IMPLICATIONS OF HIGH PERFORMANCE PRODUCTION AND WORK PRACTICES FOR THEORY OF THE FIRM AND CORPORATE GOVERNANCE

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OVERVIEW

Theories of the firm based on agency theory, transaction cost economics, and the nexus of contract conception have gained currency in the past three decades. These theories emphasize the central constitutive role of contracts for firms. Critics have charged that these theories ignore crucial aspects of firms, such as human capital, and thus serve as incomplete models of economic organization. This article seeks further expansion of this viewpoint. Specifically, it seeks to deepen the insights of the human capital turn in theory of the firm through a comprehensive analysis of the changed role of employees in production and the intricate workings of contemporary business organizations. Together both analyses support a theory of the firm that relies on an understanding of organizational capabilities as the focal point for gathering these varied inputs. This expanded understanding of the firm also helps reconceptualize corporate governance. This article argues that, given the critical function of knowledge and improvements in performance in new flattened out organizations, governance structures must be realigned to maximize the potential of such factors. Some version of the team production model of corporate governance is best able to integrate and govern these varied inputs. The article thus posits a model of the firm that builds on the notion of organizational capabilities, such as those described in the account of contemporary production offered here, and relies on a governance structure that makes boards of directors responsible for coordinating the inputs of all members of the corporate team. The article concludes by considering some implications of this argument for corporate law and regulatory compliance.

I. INTRODUCTION

Firms produce. Whether we speak of automobiles, semiconductors, software or telecommunications services, the primary activity of the firm—production—remains a constant. More than any other variable, firms' ability to produce accounts for their importance in our economy and society. It is production—and production alone—that gives value to the corporation.

Existing theories of the firm address production only at the margins, if at all. These theories fixate on the central role of contracts in constituting the firm, leaving production out of the analysis. At best, however, contractual theories amount to substituting a surveyor's report on the metes and bounds of a plot of land for a detailed topographical map. While no doubt true at one level, these theories are rather limited. In seeking to transcend the neoclassical understanding of the firm as fulfilling a production function, contractual theories have lost sight of production altogether. When we consider the advanced level of production in many sectors today, this limitation is significant.

Of course, for production to occur contracts must be signed. That contracts must be concluded does not mean that production is reducible to contracts. Firms often contract for productive inputs. How they develop, organize, alter, and generate finished products is ultimately what distinguishes one firm from another, however. Contrary to some economic thinking, an analysis of the revolution in contemporary production belies the suggestion that the processes taking place within firms involve continuous negotiation of contracts.[1] Instead, it reveals a process characterized by coordination, cooperation and collective activities.

Likewise, traditional corporate law scholarship, focused on questions of control, has virtually nothing to say about production. Scholars working in this paradigm do not offer theories of the firm so much as theories of who controls the

[1] *See* Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 AM. ECON. REV. 777 (1972).

firm. Their arguments rest on an understanding of corporate decision making suited for another era. Hierarchy and unilateral decision making are the underlying models of the firm they employ. Yet contemporary firms differ from these models in important ways. Rather than a one-directional relationship of power, firms today must find discursive rather than unilateral solutions.

To make existing contractual theories of the firm more complete, we need a realistic conception of production. The notion of firm capabilities developed in evolutionary economics is one option. Capabilities theory offers a useful umbrella concept for understanding the diverse factors involved in production.[2] Capabilities are the unique innovative, productive, and knowledge-generating practices of firms. Capabilities theory is characterized by an emphasis on "experiential, localized, socially controlled and embedded knowledge and learning in understanding firm organization and behavior."[3] To render this concept more concrete, this article offers a detailed account of contemporary production. It gathers diverse phenomena such as flattened out organizational structures, devolution of productive decision making to employee teams, improved transportation,

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[2] In the past twenty years, the capabilities concept has been subject to extensive study in the field of management and business administration but has received almost no attention in the legal academy. This article will hopefully open the debate to include this broadened conception of the firm. For some leading examples of the capabilities approach, see TECHNOLOGY, ORGANIZATION AND COMPETITIVENESS: PERSPECTIVES ON INDUSTRIAL AND CORPORATE CHANGE (Giovanni Dosi et al. eds., 1998); GIOVANNI DOSI, RICHARD R. NELSON & SIDNEY G. WINTER, THE NATURE AND DYNAMICS OF ORGANIZATIONAL CAPABILITIES (2001). The work that is credited with starting the capabilities study of economic organization is RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF THE FIRM (1982). The journal *Industrial and Corporate Change* publishes much of the scholarship in this field and it dedicated a recent issue to a reassessment of Nelson and Winter's work. *See generally Special Issue: Theory of the Firm, Learning, and Organization*, 12 INDUS. & CORP. CHANGE 147 (2003).

[3] Nicholai Foss, *Bounded Rationality and Tacit Knowledge in the Organizational Capabilities Approach: An Assessment and a Re-evaluation*, 12 INDUS. & CORP. CHANGE 187 (2003).

logistics, distribution and inventory practices, use of high performance operational systems, and the deployment of knowledge within the firm. Such practices underline what we mean when we describe firm capabilities.

Capabilities theory is consistent with theories that seek to integrate human capital into the analysis of the firm. One such account developed by Margaret Blair gives standing to employees. She contends, "[T]he relationships among the people who participate in the productive activity of firms are at the heart of the definition of the firm itself."[4] Blair uses the notion of human capital to offer a more complete theory of the firm than is available through contractual accounts. The implication of Blair's analysis is that because of the importance of firm-specific human capital investments, we need to return to an entity-driven conception of the firm that offers a more organic and complete explanation than available with contractual models.

This article seeks to expand upon Blair's analysis through the notion of organizational capabilities. The capabilities conception of the firm includes such notions as human capital but also provides a framework for analyzing the entire range of firm attributes centering on tacit and explicit knowledge used in production. To unpack the notions of human capital and organizational knowledge, what is needed is an account of the organizational processes that take place within the firm. Those processes speak to a high degree of organizational integration that involves application of particular knowledge but in recent years have also come to involve new approaches to the creation and retention of knowledge as such.

Because of the distributed and tacit nature of much contemporary knowledge, traditional managerialist, director or shareholder primacy models of the firm all fail. From one perspective, our inability to settle on one account as definitive suggests that we may be at an impasse. When viewed in terms of contemporary organizations, in which the

[4] Margaret Blair, *Firm-Specific Human Capital and Theories of the Firm, in* EMPLOYEES AND CORPORATE GOVERNANCE 58-59 (Margaret Blair & Mark Roe eds., 2000).

locus of firm decision making has shifted, however, the reason for the impasse becomes clear: we cannot settle upon one dominant actor because none is truly dominant. In today's firm, power is shared rather than imposed.

To convey this notion, the term "shared managerialism" seems appropriate. Given the importance of production to the firm, managers rather than shareholders or boards contribute most to the success of the corporate venture. Yet this power is shared—with employees, as well as directors and shareholders—rather than imposed as previous managerialist models suggest. Likewise, the breakdown of the vertically integrated firm described in this article calls into question the overly hierarchical model that contemporary scholarship still retains.[5] Even if one rejects the strong claim that deverticalization is a hallmark of contemporary production, it is difficult to deny that reciprocal arrangements and teams play a significant role even in hierarchical systems. This shared managerialist understanding comports better with an understanding of the modern firm than do theories suggesting unilateral domination by one party or another.

This article contends that appropriate corporate governance mechanisms should emerge from a conception of firm capabilities. In other words, governance structures must be aligned with firm problem-solving and production practices.[6] One theory, the team production model of

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[5] Melvin Eisenberg, *The Conception that the Corporation is a Nexus of Contracts*, 24 IOWA J. CORP. L. 819 (1999) (discussing dual nature of firm as composed of reciprocal arrangements and hierarchical structures). *See also* Stephen M. Bainbridge, *Director Primacy: The Means and Ends of Corporate Governance*, 97 NW. U. L. REV. 547, 595 (2003) (arguing that given team production many firms are best described as hierarchies of teams rather than of individuals).

[6] This argument draws from a paper by Charles Sabel analyzing Japanese corporate governance and production systems. In this paper, Professor Sabel explores the disjuncture between governance and production systems and suggests the need to rethink corporate governance systems to account for new production techniques. *See* Charles Sabel, *Ungoverned Production: An American View of the Novel Universalization of Japanese Production Methods and Their Awkward Fit with Current*

corporate law, can be used to explain how all of these productive inputs are integrated.[7] Team production has become the subject of significant commentary in the field of corporate law in recent years.[8] The team production model—resting on an understanding of firm governance as primarily involving the coordination of productive inputs from a variety of actors—comports better with the picture of the firm we derive after looking under the hood. This article contends that integrating a comprehensive capabilities theory of the firm with a team production theory of corporate law can clarify the link between production and governance.

This reanalysis of the firm and its governance structures suggests a different role for corporate law than commonly thought. While corporate law focuses on ownership and control issues, the intricacies of production take place at another level. Production, while central to defining what a firm is, falls below the radar of corporate law. Literature on social norms and corporate law has begun to explore nonlegal forces that affect the operation of firms. The perspective

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Forms of Corporate Governance (Feb. 16, 1996), *at* http://www2.law.columbia.edu/sabel/papers/Japan.html (last visited Nov. 19, 2003).

[7] Margaret M. Blair & Lynn A. Stout, *A Team Production Theory of Corporate Law*, 85 VA. L. REV. 247, 271 (1999).

