Now the teams use internal team leaders. Different team members are rotating through stints as team leaders.

Currently, approximately eight percent of Company B's work force is part-time. The company has a goal of moving to a part-time composition of 15-18% of the work force. Full-time production job openings are generally filled from the part-time workers. Full-time workers have been accorded a degree of job security by way of a no-layoff pledge. Barring severe declines in demand, any job eliminations (including part time positions) will be accomplished through attrition or for cause.
Company B uses a skill-based pay system in which workers receive pay hikes once they become "operator certified" in new skills. Workers have not received any specialized training in accounting, computer skills, or other areas that relate to information access and interpretation. Everyone in Company B has been instructed on the firm's strategic approach to production, which is referred to as "common sense manufacturing." Everyone has access to the company's operational goal statement, which includes ten standardized goals. All employees meet quarterly to review operating performance, and goals and plans for the next quarter.

Monthly plant reviews are conducted with mid-level personnel only. These are "very involved" meetings in which all essential company information is shared, and anything deemed material can be accessed. Supervisors then meet with all production personnel, but the financial data and certain head count numbers are not shared at this level due to competitive issues. At the level of the first line production worker, all information sharing is done by hard-copy management-generated reports and physical posting. These workers do not have the on-line access to information that the mid-level employees have.

Some 44 of the 48 mid-level workers participating fully in a self-managing team mode at Company A completed the survey instrument. All 44 were used in the analysis. Some 199 production workers completed the survey, producing 194 usable completed instruments.

Company C is a privately-owned manufacturer and marketer of advertising and promotional products. The firm employs about 500 people, referring to all of them as
"associates." All of the associates have received at least forty hours of training in Total Quality concepts. Other personal development is encouraged and financed, though a "pay-for-skills" system is not used. Information sharing includes an annual "fireside chat" and "6-month Reviews" with all workers. All financial and operating performance data is reviewed, as are financial goals for the next year and six months. Monthly newsletters also give workers access to company information.

Company C's "associates" are all involved in goal setting including production output, percent rejects, percent of on-time delivery, speed of quote to customers, unit cost targets, waste reduction, etc. Company C has made extensive use of cross-functional problem-solving teams, which have included many associates. These are non-permanent ad-hoc teams organized in response to a need to investigate a problem and/or develop a solution to a problem. These teams are not operational self-managing teams that work together day in and day out.

Operational self-managing work teams are a relatively new innovation at Company C. Most associates are not currently organized in self-managing work teams, but the company plans to completely organize its workplace in that manner as quickly as possible. Associates in Company C that are organized in self-managing teams track their performance versus goals on computers. Other associates are at various stages in terms of computer literacy and ability to access company information on line, but personal development along those lines is encouraged.

The input from company C involves 25 randomly selected responses. Due to current work demands, the firm has delayed a complete survey until late summer 1995.
M. Empirical Results and Discussion

1. Data Results

An aggregate score for each company was determined by weighting each of the 62 questions equally. The responses for each question where recorded by value (1-7), and then the total number of responses for each value were summed producing a frequency distribution along the 1-7 scale. An average (mean) trust score and standard deviation were calculated for each company. In the case of Company B, the responses from mid-level team members were separated from the front-line production workers and separate scores were developed for those two groups. As shown in Table 1, Company C recorded the highest aggregate trust score with a mean of 4.85 on the scale of 1-7. Company C also had the lowest standard deviation, 1.36.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>4.09</td>
<td>1.54</td>
</tr>
<tr>
<td>Company B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teams (B₁)</td>
<td>4.12</td>
<td>1.50</td>
</tr>
<tr>
<td>Production (B₂)</td>
<td>3.61</td>
<td>1.50</td>
</tr>
<tr>
<td>Company C</td>
<td>4.85</td>
<td>1.36</td>
</tr>
</tbody>
</table>
The survey data was analyzed using the General Linear Models procedure of the SAS System. Testing the group of four entities listed in Table 1 yielded a F-value of 384.46 with three degrees of freedom. This value is well in excess of the 0.05 and 0.01 confidence interval critical values, indicating that a significant difference exists among the means of the entities. Most of the paired comparisons of group means are statistically significantly different, as demonstrated by the data in Table 2 (a set of three asterisks at the end of the line of data for each paired group indicates that the difference is significant at the 0.05 level of confidence). The lone pair for which the mean trust scores are not significantly different at the five percent level is the Company C-Company B Teams dyad.