[8] *See* Blair & Stout, *supra* note 7; John C. Coates IV, *Measuring the Domain of the Mediating Hierarchy: How Contestable are U.S. Public Corporations?*, 24 IOWA J. CORP. L. 837 (1999); Lawrence E. Mitchell, *Trust and Team Production in Post-Capitalist Society*, 24 IOWA J. CORP. L. 869 (1999); Eisenberg, *supra* note 5; Kelley Y. Testy, *What is the "New" Corporate Social Responsibility?: Linking Progressive Corporate Law with Progressive Social Movements*, 76 TUL. L. REV. 1227 (2002); David Millon, *New Game Plan or Business as Usual?: A Critique of the Team Production Model of Corporate Law*, 86 VA. L. REV. 1001 (2000); Peter C. Konstant, *Team Production and the Progressive Corporate Law Agenda*, 35 U.C. DAVIS L. REV. 667 (2002); Eric Talley, *Taking the "I" out of "Team": Intra-Firm Monitoring and the Content of Fiduciary Duties*, 24 IOWA J. CORP. L. 1001 (1999); Alan J. Meese, *The Team Production Theory of Corporate Law: A Critical Assessment*, 43 WM. & MARY L. REV. 1629 (2002); Viet D. Dinh, *Codetermination and Corporate Governance in a Multinational Business Enterprise*, 24 IOWA J. CORP. L. 975 (1999).

offered in this article, while sympathetic to this approach, takes a somewhat different stance.

Likewise, the descriptive account of contemporary production techniques advanced in this article opens grounds for normative exploration. That is, in light of the highly developed capabilities of many firms today—involving process improvements driven by dramatically improved monitoring, gathering and application of collective knowledge—compliance and regulatory standards may need to be rethought, for example. In an era in which all production is subject to Schumpeterian "creative destruction" and continuous improvement, standards relating to corporate conduct should be just as rigorous.[9]

The article contains seven parts. Part I is the introduction. Part II provides an overview of the three leading theories of the firm that this article seeks to supplement. Part III offers an extended analysis of the new model of production and the firm that provides the basis for a capabilities-based theory of the firm and a team production model of corporate governance. In light of the discussion in Part III, Part IV will develop a capabilities theory of the firm. Part V integrates the theory of the firm advanced in Part IV with a team production approach to corporate governance. Part VI investigates some of the implications of this understanding of the firm for fiduciary duties in corporate law and approaches to regulatory compliance. The article concludes in Part VII.

II. EXISTING THEORIES

A variety of theories of the firm have been proposed in recent years. Three have gained the greatest currency: agency theory, transaction cost economics ("TCE") and contractarianism (or the nexus of contracts view). As described more fully below, all of these theories take contracts as a central focus. Each holds some central

[9] JOSEPH SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY 84 (1942) (arguing that the capitalist system is assaulted by a "perennial gale of creative destruction").

insights but is limited in certain respects. The subsequent analysis in this article is designed to show that "firms know more than their contracts can tell."[10] In Section III, this article will show how much firms know and thus how lacking existing theories of the firm truly are. While I will separate the three theories for the purpose of analysis, readers should be cautioned that there appears to be little agreement on whether agency theory is really separate from the nexus of contracts view or whether they are one and the same.[11] Because I find both to be incomplete theories of the firm, it will not be necessary to resolve this debate here.

A. Agency Theory

An agency relationship arises as a contract between two or more persons under which one person (the principal) engages another person (the agent) to perform some service on his or her behalf, which involves delegating some decision-making authority to the agent.[12] Delegation raises a chief problem with which the theory is concerned: agency costs. The problem of opportunism or agency costs arises from the fact that when a principal contracts with an agent to perform a certain service, the principal lacks the ability to monitor the agent fully to oversee performance of that service.[13] Because of principals' inability to monitor agents'

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[10] Bruce Kogut & Udo Zander, *What Do Firms Do? Coordination, Identity and Learning*, 7 ORG. SCI. 502 (1992).

[11] *Compare* Oliver Hart, *An Economist's Perspective on Theory of the Firm*, 89 COLUM. L. REV. 1757 (1989) (analyzing agency theory, transaction cost, and the nexus of contracts views separately) *and* Bainbridge, *supra* note 5 (criticizing the tendency of most scholars to conflate nexus of contracts and agency theories) *with* Eisenberg, *supra* note 5, at 822 (1999) (citing Jensen and Meckling as proponents of the nexus of contracts view).

[12] Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structures*, 3 J. FIN. ECON. 305 (1976).

[13] Two of the most notable exponents of principal-agent theory, Michael Jensen and William Meckling, define agency costs in terms of "(1) the monitoring expenditures of the principal, (2) the bonding expenditures of the agent, and (3) the residual loss." *Id.* at 308.

behavior fully or draft contracts specific enough to bind agents to perform in a particular manner, principal-agent theory seeks to identify tools to reduce the costs of such dilemma.[14] These costs are typically referred to as agency costs. Agents may depart from the instructions of principals for many reasons. Shirking, rent seeking, and moral hazards are significant factors. From these simple conceptual foundations, scholars have applied principal-agent theory to more complicated cases, particularly those involved in the corporation.

Agency theorists typically view the corporation as a series of principal-agent delegations. The shareholders delegate power to boards of directors to manage the corporation on their behalf, while boards delegate power to managers to run the day-to-day operations of the firm.[15] This series of downward delegations has led some scholars to speak of cascading principal-agent relations.[16] At each level in this cascading series, agents may depart from principals' wishes, thus giving rise to agency costs. An additional source of opportunism occurs in organizations when agents violate internal rules. Of relevance are rogue traders who violate compliance procedures to reap significant personal gains.[17] Similarly, employees may engage in illegal conduct to benefit the firm, with only indirect personal gains through promotions, for instance.

The chief issue that agency theorists consider is how to design incentive structures to minimize agency costs. Through economic modeling, agency theorists seek to

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[14] The optimal contract in this case would be one which minimized the agency cost of failure to comply with the law (i.e., the sum of contracting, monitoring, other expenditures in ensuring compliance with the principal's wishes and the costs of the residual divergence). *See* Lucian Arye Bebchuk, Jesse M. Fried & David I. Walker, *Managerial Power and Rent Extraction in the Design of Executive Compensation*, 69 U. CHI. L. REV. 751, 761 (2002) (noting that no such contract could be written).

[15] Bainbridge, *supra* note 5, at 565.

[16] *See* Blair & Stout, *supra* note 7.

[17] *See* Kim Kraweic, *Accounting for Greed: Unlocking the Rogue Trader Mystery*, 79 OR. L. REV. 101, 142 (2002) (describing moral hazard problems created by bonus-driven compensation systems of financial institutions).

identify equilibria contracts that maximize utility for both principals and agents.

Although agency theory is widely accepted in the legal academy, it says very little about production. It is also rigidly hierarchical. It fails to consider the blurring of supervisory and line functions, the collaborative nature of work, worker involvement in setting performance goals, and the extensive growth in informal arrangements between firms in modern industry.[18] The view that principal-agent theory fails to account for much at the level of practice has gained currency in recent years.[19] Some theorists recognize that agency problems may be overcome through mechanisms other than monetary incentives or hierarchy.[20] Other critics charge that agency theory, while an advance on neoclassical thought, lacks an account of what firms are and how their boundaries are determined.[21] All of these observations lead to the conclusion that, as a theory of the firm, agency theory falls descriptively short.

B. Nexus of Contracts Theory

A second variant of the contractual view of the firm has come to be known as the nexus of contracts theory.[22] The

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[18] Blair & Stout, *supra* note 7, at 259. Blair and Stout make this argument by noting that principal-agent analysis fails to consider the situation in which "part of the agent's job is to figure out what needs to be done (a situation [they] suspect is the norm rather than the exception in most public corporations)." Similarly, they contend that it may not always be clear who the principal is or even who the agent is. In most corporations, they contend, relationships may be more ambiguous, because both principals and agents contribute productive inputs and neither has authority over the other. *Id.* at 259.

[19] For a particularly acute analysis, see Susan Helper, John Paul MacDuffie & Charles Sabel, *Pragmatic Collaborations: Advancing Knowledge While Controlling Opportunism*, 9 INDUS. & CORP. CHANGE 443 (2002).

[20] *Id.*

[21] Hart, *supra* note 11, at 1759.

[22] Because of its focus on contracts as the basis of the firm, this theory has also been termed "contractarianism." This article uses the terms interchangeably.

nexus of contracts view conceives of the firm as a legal fiction that serves as the "nexus for a set of contracting relations among individual factors of production."[23] Taking the legal fiction argument one step further, scholars employing this theory have questioned the firm's entity status.[24] If the firm is nothing more than the sum total of its contracts, then the status of the firm as an entity may be subject to question. The corporate charter, traditionally viewed as the basis of the firm, is reduced to a contract that incorporates either elements of state corporate law by default or terms unique to the particular corporation.[25] According to this view, all contracts appear equal. The nexus at which constitutive contracts intersect entails no ontological priority over other contracts.

This narrow approach generates a hollow understanding of the firm. Production is reduced to nothing more than the contracts that furnish individual productive inputs. The dynamic, innovative and synergistic application of productive forces is left out. It also seems to beg the Coasean question of why things are carried out within the firm rather than through the market.[26] If firms can only be distinguished based on their contractual commitments, then the role of the firm as a dynamic actor capable of innovation through

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[23] William W. Bratton, Jr., *The Nexus of Contracts Corporation: A Critical Appraisal,* 74 CORNELL L. REV. 407, 415 (1989). *See also* Bainbridge, *supra* note 5, at 552; Hart, *supra* note 11, at 1765 ("viewing the firm as a nexus of contracts is helpful in drawing attention to the fact that contractual relations with employees, suppliers, customers, creditors and others are an essential aspect of the firm").