The additional piece of analysis that created five subcategories into which the responses were grouped yielded some interesting results. In terms of these categories, all four organizations recorded higher mean scores on the "fairness" measure than on any other category. In terms of their relative rankings, as can be seen in Table 3, Company C ranks highest on Fairness while Company A and Company B's Teams are essentially at the same level and Company B's production group ranks lowest.

Table 3 shows a general pattern in which the mean scores on the five categories descend in order from highest on Fairness (Category 1) to lowest on Dependability (Category 5).

Also, note that the level of trust in each of the five categories indirectly correlated with the valence of the questions in the category. All of the questions in the "fairness"
### TABLE 2

**PAIRED COMPARISONS OF TRUST MEANS**

<table>
<thead>
<tr>
<th>Group Comparison</th>
<th>Simultaneous Lower Confidence Limit</th>
<th>Difference Between Means</th>
<th>Simultaneous Upper Confidence Limit</th>
<th>Significant Difference at .05 Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - C</td>
<td>0.60436</td>
<td>0.72997</td>
<td>0.85558</td>
<td>***</td>
</tr>
<tr>
<td>A - B₁</td>
<td>0.64404</td>
<td>0.76117</td>
<td>0.87829</td>
<td>***</td>
</tr>
<tr>
<td>A - B₂</td>
<td>1.13633</td>
<td>1.24403</td>
<td>1.35174</td>
<td>***</td>
</tr>
<tr>
<td>C - A</td>
<td>-0.85558</td>
<td>-0.72997</td>
<td>-0.60436</td>
<td>***</td>
</tr>
<tr>
<td>C - B₁</td>
<td>-0.06246</td>
<td>0.03120</td>
<td>0.12486</td>
<td>***</td>
</tr>
<tr>
<td>C - B₂</td>
<td>0.43249</td>
<td>0.51407</td>
<td>0.59565</td>
<td>***</td>
</tr>
<tr>
<td>B₁ - A</td>
<td>-0.87829</td>
<td>-0.76117</td>
<td>-0.64404</td>
<td>***</td>
</tr>
<tr>
<td>B₁ - C</td>
<td>-0.12486</td>
<td>-0.03120</td>
<td>0.06246</td>
<td>***</td>
</tr>
<tr>
<td>B₁ - B₂</td>
<td>0.41508</td>
<td>0.48287</td>
<td>0.55066</td>
<td>***</td>
</tr>
<tr>
<td>B₂ - A</td>
<td>-1.35174</td>
<td>-1.24403</td>
<td>-1.13633</td>
<td>***</td>
</tr>
<tr>
<td>B₂ - C</td>
<td>-0.59565</td>
<td>-0.51407</td>
<td>-0.43249</td>
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<tr>
<td>B₂ - B₁</td>
<td>-0.55066</td>
<td>-0.48287</td>
<td>-0.41508</td>
<td>***</td>
</tr>
<tr>
<td>Category</td>
<td>Company C</td>
<td>Company A</td>
<td>Company B</td>
<td>Teams (B₁)</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>-----------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>1. Fairness</td>
<td>5.27</td>
<td>4.50</td>
<td>4.56</td>
<td>3.77</td>
</tr>
<tr>
<td>2. Honor</td>
<td>5.14</td>
<td>4.34</td>
<td>4.31</td>
<td>3.72</td>
</tr>
<tr>
<td>3. Honesty</td>
<td>4.75</td>
<td>4.24</td>
<td>4.11</td>
<td>3.73</td>
</tr>
<tr>
<td>4. Beneficence</td>
<td>4.80</td>
<td>4.05</td>
<td>4.09</td>
<td>3.44</td>
</tr>
<tr>
<td>5. Dependability</td>
<td>4.08</td>
<td>3.25</td>
<td>3.61</td>
<td>3.46</td>
</tr>
</tbody>
</table>
category have a positive valence. Sixty percent of the questions in the "Honor" category, and fifty percent in the "Honesty" category, were positively worded. But in the two lowest ranked categories, "Beneficence" and "Dependability", only twenty percent and ten percent of the questions respectively had positive valence. This result would imply that the tenor of the question affects the response to it.