[24] Bainbridge, *supra* note 5, at 595; Eisenberg, *supra* note 5, at 830; Blair & Stout, *supra* note 7, at 259.

[25] Henry N. Butler & Larry E. Ribstein, *Opting Out of Fiduciary Duties: A Response to the Anti-contractarians*, 65 WASH. L. REV. 1, 7 (1990).

[26] Ronald Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937). Harold Demsetz describes the problem with which Coase was concerned clearly: "Why do firms emerge as viable institutions when the perfect decentralization model amply demonstrates the allocative proficiency of the prices that emerge from impersonal markets?" HAROLD DEMSETZ, *The Theory of the Firm Revisited, in* OWNERSHIP, CONTROL, AND THE FIRM: ORGANIZATION OF ECONOMIC ACTIVITY 144, 147 (1990).

internal processes is put in question. Firm competitive advantage cannot exist in such a contract-limited world, and we would remain in the realm of neoclassical economics.

The contractarian model, by reducing the firm to a series of contracts, focuses only on firms' existing resources, much like agency theory.[27] Contractual theories assume fixed levels of technology, inputs and outputs—assumptions that bear little resemblance to actual firms.[28] The nexus of contracts approach conceives of the firm in overly static terms and cannot account for the dynamic process by which firms discover new uses of internal or external resources.[29] Moreover, given the increased value attributed to employee skills and knowledge, contractual theories of the firm underemphasize the value of firms' intangible human capital and organizational learning.[30]

C. Transaction Cost Economics

A large amount of work has gone into examining the purpose of firms since Coase argued that neoclassical economics could not account for their existence.[31] Pioneering work in transaction cost economics ("TCE") led to an understanding of the firm as a governance structure for managing transactions.[32] In response to Coase's finding that learning and haggling costs made market transactions infeasible for certain transactions, TCE theorists identified the importance of firm-specific investments as determinants

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[27] NICOLAI FOSS, CAPABILITIES AND THE THEORY OF THE FIRM 8 (Danish Research Unit for Indus. Dynamics, Working Paper No. 98-6, 1996).

[28] *Id.* at 9.

[29] *Id.* at 8-9 ("[I]t is outside the prerogative of standard contractual analysis to examine how new resource uses are discovered, how resources are accumulated, how firms learn, [and] which governance structures best promote learning under which circumstances.").

[30] *See* Blair & Stout, *supra* note 7, at 261.

[31] *See, e.g.*, OLIVER WILLIAMSON, THE MECHANISMS OF GOVERNANCE (1996); Blair & Stout, *supra* note 7; DEMSETZ, *supra* note 26; Alchian & Demsetz, *supra* note 1; Jensen & Meckling, *supra* note 12.

[32] *See generally* OLIVER WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM (1985).

of whether transactions are conducted within a firm or through market transactions. When independent actors engage in market transactions involving investments of high asset specificity, they are exposed to risks of holdup and other opportunistic behavior.[33] TCE thus shares with agency theory a concern with agency costs or opportunism.[34]

In focusing on the limitations of market transactions, TCE raises an additional point: the issue of incomplete contracting or bounded rationality. The incomplete contracting thesis is based on the observation that contingencies that arise over the life of any long-term contract make it impossible to specify ex ante the entire range of services required or the manner of performance.[35] According to Williamson, contractual hazards, such as opportunism and bounded rationality, are the key questions with which the study of governance is concerned.[36] The limitations involved in drafting complete contracts lead firms to engage in integration. When the marginal cost of overseeing a contract with a third party exceeds the cost of firms producing something in-house, integration will result.

As a practical matter, however, parties do enter relational contracts. Long-term contracts frequently leave specifics undefined in the understanding that over the course of the working relationship, the parties will refine governance arrangements and will realign incentives to reflect changed

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[33] Asset specificity refers to the extent to which a particular asset can be redeployed in another context. An asset that has been designed solely for use in producing a particular product can be considered highly specific. A standard automobile owned by a firm is nonspecific.

[34] WILLIAMSON, *supra* note 31, at 173 (noting that terms such as "moral hazard" and "agency costs" involve the same concerns as analyses of opportunism).

[35] *Id.* at 56. It is not necessarily the case that such a contract could not be written but rather that the costs of thinking, negotiating and enforcing a sufficiently complete contract would be prohibitive. *See* Hart, *supra* note 11, at 1763-64.

[36] WILLIAMSON, *supra* note 31, at 5 ("the study of governance is concerned with the *identification, explication, and mitigation of all forms of contractual hazards*").

circumstances.[37] Of course, parties can always resort to litigation to seek clarification of contractual disputes, but in practice, the overriding preference is to work through contractual issues in the pursuit of mutual goals. Indeed, as Williamson has acknowledged in recent work, hybrid arrangements constituting a midway point between market contracting and integration are increasingly prevalent.[38]

There is, however, a paradox connected to the central TCE observation. While economic organization is a tool for economizing on transaction costs, the creation of internal organization through the establishment of firms entails other transaction costs.[39] Questions of bounded rationality and agency costs arise within organizations as well as in market transactions. While TCE is helpful in explaining why some transactions occur in the market and others within firms, it does not provide a compelling account of what happens within the firm. TCE shows us that firms offer a way to economize on costs such as bounded rationality and opportunism, but to consider this sufficient for a theory of the firm is to exclude much of what happens within firms.

Similar observations hold when considering the property rights theory of the firm, a theory that builds on TCE. According to the property rights theory, assets constitute the core of the firm. By providing access to tangible and intangible assets, firms are able to direct employees.[40] Under this view, firm-specific investments of employees are investments relating to the ability to use specific assets of the firm. Once brought inside the boundaries of the firm,

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[37] OLIVER HART, FIRMS, CONTRACTS AND FINANCIAL STRUCTURE 24-26 (1995) (describing purpose and costs of renegotiating incomplete contracts).

[38] *See* WILLIAMSON, *supra* note 31.

[39] Peter G. Klein, *New Institutional Economics*, *in* ENCYCLOPEDIA OF LAW AND ECONOMICS 456, 464 (Boudewijn Bouckeart & Gerrit De Geest eds., 2000).

[40] Edward B. Rock & Michael L. Wachter, *Islands of Conscious Power: Law, Norms, and the Self-Governing Corporation*, 149 U. PA. L. REV. 1619, 1636 (2001).

nonhuman capital serves as the "glue" that ties nontransferable specific assets to the firm.[41]

The problem with this theory is that assets do too much work. The fact that firms control certain assets makes it difficult for employees to do certain work outside of a particular firm for which they are skilled. Yet that is not the entire story. The asset-based approach neglects considerations of production. By prioritizing assets, it misses the fact that assets are generally valued in their use and that the use-value of assets turns on their role in production. It also fails to explain how innovation occurs. It is not the case that the assets in existence in a firm on a given day are the sole determinants of employee behavior. Employees may change assets or re-deploy assets in a different manner or request that new assets be acquired. Employees can also invent new assets (e.g., products, methods of production). When employees create new assets for the firm, it seems strange to say that those assets are the glue that then binds the employees to the firm. Rather than suggest that the existence of employee job mobility provides grounds for denying the centrality of employees in the theory of the firm, one may more reasonably conclude that something more than straightforward contracting or control measures is involved.

This article contends that traditional scholarship misses the elusive basis upon which the firm hangs together. Neither asset nor contract based theories give adequate attention to the phenomenon of cooperation. Part of the reason for this shortcoming stems from application of hierarchical organizational theory. The intricacies of new production technologies and the deverticalization of firm management structures illustrate the cooperative nature of contemporary business practice. Application of new production and management techniques, while not eliminating agency cost and incomplete contracting problems, presents a more compelling resolution to these issues than is available through contractual theories.

[41] *Id.* at 1636.

III. THE REVOLUTION IN PRODUCTION

A. Overview

In the past twenty years, capitalist production has undergone major changes. This article argues that, as a result of these changes, we need to rethink the theory of the firm. Existing models of the firm arose during an earlier era and are based on a now antiquated model, the large vertically integrated corporation.[42] This article's argument is not that large firms have ceased to exist, that they have become unimportant, or that they fail to exhibit some of the tendencies towards vertical integration that Alfred Chandler has described so well. Instead, this article argues that the increase in alliances, networks, hybrid corporate forms, and the decentralization of power between and among firms across industry has eclipsed the traditional model of the firm.[43] Rather than provide a comprehensive analysis of these developments, this article offers a survey.

To provide footing for this broad argument, this article will focus on four specific developments. Manual Castells identified these four points as indicative of the causes and consequences of the restructuring of capitalism since the

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[42] For a canonical account of the paradigmatic firm of the twentieth century, see generally ALFRED CHANDLER, THE VISIBLE HAND: THE MANAGERIAL REVOLUTION IN AMERICAN BUSINESS (1977); ALFRED CHANDLER, SCALE AND SCOPE: THE DYNAMICS OF INDUSTRIAL CAPITALISM (1990).

[43] *See, e.g.*, Todd R. Zenger & William S. Hesterly, 8 ORG. SCI. 3 (1997) (speaking of "a progressive 'swelling' of the zone between hierarchy and market" and contending that new hybrid organizational forms "introduce high powered marketlike incentives into firms and hierarchical controls into markets."); Paul S. Adler, *Market, Hierarchy and Trust: The Knowledge Economy and the Future of Capitalism*, 12 ORG. SCI. 214 (2001). *See also* Giovanni Dosi et al., *Towards a Theory of Corporate Coherence, in* TECHNOLOGY AND ENTERPRISE IN A HISTORICAL PERSPECTIVE 185, 186 (Giovanni Dosi et al. eds., 1992) ("the boundaries of the firms are sometimes quite fuzzy, with interfirm agreements, joint ventures, and consortia rendering precise delineations of firms' activities imprecise."); Gunther Teubner, *Hybrid Laws: Constitutionalizing Private Governance Networks, in* LEGALITY AND COMMUNITY 311 (Robert A. Kagan et al. eds., 2000).