2. Discussion of Results

The pattern of the means supports the hypothesis, developed earlier, that the level of trust by workers in management is positively affected by the depth and breadth of access that workers have to the firm's information as well as by the degree to which workers can control that access themselves. Consistent with this hypothesis, Company C exhibited a higher trust index than either company A or the production group at Company B. Company C has more complete information access, more direct control of access by the workers themselves (via on-line personal computers), and more training in CIT than either of the other two groups.

One would expect that Company B's teams would rank with Company C. Both circumstances involve widespread information sharing and direct access to company data by workers. However, the mean score for Company B's Teams is actually much closer to Company A. But while the mean score for Company B Teams (B3) appears quite close to that of Company A, it is not significantly different from Company C, as shown in Table 2. In spite of that conclusion, the mean score for Company B in comparison to the other means warrants further consideration.
A significant organizational difference between Company C and Company B is that Company C has reportedly had a fairly long history of relatively cooperative relationships with its employees, even though its organizational structure was Taylorist-like. Company B has also had stable, local family ownership and management. Employee participation is not completely new, though the self-managing work team concept is. In comparison, Company B has reportedly had a history of more antagonistic labor-management relationships, absentee ownership, and recent changes in ownership. Participative management techniques represent a relatively new phenomenon at Company B and a quantum change from the previous command-and-control philosophy. One might reasonably expect some difference in trust levels of organizations that look pretty much the same at a point in time if their histories are significantly different.

Obvious limitations of this empirical research include the facts that only four firms were studied, and that not all possible explanatory variables were controlled for. More extensive research is needed. Also, there are issues that deal with the questionnaire itself. Besides the already mentioned issue of possible bias caused by the wording of the various statements in the survey instrument (the valence issue), there are conceptual issues to deal with, such as what is and is not being measured. In this regard, I will highlight the concept of "dependability."

Category 5, called Dependability, refers to the inverse of the workers' intent to record the understandings and agreements between themselves and management and then monitor (check on) compliance with agreed upon plans and projects. This category reflects a complex set of beliefs including the perceived tendency of management to take
advantage of workers (the subject of Category 4), as well as the their perceived willingness and ability to stick to schedules and fulfill specified agreements negotiated with workers (some of which may overlap with category 2). Category 5 is, therefore, not a "clean category." To the extent that record keeping and monitoring reflect a concern that management will take advantage of workers if ambiguity arises, the low rating is consistent with the fact that the next lowest rating, in general, is assigned to Beneficence. To the extent that it relates to Category 2 (unconfirmed feelings and thoughts about whether management intends to or will fulfill its commitments to the workers), the low rating would seem to conflict with the much higher ranking on Category 2.

Part of the problem with Dependability might be that no specific attempt is made to measure worker assessment of management competency. Honesty, fairness and good will are the focal points. These three elements represent necessary conditions to establish trust, for sure, but they may not be sufficient to do so. Workers may need to believe that management has the intelligence, the fortitude, the time and the resources to develop and manage participative workplaces. Even if workers believe that management possesses the necessary personal attributes, environmental factors such as a history of ownership turnover or a tenuous economic climate might lead workers to conclude that management a group will not be able to sustain a long term commitment to participation. Since the Organizational Trust Inventory measures worker attitudes about management intentions and inclinations but not their abilities, a key component of trust remains unassessed.
N. Conclusions and Recommendations

My empirical research supports the position that worker trust in management as a group is positively affected by the amount of information about the firm’s plans, conditions and performance, the ability of workers to accurately interpret that information, and the degree of control that workers have regarding that access. In doing so, I have also supported the view that information is not simply an objective reality that is interpreted in the same way by workers and managers, and so the effect of information on trust depends on the perception that workers have the skills they need to make sense of the available information as well as the power to access and manipulate the information.

I have also highlighted the position that a cross-sectional study of trust may be inadequate. The trust-enhancing or destroying conditions that exist at a point in time are important, but their effects may be tempered or expanded by historical development. Longitudinal studies are needed to evaluate how trust is developed and maintained.

I have used a methodological approach in which the nature of worker access to information and the ability of workers to make sense of it all has been defined by management. Obviously, worker perceptions of the depth and breadth of the information that they can access, their ability to validly interpret what they have access to, and the degree of control they have over access are crucial to their level of trust, and those perceptions may be different than what management believes to be the case. Future research should include an assessment of these perceptions, using separate scales to measure worker attitudes about their ability to access and understand important
organizational information should be considered in the future. Inclusion of questions that address workers' perceptions of management's ability or competence to fulfill agreements, bargain in good faith, and so forth would also be helpful.

The roles of trust and information technology have heretofore been analyzed separately in organization theory. I have argued that the two must be integrated to produce a better understanding of whether economic coordination will be done by the market, by traditional hierarchy, or by teams. Such an integrated approach would be productive if combined with the advances in game theory.
CHAPTER IV

AN INTEGRATION OF CHAPTERS I - III:
WHAT HAS BEEN LEARNED OVERALL.

This concluding chapter relates the results of the empirical investigation regarding trust to the theoretical material developed in the first two chapters of this dissertation, and assesses what has been contributed to the debate about de-skilling and technological change. The chapter also deals with what has been learned in regard to improving future research. The chapter is organized around a number of themes as classified by the subheadings used herein.

A. Information, Dominance and Trust

Chapter I demonstrates that the competitive advantage of nations or firms might be linked to an organizational strategy which enhances the power of a dominant group (e.g., merchants or managers) over a subordinate group (e.g., producers or production floor workers). In such a conflictual institutional setting, information is not only a productive asset but a power resource. A dominant group will try to maintain or expand its dominance through an informational advantage vis à vis the subordinate group. The dominant group will attempt to organize economic activity in such a way as to strip information away from the subordinate group(s) and limit the access of said group(s) to important information. In the absence of cooperation, the goals of the dominant group would be fostered by efforts to de-skill the subordinate group(s). However, as Alfred Marshall argued, the dominant group may use knowledge technologies to deceive the
subordinate group(s) with regard to its real actions and intentions. As demonstrated in Chapter III, the organization of access to information can affect worker trust in regard to whether management really is attempting to dominate and de-skill them or to cooperate with and en-skill them.

Most prominent figures in the history of economic thought viewed distrust, de-skilling and intent-to-dominate as endemic to capital-labor relations in their time. However, these scholars also concluded that cooperation among economic agents was more beneficial not only to the particular institution being analyzed but to all the parties therein -- and the parties knew it! But cooperation and an acceptance of mutual interdependence was difficult to achieve due to a lack of trust between parties, especially between capitalists and workers. Adam Smith even developed empirical support for the idea that trust is a valuable asset by arguing that owners paid higher wages to workers that they felt they could trust.

Part of the problem with trust was that it required an investment. Smith, Andrew Ure, John Stuart Mill and Marshall all concurred with this assessment. Smith, Mill and Marshall all argued that the investment should take the form of education of the worker. Marshall added that worker education and development coupled with participative work systems could enable a critical mass of trust to be achieved. Charles Babbage specifically associated worker trust in cooperative labor-management relationships with widespread access to information, arguing that firms on the continent had more cooperative relations because their workers had more information than English workers. Many current assessments of the underdeveloped state of employee participation argue
that it is the cost of the investment in building and maintaining trust that has stymied greater use of such strategies.