1980s. First, since the mid-1970s, there has been a major transformation in the organization of production and the structure of markets in the global economy.[44] Second, the fundamental goal of the organizational changes that have occurred is to cope with rapid changes in the economic, institutional, and technological environment of the firm by enhancing flexibility in production, management, and marketing.[45] Third, many organizational changes have intended to redefine labor processes and employment practices by introducing the model of lean production, the automation of jobs, elimination of tasks, and suppression of managerial layers.[46] Finally, Castells maintains that knowledge management and information processing have become essential to the performance of organizations operating in the informational, global economy.[47] The phenomena Castells describes set the parameters for the view of new production systems that define firm capabilities today. For ease and clarity of presentation, this section will break the phenomena down into separate categories with the understanding that they frequently interact and intersect in practice. Part III.B. will consider the development of flexible production, error detection and correction, and team production. Part III.C. will consider the broad range of knowledge collection, retention and application mechanisms.

B. The Emergence of Flexible, High-Performance Work Systems

The predominant form of business organization in twentieth century America was the large firm.[48] Typically, such firms could be characterized as multidivisional,

[44] MANUAL CASTELLS, THE RISE OF THE NETWORK SOCIETY 164 (1996).

[45] *Id.*

[46] *Id.*

[47] *Id.*

[48] *See generally* ALFRED D. CHANDLER, SCALE AND SCOPE: THE DYNAMICS OF INDUSTRIAL CAPITALISM (1990).

multinational and hierarchical.[49] To fully understand how much has changed, one must examine the historical reasons for the emergence of this organizational form. Early in the industrial revolution, Adam Smith recognized that the division of labor and mass production techniques could be more efficient than small-scale craft manufacturing. Using the example of the production of pins, Smith argued that by dividing tasks down into individual parts, workers could generate greater output (i.e., realize greater economies of scale) than by having each individual worker create the entire product.[50] Individual workers could specialize in tasks such as putting the head on a pin, thus enabling overall output to increase exponentially. In the twentieth century, this model (subject to modification through vertical integration) was employed by Henry Ford in his first automobile factory and became replicated in most manufacturing firms.

The development of the Fordist mass production system was premised on a substantial division of labor and entailed certain consequences including the form the firm took, the establishment of production routines and the relation of workers to firms.[51] For example, by dividing production into many different parts, large corporations effectively made individual workers inseparable from the firm.[52] Intuitively, a worker who specializes in mounting car doors on an assembly line cannot decide to work freelance. In economic terms, firm-specific investments a worker makes in the context of mass production do not give rise to skills that are readily transferable to other contexts. In Fordist production,

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[49] Timothy J. Sturgeon, *Modular Production Networks: A New American Model of Industrial Organization*, 11 INDUS. & CORP. CHANGE 451 (2002).

[50] ADAM SMITH, THE WEALTH OF NATIONS 4-5 (Everyman's Library ed. 1991).

[51] The term "Fordist" was coined to refer to the mass production system developed by Henry Ford. *See* MICHAEL J. PIORE & CHARLES F. SABEL, THE SECOND INDUSTRIAL DIVIDE: POSSIBILITIES FOR PROSPERITY (1984).

[52] Charles F. Sabel & Michael C. Dorf, *A Constitution of Democratic Experimentalism*, 98 COLUM. L. REV. 267, 293 (1998).

the firm is responsible for dividing up tasks and must develop organizational procedures whereby the actions of various workers can be coordinated.[53] Routines and procedures are both necessary to ensure coordination of activities and to avoid the dangers of opportunism that arise from asymmetries in information possessed by workers and management.[54] This latter element arises from the fact that as workers become more specialized, they develop intimate knowledge of the production process, which creates opportunities for workers to gain at the expense of the firm (i.e., agency costs).[55]

Frederick Taylor's work constitutes the apotheosis of this routinized production model. On Taylor's model, firms could break production down "scientifically," that is, through attention to hiring guidelines, time and motion studies and regimented routines.[56] The routines to emerge from this model were so far-ranging that the need for the worker to think was eliminated; workers virtually became the machines they were supposed to operate.[57] Taylor's vision of scientific production ultimately failed because it could neither overcome cognitive limitations nor supplant markets as drivers of choices concerning operations or production. It was simply too unrealistic to contend that production could be steered in such a regimented manner. Production must respond to changes in the market—something that cannot be determined ex ante.

1. Flexible Production

In the early 1980s, Sabel and Piore identified a shift in the nature of production from the traditional Fordist and Taylorist mass production models to one of flexible

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[53] *Id.* at 295.

[54] *Id.*

[55] *Id.*

[56] FREDERICK WINSLOW TAYLOR, THE PRINCIPLES OF SCIENTIFIC MANAGEMENT (1911).

[57] Sabel & Dorf, *supra* note 52. *Cf.* BRUCE MAZLISH, THE FOURTH DISCONTINUITY: THE CO-EVOLUTION OF HUMANS AND MACHINES (1995).

specialization.[58] They argued that mass production had given way to a new environment in which firms competed "on the basis of quality, cost, innovation, and customization."[59] This shift in part represented a response to unpredictable quantity and quality of demand, difficulties in dealing with globalized markets and increasing problems of technological obsolescence.[60] Examples of the flexible production model could be found in industrial craft industries as well as in high volume production, which enabled firms to realize significant gains in economies of scale and scope.[61] At its core, flexible production means the ability to modify production of goods or services rapidly in light of changes in market conditions, consumer demand, or new technology and innovation.[62] It is with respect to high volume producers engaged in flexible production that much of the discussion that follows is concerned.

A key enabler of the new production system is information technology ("IT"). At every stage in the process, IT applications help compile data, communicate between distributed production teams and locate information. The productivity enhancements that IT has generated enable companies to do more things better with fewer resources. Technology enables companies to vary the number of products offered and reduce the delay associated with changeovers in equipment.[63] Depending upon the type of

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[58] *See generally* PIORE & SABEL, *supra* note 51.

[59] Rosemary Batt, *Work Organization, Technology, and Performance in Customer Service and Sales*, 52 INDUS. & LAB. REL. REV. 539, 539 (1999).

[60] CASTELLS, *supra* note 44, at 166.

[61] *Id.* at 167.

[62] Different definitions of the term "flexible production" have been used. *See* Maury Gittleman et al., *"Flexible" Workplace Practices: Evidence from a Nationally Representative Survey*, 52 INDUS. & LAB. REL. REV. 99 (1998) (referring to the overlapping use of the terms "flexible" and "high-performance work organizations" to refer to similar phenomena). For clarity of exposition, this article will treat these interrelated phenomena separately.

[63] The reduced cost of IT has allowed companies to expand economies of scope. *See* PAUL MILGROM & JOHN ROBERTS, ECONOMICS, ORGANIZATION AND MANAGEMENT (1992).

production that occurs, humans may play a greater or lesser role. In some firms, workers may oversee the programming of manufacturing equipment and then manipulate the machines in assembling products. Alternatively, automated production systems in which human actors play a minor role in actually producing goods are essential in environments where high contamination risks for either the product or operator exist or where the part size is too large or too small for a human to manipulate.[64] In either event, the ability to produce is becoming more and more inseparable from the application of technology.

Automobile production affords one of the most apt examples of how technology has enabled product differentiation. On the Fordist assembly line, equipment used in manufacturing was highly specialized and could generally support the production of one type of good—Henry Ford allegedly quipped that consumers could have whatever color car they wanted so long as it was black. Switching from producing one line of car to another would require massive capital investments in equipment. When manufacturers began shifting to automated equipment in the 1980s, a change in product line still required substantial capital outlays. In recent years, however, the nature of automation itself has shifted from "fixed" or "hard" automation to "flexible" automation.[65] As an example of this shift to flexible automation, from 1989 to 1994 the average number of robots used in each hour of vehicle production increased 60 percent.[66] Robots, unlike hard machinery, can be reprogrammed to produce different products. For example, leading contemporary plants can change

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[64] Jonghun Park et al., *A Distributed, Event-Driven Control Architecture for Flexibly Automated Manufacturing Systems*, 15 INT.'L J. COMPUTER INTEGRATED MFG. 109 (2002).

[65] John P. MacDuffie & Frits K. Pil, *From Fixed to Flexible Automation and Work Organization: Trends from the International Plant Assembly Survey*, *in* TRANSFORMING AUTO ASSEMBLY: INTERNATIONAL EXPERIENCES WITH AUTOMATION AND WORK ORGANIZATION 238 (Takahiro Fujimoto & Ulrich Jürgens eds., 1996).

[66] *Id.*

outsourcing.[75] Modules can be outsourced, made in-house or both depending upon current needs.[76] Modular production thus affects the boundaries of the firm as well as the speed in which products can be assembled.[77] With the emergence of modular design as well as improved transportation and logistics, the model of the vertically integrated firm epitomized by Ford's steel production to automobile distribution system has given way to a more decentralized, horizontal firm. The question "make or buy?" is now asked of every business decision. Companies now outsource things that even ten years ago would have appeared to be a core business practice.[78] By outsourcing, companies can reduce their fixed capital costs overall, which allows firms to concentrate on product innovation and organizational flexibility.[79] Outsourcing also enables firms to realize other ancillary benefits, such as benchmarking their own production versus the production of suppliers.[80] From both a conceptual and practical standpoint, the decrease in lead firm reliance on fixed capital investments makes firms more

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[75] Nicolai Foss explains succinctly that "outsourcing simply means letting suppliers take over activities that were once undertaken in house; thus it is an instance of vertical disintegration." FOSS, *supra* note 27, at 7.