A major problem with the established approaches to analyzing employee participation is the determinist view of information. The key benefit of participation is argued to be the unlocking of hidden but objective information that can be used to improve the firm's efficiency. The key problem is that asymmetric access to information threatens the trust needed to support cooperative, participative workplaces. By introducing a indeterminist methodology, I have offered the view that it is the creation of new knowledge that is key benefit of participation, and that asymmetric understanding -- not simply asymmetric access -- retards trust. These theoretical views argue for a new, indeterminist conception of the firm in which information processes are at least as significant as information per se.

B. The Need to Study Group Attitudes

Chapter I shows that Mill argued that capitalists and labor were interested in reducing hostility and developing cooperative relationships. This is the same argument made in the 1994 Freeman and Rogers study on labor and management attitudes. Such attitudes and relationships, including trust, have been modelled in the history of economic thought as existing between groups or "classes" rather than individuals. Even though emotions like altruism and trust were individual traits, they were affected by and exhibited through group processes. Chapter III argues for a similar focus, and the empirical research reported on therein measures trust between workers as a group in upper or top management as a group.
As pointed out in Chapter III, trust is a "climate" element that should be measured as a collective concept, but most modern research on organizational trust has dealt with trust of one individual in another "focal" person. This approach is consistent with the methodological individualism that is characteristic of mainstream economics and organizational theory. Evaluation techniques such as the Organizational Trust Inventory that I have employed in my research are better suited to measuring trust as it relates to participative employee relations strategies. Therefore, this research provides a new perspective on interorganizational trust.

A common thread among all three chapters is the idea that innovations in information and communications technology present conflicting possibilities. On one hand, it can be used to enhance the efficiency of organizational coordination while providing broader information access. In this sense, it is a trust-builder. However, as Marshall argued, information can also be manipulated to deceive, and technological advance increases that potentiality. As with de-skilling, it is not necessarily the case that competitive capitalist firms will use CIT to dominate workers. I argue that an indeterminist perspective will help to predict and analyze the conditions under which CIT will be used to monitor workers versus those under which CIT will empower them.

C. The Importance of Information Processes

Even where a firm is not actually trying to deceive, the potential could create ambiguity or uncertainty as to the firm’s true intentions and fairness. This is a trust-buster. As argued by David Kreps (and cited in Chapter III), the result of such ambiguity is distrust. Therefore, the importance of who controls what information is
accessed and how it is accessed, which is demonstrated by the empirical work reported on in Chapter III, was apparent in the history of economic thought. Extensive information availability alone may not have much elevated trust levels then, and may not do so now.

Chapter II's emphasis on indeterminism and, hence, radical uncertainty further emphasizes the role of trust (faith?) in organizational relationships. One is dealing with more than parametric uncertainty. Knowledge involves more than accurate assessments of probabilities, and learning is more than the updating of and adaption to probability distributions. Trust cannot be based solely on individual observation of objective information. Rather, trust is based to a significant degree on a sense that a cooperative process is going on to build and maintain a common base of information and knowledge. The importance of this sense is supported by the empirical work reported on in Chapter III. I argue, therefore, that the empirical work supports the need for a new indeterminist perspective on the theory of the firm.

Another common link among the chapters is a focus on organization-wide variables. Classical and early neoclassical economic thought certainly recognizes the importance of individuals but uses a more aggregated concept of "classes" in explaining outcomes. Chapter II encourages a breaking away from a sole reliance on methodological individualism in order to incorporate holism and group-level phenomena such as shared mental models. These themes are supported by the empirical research on trust. That research focuses on organization-wide variables like information systems to explain trust.
D. A Need to Assess Perceived Management Competency

One element of trust that is omitted in the OTI instrument used to conduct the empirical analysis is the concept of "competency." This issue was important to the classical and early neoclassical economists. Openness, honesty and goodwill were necessary but not sufficient conditions, at least with regard to management trust in workers. Workers would have to be competent to take responsibility and authority without disrupting the routines necessary for consistent performance. The mutual interdependence of the many small producers in the evolving factory system and the industrial revolution meant that inconsistency would disrupt the capitalist system. A firm and its workers who affected such disruption would be severely penalized.