[76] Note that the development of modular production with well established protocols makes the "make or buy" decision less about the risk of misunderstanding production requirements than may have been true in the past. FOSS, *supra* note 27, at 18. It may still be true that firm capabilities cannot be transferred outside of firm boundaries, but this impediment is no longer as applicable in relation to manufacturing capability.

[77] For an analysis of the firm boundary question, see *infra* Part IV.

[78] *A Moving Story*, ECONOMIST, Dec. 7, 2002, at 73.

[79] Sturgeon, *supra* note 49, at 465 ("Firms that outsource a large share of their manufacturing no longer have to carry the financial, administrative and technical burdens of fixed capital for production, allowing them to focus on product innovation and become more organizationally and geographically flexible."). This view runs contrary to those theorists who contend that by outsourcing firms lose control over key aspects of production and undermine firm capacity to learn. For a description of this view, see R. Bettis et al., *Outsourcing and Industrial Decline*, 6 ACAD. MGMT. EXEC. 7 (1992).

[80] *A Moving Story*, *supra* note 78.

fluid. It also allows firms to concentrate on improving competitive advantage through product research and development, thereby avoiding concern with manufacturing, sales and distribution. The era of production this system inaugurated has been rightly called revolutionary "in its systematic deverticalization in response both to changes in coordination technology and to plain-old increases in the extent of markets."[81]

In addition to well-known cases of "just-in-time" manufacturing, retailers also employ "just-in-time" inventory controls in a variety of ways. Electronic point-of-sale inventory systems and data interchange with manufacturers have allowed real time communication of inventory levels and needs between retailers and manufacturers.[82] As a customer buys a product at a checkout line, the UPC bar code on the product is read, existing inventory records are reduced by one, and the retailer is able to determine whether to reorder the product or close it out based on business needs.[83] Wal-Mart, perhaps more than any other firm, epitomizes this transformation. By installing a $4 billion "retail link" supply chain management system, incorporating centralized warehouse logistics and purchasing electronic data interchange and wireless bar code scanning, Wal-Mart was able to realize a productivity advantage over competitors of 48% by the mid-1990s.[84] By reducing spoilage and stock-outs, enhanced inventory controls through technology have facilitated the development of large retail stores in the

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[81] Langlois, *supra* note 71, at 378.

[82] Paul Nightingale et al., *Capacity Utilization Revisited: Software, Control and the Growth of Large Technical Systems*, 12 INDUS. & CORP. CHANGE 477, 495-99 (2003). Electronic point of sale systems rely on the Universal Product Code ("UPC") bar code printed on most products.

[83] Eric Brynjolfsson et al., *Intangible Assets: Computers and Organizational Capital*, BROOKINGS PAPERS ON ECON. ACTIVITY, 2002 No. 1, at 137, 146.

[84] *Id.* These findings also appear consistent elsewhere in the retail sector. Nightingale and his co-authors report that the use of technology, particularly in IT and logistics, accounts for the substantial profitability of the UK supermarket industry. Nightingale et al., *supra* note 82, at 496.

United States and the United Kingdom.[85] The technological changes that enable improved inventory and distribution practices also have other beneficial unintended consequences for business. For instance, manufacturers and retailers can supply, receive and store much greater amounts of information about consumer demand, logistics, product returns, defects, marketing and competitive factors.[86] Together this increased information flow improves efficiency and firms' overall capabilities to manage operations.

The seismic nature of these changes to firm operations requires different human capital investments. To perform the tasks involved in flexible production and flexible automation, workers need different skills.[87] For one, workers must be capable of accommodating rapid changes in production.[88] This includes heightened responsibility for learning to accommodate greater product complexity while maintaining productivity and quality, employing a variety of new skills, using technologically sophisticated equipment, working with other members of a team and identifying product-specific quality problems.[89] Workers must also be able to anticipate, test and resolve problems in advance of the launch of a new product line.[90] Empirical findings regarding firm employment practices show that companies place high value on human capital investments needed to engage in such practices. For instance, companies tend to compensate employees who have more versatile skills at a higher rate than other employees.[91] Alongside improvements in organizational capabilities to manage flexible production,

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[85] Nightingale et al., *supra* note 82, at 496.

[86] Eileen Appelbaum & Peter Berg, *High Performance Work Systems: Giving Workers a Stake*, *in* THE NEW RELATIONSHIP: HUMAN CAPITAL AND THE AMERICAN CORPORATION 102, 104 (Margaret M. Blair & Thomas A. Kochan eds., 2000). *See also* Nightingale et al., *supra* note 82, at 497.

[87] MacDuffie & Pil, *supra* note 65, at 17.

[88] *See, e.g.*, Eric Bresnahen et al., *Technology, Organization and the Demand for Skilled Labor*, *in* THE NEW RELATIONSHIP, *supra* note 86, at 145.

[89] MacDuffie & Pil, *supra* note 65, at 18.

[90] *Id.*

[91] *See* Gittleman et al., *supra* note 62.

workers' abilities to manage such production have also increased.

3. Real Time Error Correction and Quality Control

Improvements in manufacturing that have increased economies of scale and scope have been complemented by improved error detection and control and quality assurance practices. Manufacturers now demand that suppliers deliver goods not only on time but also with perfect quality.[92] Error reduction and quality improvements have been realized through a dynamic approach including goal setting, monitoring and problem solving in real time. The fundamental significance of leading quality control methods is the simultaneous nature of problem solving and production. By correcting problems the moment they manifest (normally with the application of technology) quality can increase overall and the likelihood of systemic defects can decline dramatically. Together these results also minimize the frequency of delays.

The oft-cited example of production at Toyota constitutes a paradigmatic case of this approach to production.[93] Indeed, the developer of this system, Taichi Ohno, commented that "the Ford system of mass production put its stamp on its age . . . the Toyota system is putting its stamp on its own."[94] The Toyota system consists of two parts. The first pillar of

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[92] Appelbaum & Berg, *supra* note 86, at 102, 105. Reflecting the increased demands just-in-time practices impose, Appelbaum and Berg note that "for companies that now hold very little inventory, and for firms that supply them, the importance of on-time delivery of perfect quality goods has increased dramatically." *Id.* at 107. The demands for zero defects are present in service as well as manufacturing businesses. As ICT services have become essential business tools, network operators are being forced to maintain service levels of 99.99 percent reliability or higher. Nightingale et al., *supra* note 82, at 502.

[93] Although Toyota is a Japanese firm, it has served as the baseline against which all American automakers have aligned their production. It is, in a very real sense, representative of changes in production in the auto industry, as well as manufacturing more generally.

[94] T. OHNO & S. MITO, PRESENT ET AVENIR DU TOYOTISME (1993).

automobile lines overnight.[67] The ability to reprogram robots enables firms to shift production in light of customer preferences, shortcomings in prior product lines, new designs or improvements in existing lines.[68] In contrast to prior factories in which maximum output was the goal, car factories are becoming much smaller and more flexible, thus resulting in increases in scale and scope.[69] Significant in their own right, these developments have had far-reaching repercussions in the production of goods and services.

2. Just-In-Time Manufacturing and Inventory

Excess inventories have always been a major business risk for both manufacturers and retailers. As the economy, technology, consumer demand or competitive environment changes, firms that have already produced goods for sale can be left with excess inventory. One solution to this problem is to calculate as precisely as possible the level of goods required over time, but predictions of this sort are bound to be imprecise. Alternatively, firms could manufacture goods only upon receiving an order. Although a superior solution, this option historically suffered from the disadvantage of slowing product delivery. Yet through improved communication, manufacturing efficiencies and transportation, such manufacturing on demand—called "just-in-time"—can now be accomplished. With the advent of "just-in-time" production, manufacturers have been able to reduce waste, improve quality and better align product mix with consumer demand. "Just-in-time" has been particularly effective in industries in which technology changes rapidly,

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[67] *Incredible Shrinking Plants-Car Manufacturing*, ECONOMIST, Feb. 23, 2002, at 77.

[68] *Id.* *See also* Sturgeon, *supra* note 49, at 466-67 (noting that suppliers outsourcing manufacturing frequently use highly automated production systems that can be reprogrammed on short notice to produce a wide product variety).

[69] *See Incredible Shrinking Plants*, *supra* note 67, at 76 (stating that factories producing 750,000 cars per year are a thing of the past and that future flexible plants could produce as few as 200,000 automobiles per year).

as firms can eliminate old products and introduce new products rapidly.

As one of the enablers of customized "just-in-time" production, modular design has also contributed greatly to the breakdown of the vertically integrated firm. A modular system "is composed of units (or modules) that are designed independently but . . . function as an integrated whole."[70] Modular design enables companies like Dell, among others, to assemble computers "like Lego from a set of standardized components."[71] Three design rules form the backbone of modular systems. First, the system must have an architecture that broadly defines "what modules will be part of the [modular] system and what their functions will be."[72] Second, interfaces determine protocols for interaction between different modular subsystems.[73] Third, standards are used to determine whether modules within the system conform to established design rules and how they perform in comparison to other modules.[74] Together these design rules facilitate the creation of complex systems composed of smaller subsystems. Standards for interconnection of modules and for verification of the conformity of subsystem components are the glue that holds modular systems together.

When applied in the context of outsourcing, industry-defined standards and certified production guidelines allow lead firms to choose from a variety of suppliers and thereby achieve maximum flexibility in production scale and scope. The decision to contract with an outside firm to provide business requirements is typically referred to as

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[70] Carliss Y. Baldwin & Kim B. Clark, *Managing in an Age of Modularity*, HARV. BUS. REV., Sept.-Oct. 1997, at 86.

[71] Richard N. Langlois, *The Vanishing Hand: The Changing Dynamics of Industrial Capitalism*, 12 INDUS. & CORP. CHANGE 351, 375 (2003).

[72] Baldwin & Clark, *supra* note 70, at 86.

[73] *Id.* at 86.

[74] *Id.*

the Toyota system, "just-in-time" production, was discussed in the prior section. The second part, "auto-activation," involves the delegation of responsibility for quality control to line workers.[95] Workers who encounter quality defects are authorized to correct defects then and there, even if it means stopping the production line midstream.[96] This is no small development. One author has commented that the freedom this system gives to individual workers is "unique in the history of contemporary work organization."[97] Unlike Taylorist production, workers in the Toyota system do not merely follow predefined directions of a superior but are responsible for a "wide range of options which are not entirely defined in advance."[98] This means that the worker is charged with facilitating changes in production as well as problem solving.[99] This section will concentrate on the latter part.

The worker as problem solver replaces supervisors as the sole quality control monitors. Problem solving requires workers to detect, diagnose, and take appropriate action as problems arise.[100] According to one study, this problem solving methodology stems from basic rules of the organization, including the diagnosis of every use with built in tests and the improvement of every problem close in time and person to its occurrence.[101] Put differently, these rules embody the philosophy that expectations of how something will work are articulated in advance so that gaps in expected and actual performance will be recognized immediately.[102]

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[95] Benjamin Coriat, *The 'Abominable Ohno Production System.' Competences, Monitoring, and Routines in Japanese Production Systems*, *in* THE NATURE AND DYNAMICS OF ORGANIZATIONAL CAPABILITIES 217 (Giovanni Dosi et al. eds., 2000).

[96] *Id.* at 218.

[97] *Id.* at 228.

[98] *Id.* at 223.

[99] *Id.*

[100] *Id.*

[101] STEVEN J. SPEAR, JUST-IN-TIME IN PRACTICE AT TOYOTA: RULES-IN-USE FOR BUILDING SELF-DIAGNOSTIC, ADAPTIVE WORK SYSTEMS 20 (Harv. Bus. Sch., Working Paper No. 02-043, 2002).

[102] *Id.*

To succeed in this process, workers necessarily develop tricks of the trade that are largely unnoticed by those working outside of their areas. In other words, they develop a large amount of tacit knowledge.[103] With every problem that they detect, diagnose and correct, they develop understandings that elude canonical definition.[104] Steven Spear distinguishes the methodology employed at Toyota from efforts to fix "best practice" in that the Toyota approach uses current best practice as the basis for discovering large and small problems, rather than as a canonical methodology.[105] Toyota has thus adopted a formal structure in its work environment, but it is a structure that functions as a hypothesis that undergoes constant revision.

Examples from Spear's investigation help illustrate how this process functions. At Toyota's Georgetown plant, work involving the mounting of a car seat on a body was broken down into seven discrete elements lasting a total of 51 seconds. The precision of this process warrants extended quotation:

> Painted hashmark lines on the floor subdivided the work station into ten pieces. Since one cycle of work was meant to occupy 51 seconds and was meant to be completed within a single work zone, each subdivision was worth 5.1 seconds of work. This provided a first level diagnostic for work. For example, if a worker had completed the first three seat-installation steps, meant to take 15 seconds according to the activity's design, but the car had traveled past the fourth hash mark (i.e., 20.4 seconds had elapsed), then the worker had fallen behind and needed help completing his or her work from the team leader. The team leader, noting the disparity between the expected progress of the 'standardized work' and the actual progress, came to assist the line worker. Thus, an agreed prespecification of how work was expected to proceed allowed for a built-in,

[103] Coriat, *supra* note 95, at 224.

[104] *Id.*

[105] SPEAR, *supra* note 101, at 20.

> real-time diagnostic that this piece of the system was operating incorrectly and resources could be brought to bear for immediate remediation close in time, place and person to the problem's occurrence.[106]

Spear goes on to explain that the "built-in" test described in this example compared the worker's actual progress to expected progress given the design.[107] Furthermore, the discrepancy between expected and actual progress automatically signaled to the team leader to investigate what had occurred and the cause of the disparity.[108] As this example shows, by responding to errors in real time, workers can avoid production interruptions.

The process of error detection and control in the Toyota system thus occurs simultaneously with production. To make such production possible, information needed to solve a problem is always right at hand. When problem-solving information is remote, because it is "sticky" with respect to a particular location, error detection and correction may be more difficult. The notion of stickiness is a way of referring to tacit knowledge (i.e., knowing how as opposed to knowing that) that is particularly local in nature. A given piece of information is considered sticky within an organization in proportion to the incremental expenditure required to transfer that information to a specific locus where it can be used.[109] The location of that information will affect the location where problem solving occurs. Problems that can be solved with information on hand in a given location will tend to be solved at that location. Problems requiring inputs of multiple actors may be resolved through an iterative process involving multiple sites of sticky information within an organization. The underlying phenomenon on which these insights are based is Michael Polanyi's distinction between tacit and explicit knowledge.[110]

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[106] *Id.* at 12.

[107] *Id.*

[108] *Id.*

[109] Eric Von Hippel, *'Sticky Information' and the Locus of Problem Solving: Implications for Innovation*, 40 MGMT. SCI. 429 (1994).

[110] MICHAEL POLANYI, THE TACIT DIMENSION (1966).

Technical problems are frequently resolved through tacit, as opposed to explicit, knowledge.[111] In applying tacit knowledge, a person acting skillfully employs a set of rules that are unknown to that person.[112] Whether such tacit knowledge is freed up for use elsewhere in an organization is thus a function of the cost and potential value the information holds. If it is costly to transfer sticky (or tacit) information, firms may attempt to "unstick" it by converting the information into a more accessible and transferable form such as a database. This process of transferring information and making it widely available is the concern of knowledge management.[113] The point of the foregoing discussion is to illustrate that while much crucial innovation-related problem solving information is local and tacit, there are important incentives for firms to share this information internally either through iterative processes or by making knowledge explicit and accessible.

In addition to constituting a way of converting tacit knowledge into ready problem solving information,

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[111] Nonaka and his co-authors explain this distinction well:

> Explicit knowledge can be expressed in formal and systematic language and can be shared in the form of data, scientific formulae, specifications, manuals, and so forth. . . It can be easily "processed," transmitted and stored. Explicit knowledge is about past events or objects "there and then," and it is oriented to context-free theory. . . .Tacit knowledge, on the other hand, is highly personal and hard to formalize. As Polanyi (1966) put it, "we can know more than we can tell." Subjective insights, intuitions and hunches fall into this category of knowledge. Tacit knowledge is deeply rooted in action, procedures, routines, commitment, ideals, values and emotions.

Ikujiro Nonaka et al., *A Theory of Organizational Knowledge Creation: Understanding the Dynamic Process of Creating Knowledge, in* HANDBOOK OF ORGANIZATIONAL LEARNING & KNOWLEDGE 491, 494 (Meinolf Dierkes et al. eds., 2001).

[112] Von Hippel, *supra* note 109. This understanding bears a great similarity to the tacit knowledge or "feel for the game" possessed by the players in a game. *See* PIERRE BOURDIEU, THE LOGIC OF PRACTICE 66-68 (1990).

[113] *See infra* Part III.C.

technology has vastly improved firms' abilities to monitor production for quality. Information technology enables firms to continuously monitor products manufactured. In the steel industry, for instance, "information and computation technologies enable customers to inspect for, and steel mills to achieve, tight conformance to specifications for gauge, shape, flatness, strength, or surface quality."[114] Computers monitor the production process to adjust temperature and speed of steel sheet production, enabling the manufacturer to achieve uniformity in "heating, rolling, shaping or finishing of steel."[115] On this model, every aspect of the production process is geared to meeting customer specifications and ensuring the highest quality.

4. Team Production

Flexible, high-performance work systems require different uses of human resources than traditional firms. As Sabel and Dorf contend, "[t]he basal unit of the new firm is the team or work group."[116] One implication of team production is a shift from vertical to horizontal intrafirm coordination. As in the Toyota production system, horizontal organizational structures involve frontline workers taking over responsibilities traditionally carried out by supervisors.[117] In contrast to bureaucratic corporate models in which firm interaction proceeds along formal lines, "high-performance work systems make use of horizontal coordination and communication within and among functional units of the firm and rely less on coordination of these units through vertical layers of hierarchy."[118] In Toyota production, for example, workers on the shop floor

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[114] Appelbaum & Berg, *supra* note 86, at 105.

[115] *Id.*

[116] Sabel & Dorf, *supra* note 52, at 298.

[117] Appelbaum & Berg, *supra* note 86, at 103 ("We find compelling evidence that companies that strive to meet world class standards for quality, reliability, and on-time delivery have given front-line workers major responsibility for horizontal coordination of the production process previously carried out by supervisors and lower level managers.").

[118] *Id.* at 103.

circulate *kanban* signals to each other, providing continuous horizontal flows of information on the shop floor.[119] By working through functional as opposed to formal groups, intrafirm interaction can be continuously invented and reinvented in light of current priorities.