The increasing importance of the interconnected global economy, the shedding of ancillary businesses and a concentration on core competencies by firms, and the development of "virtual corporations" are among the factors that are re-emphasizing the need for seamless coordination that was stressed by the historians. If, as Frank Knight has argued, firms are viewed as coordination specialists, then competency in that arena will be an important determinant of trust. Further research on trust would benefit from adding a competency dimension.

E. Extensions

I have argued that de-skilling is not a necessary strategy for capitalist firms striving to maximize profits in a competitive economy. As was pointed out by Babbage in the 19th century, de-skilling is only one strategic choice. I have further argued that whether a firm will pursue an en-skilling and participative strategy depends on the degree
of uncertainty in its environment and the ability of the firm to create a communications and information technology structure that enables workers to rigorously challenge the hypothesis that their management can be trusted (if rigorous attempts to falsify that hypothesis fail, the sense of trust will be enhanced). More research is needed with respect to these elements. In particular, I would note that my empirical research made no effort to assess the speed or predictability of change in the environments of the firms that I studied, or to assess worker perceptions of management competency.
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_____.


_____.


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APPENDIX A
THE ORGANIZATIONAL TRUST INVENTORY

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Please report what you believe to be the opinions of members of your department or unit with respect to the other department or unit.

1. Your department or unit is ____________________________.
   (enter name of department or unit)

2. The other department or unit about which you are responding to is ____________________________.
   (enter name of department or unit)

Please circle the number to the right of each statement which most clearly describes the opinion of members in your department or unit toward the other department. Interpret the blank spaces as referring to the other department or unit about which you are commenting.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Slightly Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. We think the people in ___ are fair in their negotiations with us.

2. We think that ___ fairly represents its capabilities.

3. We intend to monitor changes in situations because ___ will take advantage of such changes.
4. We feel that ___ takes advantage of our department. 1 2 3 4 5 6 7
5. We feel that ___ takes advantage of us. 1 2 3 4 5 6 7
6. We intend to check whether ___ meets it obligations to our department. 1 2 3 4 5 6 7
7. We think ___ misrepresents its demands during negotiations. 1 2 3 4 5 6 7
8. We think that people in ___ manipulate others in order to gain a personal advantage. 1 2 3 4 5 6 7
9. We think ___ keeps commitments. 1 2 3 4 5 6 7
10. We plan to monitor ___'s compliance with our agreement. 1 2 3 4 5 6 7
11. We think ___ misrepresents its capabilities in negotiations. 1 2 3 4 5 6 7
12. We intend to monitor ___ closely so that they do not take advantage of us. 1 2 3 4 5 6 7
13. We think that ___ takes advantage of ambiguous situations. 1 2 3 4 5 6 7
14. We think ___ behaves according to its commitments. 1 2 3 4 5 6 7
15. We feel that we can depend on ___ to negotiate with us honestly. 1 2 3 4 5 6 7
16. We think ___ tries to take advantage of us. 1 2 3 4 5 6 7
17. We intend to negotiate cautiously with ___. 1 2 3 4 5 6 7
18. We feel we can depend on ___ to move our joint projects forward. 1 2 3 4 5 6 7
19. We think that the people in ___ use confidential information to their own advantage. 1 2 3 4 5 6 7
20. We think that ___ takes advantage of a changed situation. 1 2 3 4 5 6 7
21. We think that ____ is dependable.