A study conducted by Eileen Appelbaum and Peter Berg suggests that team production systems have proliferated in manufacturing firms in the United States. From 1995 to 1997 they examined modern manufacturing practices in the steel, medical instrument, and apparel industries to determine the nature and extent of horizontal coordination and decision making among nonsupervisory employees.[120] They hypothesize that if nonsupervisory workers have assumed responsibilities as monitors and managers, then their compensation should begin to match that of supervisory employees.[121] As such, they examine the extent to which compensation for workers in group settings has become more contingent. Approximately 60 percent of the blue-collar employees surveyed in each of the three industries indicated they were members of self-directed teams.[122] Even when restricting the definition of team function to only include groups meeting to maintain quality control, solve problems, and assign daily tasks, 24.8 percent of steel workers, 29.5 percent of apparel workers, and 39.1 percent of medical instrument workers stated they were members of a team with such responsibilities.[123] Of the workers in steel plants who indicated they worked in teams, 60.8 percent stated that they participated in setting performance goals, 76.5 percent stated that they do their own quality control, and 73.3 percent met to solve problems.[124] The authors conclude, "[t]he function of the supervisor in many of the plants in [their] sample is shifting from monitoring workers and running daily production operations to focusing on problem

[119] Coriat, *supra* note 95, at 228.

[120] Appelbaum & Berg, *supra* note 86, at 102.

[121] *Id.*

[122] *Id.* at 122.

[123] *Id.* at 123.

[124] *Id.* at 125.

solving across functional areas."[125] While the survey of 4,000 workers in three industries cannot be considered dispositive, the understanding that approximately half of blue-collar manufacturing employees work in teams that perform functions traditionally performed by supervisory employees alone, suggests that something has changed dramatically.

Other studies show the importance of a shift from hierarchies to project-based teams for innovation. A case study of the Danish hearing aid company Oticon A/S illustrates this phenomenon well. Once a leading performer in the industry, Oticon's market share dropped from 14 percent to 9 percent in an 18-month period in the late 1980s.[126] In response, the company radically overhauled its management structure in 1990 to improve its innovative capacity and allow it to capitalize on technological changes in the industry.[127] Between 1990 and 1993, the proportion of sales due to new products almost doubled and more than half of all sales could be attributed to products introduced during the prior two years.[128] Improved financial performance followed.[129]

The changes that led to this new innovative capacity are noteworthy. Through a new organizational architecture, Integrated Product Development, Oticon reorganized itself around a series of cross-functional project teams in charge of single development projects.[130] Departments and positions were eliminated.[131] Most employees were grouped into "professional areas" and "competence centers" to replace

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[125] *Id.* at 123. Interestingly, a survey of management attitudes regarding the effects of IT on human resource policies found that a majority of managers who were surveyed indicated that the use of IT both increased workers' autonomy and improved managements' need and ability to monitor workers. Bresnahen, *supra* note 88, at 23.

[126] Gianmario Verona & Davide Ravasi, *Unbundling Dynamic Capabilities: An Exploratory Study of Continuous Product Innovation*, 12 INDUS. & CORP. CHANGE 577, 581 (2003).

[127] *Id.*

[128] *Id.*

[129] *Id.* at 582 tbl. 1.

[130] *Id.* at 591-92.

[131] *Id.* at 592.

functional organizational lines.[132] Professional areas are loosely defined groups of professionals.[133] Competence centers are groups with specific technical skills (e.g., mechanical engineering).[134] A remarkable aspect of these changes is that rather than find the person to fit the predefined job, the company began designing jobs to fit the person.[135] Afterwards, a professional manager was put in charge of a product development project and was responsible for selecting, hiring, and training people to ensure needed competencies for different projects.[136] Members of project teams are relatively self-selected, thus allowing members to choose to participate based on skills and interests.[137] Knowledge related to innovation is shared within project groups, between project groups through meetings, and through a corporate database.[138]

The dramatic change in the organization of Oticon and the improved performance that resulted help illustrate how nonhierarchical systems of coordination tend to promote innovation. Examples like these make more convincing Piore and Sabel's argument that bureaucratic organizations will give way to more flexible ones.[139] With decentralized, fluid organizations, however, comes a more difficult process of knowledge integration. The next section describes how such problems are overcome.

C. Knowledge

The new production systems described in this article are knowledge intensive. This statement comports with the broader observation that advanced economies are

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[132] *Id.*
[133] *Id.*
[134] *Id.*
[135] *Id.*
[136] *Id.*
[137] *Id.* at 593.
[138] *Id.* at 592-93.
[139] PIORE & SABEL, *supra* note 51.

increasingly knowledge dependent.[140] Knowledge has become the chief determinant of firm growth and is the chief enabler of modern production.[141]

While most agree on the importance of knowledge, how firms manage this intangible resource is a more difficult question. Traditional conceptions of knowledge consider it an individual phenomenon. For organizations that are increasingly knowledge dependent, treating knowledge as a wholly individual phenomenon limits their ability to make use of a key source of value. As studies of the use of knowledge within organizations have developed, it has become more evident that knowledge is also shared within firms. In recent years, management has increasingly come to recognize this phenomenon.[142] The concept of organizational learning captures the notion of collective knowledge and the extent to which organizations develop a repository of knowledge that may exceed the knowledge held by individuals in the firm.[143] Organizational learning and knowledge are critical elements in completing the description of the new firm.

To best understand the concept of organizational knowledge, one should consider how firms create it. This approach also lends itself to an integrated understanding of the role of knowledge in production. While there are arguably many different ways to conceptualize the knowledge creation process within organizations, organizational theorists Nonaka, Toyama and Byosiere provide a clear exposition of its various components.[144] They begin by clarifying the distinction between knowledge and information. Information, they argue, "is a flow of messages"

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[140] *See* CASTELLS, *supra* note 44.

[141] *See* Peter Brödner, *The Future of Work in a Knowledge-Based Economy*, *in* ECONOMY AND WORK IN THE KNOWLEDGE SOCIETY (ICT/CIREM Int. Seminar, 2000), *available at* http://www.iatge.de/ (last visited Nov. 20, 2003). *See also* PETER DRUCKER, THE PRACTICE OF MANAGEMENT (1993).

[142] *See* Sarah Kaplan et al., *Knowledge-Based Theories of the Firm: A Review and Extension*, 23 ACAD. MGMT. REV. 242 (2002).

[143] JAMES G. MARCH & HERBERT A. SIMON, ORGANIZATIONS (1958).

[144] Nonaka et al., *supra* note 111, at 491.

whereas knowledge "anchored in the beliefs and commitment of its holder is created by that flow of information."[145] Consistent with the understanding of knowledge developed by Polanyi, they argue that knowledge can be classified as either tacit or explicit.[146] Both sources of knowledge are important to knowledge creation.[147] Nonaka and his co-authors argue that a dialectical process of "knowledge conversion" between explicit and tacit knowledge is necessary for organizations to make full use of the knowledge they possess.[148] Knowledge conversion occurs in four different moments: socialization, externalization, combination, and internalization.[149] Knowledge creation requires each of these elements to work in tandem.

First, socialization occurs as an exchange of tacit knowledge.[150] Traditionally, sharing of tacit knowledge occurs during joint activities, such as apprenticeship or informal gatherings of colleagues.[151] Because of the informal nature of the exchange, however, socialization is difficult for firms to manage.[152] Second, externalization is the "process of articulating tacit knowledge as explicit knowledge."[153] According to the authors, externalization is the key element of knowledge creation, because it constitutes a basis for the creation of new explicit concepts from tacit knowledge.[154] The conversion of tacit knowledge into explicit knowledge frequently involves the use of metaphors, analogies and models, as a way of explaining very personal knowledge to a

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[145] *Id.* at 492.

[146] *Id.* at 494. Others have termed this descriptive versus procedural knowledge. *See* Luciana D'Adderio, *Configuring Software, Reconfiguring Memories: The Influence of Integrated Systems on the Reproduction of Knowledge and Routines*, 12 INDUS. & CORP. CHANGE 321, 324-30 (2003).

[147] Nonaka et al., *supra* note 111, at 494.

[148] *Id.*

[149] *Id.* at 495.

[150] *Id.*

[151] *Id.*

[152] *Id.*

[153] *Id.*

[154] *Id.*

wider group.[155] A third element, combination, involves the manipulation of existing explicit knowledge—contained in reports, internal documents, or conversations—into new explicit knowledge, through conceptualization or systematization.[156] Finally, internalization, involving the creation of new tacit knowledge through interaction with circulated explicit knowledge, completes the process.[157] Internalization of explicit knowledge occurs through training that provides general information about strategy or practices and through "simulations or experiments that trigger learning by doing."[158] Through the cycle, the authors describe a way of viewing organizational knowledge identification, circulation, and creation in its entirety. It is, however, something of an ideal approach and one that requires cultivation and resources to facilitate.

For many firms, the distributed nature of knowledge, particularly in production, can impede their ability to realize the full potential of accumulated organizational knowledge. Two main factors contribute to this situation. First, knowledge can be divided within a firm as a result of knowledge specialization and differentiation.[159] Indeed, within complex organizations, no single person can possess all of the knowledge needed to complete a task.[160] Division and fragmentation between different domains and communities of practice has resulted.[161] Second, tacit knowledge obtained from learning by doing rather than

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[155] *Id.*

[156] *Id.* at 497.

[157] *Id.*

[158] *Id.*

[159] Brödner, *supra* note 141. *See also* Mulholland and his co-authors, who note that "much of the valuable knowledge of a company is tacit, hard to formalize, and therefore hard to classify." Paul Mulholland et al., *Integrating Working and Learning: A Document Enrichment Approach*, 19 BEHAV. & INFO. TECH. 171, 172 (2000).

[160] Tamara Sumner et al., *Moving From On-the-Job Training Towards Organizational Learning*, *at* http://sern.ucalgary.ca/KSI/KAW/KAW99/papers/Domingue1/enrich-banff99.pdf (last visited Nov. 20, 2003).