22. We feel we cannot depend on ____ to fulfill its commitments to us.

23. We don’t plan on checking on ____.

24. We intend to check on ____’s progress with our projects.

25. We think that ____ negotiates agreements fairly.

26. We intend to question ____’s statements regarding their capabilities.

27. We intend to watch for misleading information from ____ in our negotiations.

28. We intend to misrepresent our capabilities in negotiations with ____.

29. We feel that ____ is straight with us.

30. We think the people in ____ tell the truth in negotiations.

31. We think that ____ meets its negotiated obligations to our department.

32. In our opinion, ____ is reliable.

33. We think the people in ____ keep their promises.

34. We worry about the success of joint projects with ____.

35. We think that the people in ____ succeed by stepping on others.

36. We think ____ keeps the spirit of an agreement.

37. We think ____ negotiates important project details fairly.
38. We feel that ___ tries to get the upper hand. 1 2 3 4 5 6 7
39. We think that ___ takes advantage of our problems. 1 2 3 4 5 6 7
40. We feel that ___ negotiates with us fairly. 1 2 3 4 5 6 7
41. We think that ___ takes advantage of our weaknesses. 1 2 3 4 5 6 7
42. We feel that ___ will keep its word. 1 2 3 4 5 6 7
43. We feel confident that ___ won’t take advantage of us. 1 2 3 4 5 6 7
44. We feel uncomfortable about ___’s willingness to stick to the schedule. 1 2 3 4 5 6 7
45. We think ___ is open in describing its strengths and weaknesses in negotiating joint projects. 1 2 3 4 5 6 7
46. We think ___ negotiates realistically. 1 2 3 4 5 6 7
47. We think ___ does not mislead us. 1 2 3 4 5 6 7
48. We intend to speak openly in our negotiations with ___. 1 2 3 4 5 6 7
49. We think that people in ___ interpret ambiguous information in their own favor. 1 2 3 4 5 6 7
50. We intend to check on the reasoning given by ___ during negotiations. 1 2 3 4 5 6 7
51. We intend to monitor ___’s behavior for timeliness. 1 2 3 4 5 6 7
52. We feel that ___ tries to get out of its commitments. 1 2 3 4 5 6 7
53. We feel that commitments made to our department will be honored by the people in ___. 1 2 3 4 5 6 7
54. We feel that ___ negotiates joint expectations fairly. 1 2 3 4 5 6 7
55. We think ___ lets us down.

56. We worry about ___’s commitment to agreed upon goals.

57. We intend to work openly with ___ because they will not take advantage of us.

58. We intend to share information cautiously with ___ to avoid having them use it to their advantage.

59. We plan to share information openly with ___ because they do not take advantage of us.

60. We plan to document all aspects of our negotiations with ___.

61. We intend to check ___’s actions to avoid being taken advantage of.

62. We feel that ___ takes advantage of people who are vulnerable.
### Subgrouping of Questions for Categories in Table 3

<table>
<thead>
<tr>
<th>Category and Percentage of Positively Worded Questions</th>
<th>Number of Questions in Category</th>
<th>Straight Scored</th>
<th>Reverse Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairness 100%</td>
<td>6</td>
<td>1, 2, 25, 37, 40, 54</td>
<td></td>
</tr>
<tr>
<td>Honor 60%</td>
<td>15</td>
<td>9, 14, 18, 21, 31, 32, 33, 42, 53</td>
<td>22, 34, 44, 52, 55, 56</td>
</tr>
<tr>
<td>Honesty 50%</td>
<td>14</td>
<td>15, 29, 30, 45, 46, 47, 48</td>
<td>7, 11, 17, 26, 27, 28, 50</td>
</tr>
<tr>
<td>Beneficence 21%</td>
<td>19</td>
<td>36, 43, 57, 59</td>
<td>4, 5, 8, 13, 16, 19, 20, 35, 38, 39, 41, 49, 58, 60, 62</td>
</tr>
<tr>
<td>Dependability 12%</td>
<td>8</td>
<td>23</td>
<td>3, 6, 10, 12, 24, 51, 61</td>
</tr>
</tbody>
</table>
INTERVIEW PROTOCOL

Prior to conducting the survey of workers using the Organizational Trust Inventory (OTI) instrument, I personally interviewed the plant manager and/or plant production manager on site at each respondent company. The purposes of those interviews were to explain the survey and to gather data about the firm’s human relations strategies and programs as well as their information technology structures. The process involved direct questions that asked the manager to describe what kind of information was made available to workers, how information could be accessed, what kinds of incentive plans (e.g., gain sharing) existed, and so forth.

The nature of worker access to company information, worker training, the kinds of job assurances (if any), and other characteristics were thus provided by management. Workers were not asked about their perceptions regarding information access, training, etc.