[161] Brödner, *supra* note 141, at 2. *Cf.* JURGEN HABERMAS, BETWEEN FACTS AND NORMS (1996) (critiquing autonomous expert systems).

formal processes constitutes the main way in which organizations transfer routines and skills to producers.[162] The individualized and localized nature of tacit knowledge can create significant information asymmetries within a firm. Although organizational knowledge is frequently difficult to identify and deploy, its importance to firm success means that firms must optimize their use of knowledge to realize competitive advantages.

As with flexible production, just-in-time inventories, and error correction and detection, the advent of information technology has created an entirely new source of knowledge in firms. In addition to automating routine practices, computers make it easier to accumulate data both intentionally and as a by-product of other tasks.[163] One example, touched on earlier, is the manner in which information technology allows firms to retain a systematic record of all interactions with a customer. As record keeping becomes more automated, the collection and manipulation of additional information becomes only marginally more taxing. Yet the accumulation of ever-larger quantities of information can overwhelm the ability of decision makers to analyze the information.[164] Something is needed to enable firms to turn increasing quantities of data into knowledge that supports firm problem solving and decision making.

Knowledge management—the process of collecting, systematizing, and redeploying knowledge in organizations—is one solution to problems of specialization, asymmetries in information, informational overload, and distributed organizational structures. Knowledge management is intended to solve the problem that "knowledge acquired through experience doesn't get reused because it isn't shared

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[162] SIDNEY G. WINTER, TOWARD AN EVOLUTIONARY THEORY OF PRODUCTION 16 (Lab. of Econ. & Mgmt., Sant'Anna Sch. of Advanced Studies, Working Paper No. 27, 2002).

[163] Bresnahan, et al., *supra* note 88, at 152.

[164] John Seely Brown & Paul Duguid, *Organisational Learning and Communities of Practice: Toward a Unified View of Working, Learning, and Innovation*, *at* http://www2.parc.com/ops/members/brown/papers/orglearning.html (last visited Nov. 26, 2003).

in a formal way."[165] Knowledge management allows the capture of both explicit and tacit knowledge, which frequently would have remained nontransparent or simply been lost in the past.

Knowledge management has three main tasks: (1) to explicate and codify socially embodied knowledge in a structured way; (2) to connect people to these explicit knowledge bases for their effective use; and (3) to integrate the different perspectives needed for problem solving.[166] Retention is only one side of the equation; knowledge management also enables firms to redeploy knowledge gained in other contexts. Because of the substantial business need to rationalize knowledge acquisition and retention, knowledge management has emerged as a critical tool for business process management and reengineering.[167]

The importance of cultivating knowledge within an organization was previously considered a justification for vertical integration. While Chandler has recognized the importance of knowledge creation and retention in connection with the large firm,[168] his analysis does not capture the extent to which knowledge management solutions can enable small firms and hybrid, distributed organizations to realize benefits similar to those of vertical integration.

The process of managing knowledge can be broken down into four actions: (1) knowledge gathering; (2) knowledge organization and structuring; (3) knowledge refinement; and (4) knowledge distribution.[169] Knowledge management

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[165] Jeff Angus et al., *Knowledge Management: Great Concept . . . But What Is It?*, INFO. WEEK, Mar. 16, 1998, at 58.

[166] Brödner, *supra* note 141.

[167] Andreas Abdecker et al., *Workflow-Embedded Organizational Memory Access: The DECOR Project*, *in* WORKSHOP ON KNOWLEDGE MANAGEMENT AND ORGANIZATIONAL MEMORIES (ICJAI '01 Workshop, 2001).

[167] Alfred Chandler & Takashi Hikino, *The Large Industrial Enterprise and the Dynamics of Economic Growth*, *in* BIG BUSINESS AND THE WEALTH OF NATIONS (Alfred D. Chandler, Jr. et al. eds., 2000).

[168] *Id.*

[169] V. Richard Benjamins et al. *Knowledge Management Through Ontologies*, *in* PROCEEDINGS OF THE SECOND INTERNATIONAL CONFERENCE ON

systems include such diverse components as databases, corporate memories and instincts, expert systems, document management systems, and so-called learning organizations.[170]

Because of the heterogeneous nature of the knowledge that may be combined in a knowledge management system, a firm should create a formal structure to support such a system. One means of doing so involves the development of ontologies. An ontology is a shared and common understanding of some domain that can be communicated across people and computers.[171] Another way of expressing the concept is to say it is a formal, explicit specification of a shared conceptualization.[172] To assemble an ontology, collaborators contribute to a classification of data in terms of a formal language. Ontologies provide the formal structure upon which knowledge management systems operate.

While a wide range of options for knowledge management systems exists, they are typically user friendly, permitting users to interface with HTML pages, graphics, text, visual languages, and hypermedia.[173] Both local and wide area

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PRACTICAL ASPECTS OF KNOWLEDGE MANAGEMENT, BASEL, SWITZERLAND, OCTOBER 29-30, 1998 (Ulrich Reimer, ed., 1998).

[170] KARL M. WIIG, KNOWLEDGE MANAGEMENT: THE CENTRAL MANAGEMENT FOCUS FOR INTELLIGENT ACTING ORGANIZATIONS (1994).

[171] Benjamins et al., *supra* note 169, at 5.

[172] To explicate this notion the authors state:

> 'Conceptualization' refers to an abstract model of some phenomenon in the world by having identified the relevant concepts of that phenomenon. 'Explicit' means that the type of concepts used, and the constraints on their use are explicitly defined. 'Formal' refers to the fact that the ontology should be machine-readable. 'Shared' reflects the notion that an ontology captures consensual knowledge, that is, it is not private to some individual, but accepted by a group.

Id.

[173] Brian R. Gaines et al., *Knowledge Management for Distributed Enterprises*, *in* PROCEEDINGS OF TENTH KNOWLEDGE ACQUISITION FOR KNOWLEDGE-BASED SYSTEMS WORKSHOP (Knowledge Science Institute, University of Calgary, 1996), *available at* http://ksi.cpsc.ucalgary.ca/KAW/KAW96/gaines/KMDE.html (last visited Nov. 20, 2003).

networks can be used for these applications. Knowledge management systems can be either vertical or horizontal. Vertical systems are useful in one business situation, usually within one firm. Horizontal knowledge management systems constitute general frameworks that can be applied across a variety of organizational groupings. Horizontal knowledge management systems that support distributed organizations or engineering groups illustrate some of the more powerful technology uses.

Knowledge management solutions may in turn offer a means of facilitating organizational learning. Mulholland and his co-authors propose an approach to organizational learning that involves the use of knowledge management tools.[174] Specifically, they consider a document enrichment approach. The process involves processing information, such as customer complaints, by consulting an archive of past experience, engaging in collaborative efforts to solve the problem, adding to a document as the case is resolved, and finalizing the document for inclusion in an archive, intranet, or internet information source.[175] The process illustrates the manner in which information technology can leverage the brainpower of an organization. In a large firm, no single employee could process similar amounts of information on more than a handful of clients. Through the use of a document enrichment approach, such as the one proposed by Mulholland and his co-authors, all employees in a firm could have complete information about a client's entire history. The solution they posit is only one conceivable approach to knowledge management. The important point is that knowledge management tools enable firms to develop a rich body of knowledge that is readily available across various communities of practice operating in dispersed organizational structures.

Knowledge management is not only affecting the circulation of knowledge within firms but is also directly generating changes at the level of production. According to

[174] Mulholland et al., *supra* note 159.

[175] *Id.*

one observer, "knowledge management essentially changes the way an organization functions."[176] Production changes occur because knowledge management applications are increasingly becoming bundled with business process management tools. Business process management frequently involves the use of a knowledge management solution such as a workflow tool. Workflow tools may build upon comprehensive enterprise models involving organizational structures, business processes, and information system structures. Such tools provide a window into the firm, thereby facilitating refinements in business processes. The workflow tool can be linked to knowledge management applications that allow the user to access information on the firm-wide or community-of-users level. Alternatively, the two applications can be so tightly linked that as the business process model conducts new activities, queries to the knowledge archive are made automatically and offered to the user.[177] As the user manipulates the application, the context is clarified and the information provided becomes more accurate. Some systems linked to workflows employ an information assistant that observes the running workflow of a user, interprets information needed to offer active support from a process-oriented archive, and maintains a sense of the context and information retrieval to make more precise queries to the archive.[178] As the sophistication and user-friendliness of knowledge management systems grows, distributed knowledge can be brought to bear in distributed production sites, while centrifugally throwing off new sources of knowledge that can be redeployed elsewhere. The net effect of these processes is to tighten the link between knowledge creation, retention, application, and production.

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[176] BHAVAMI THURAISINGHAM ET AL., COLLABORATIVE COMMERCE AND KNOWLEDGE MANAGEMENT 4 (Sloan Sch. of Mgmt., Mass. Inst. of Tech., Working Paper No. 4348-01, 2001).

[177] Abdecker et al., *supra* note 167.

[178] *Id.* at 2.

IV. CAPABILITIES-BASED THEORY OF THE FIRM

The changes in production and emerging methods for gathering and accessing knowledge have altered the boundaries and structure of the firm. These changes challenge existing conceptions of economic organization. For one, hierarchy can no longer perform all the work we once expected. Teams, with discretionary power over a range of productive choices, determine ends as well as means.[179] They also monitor production to ensure proper outcomes. The high value associated with diffuse individual and team knowledge within firms has changed the balance of power within organizations. As the holders of key productive and innovative capacities, employees can no longer be characterized as simply following routines established from above.

A. Capabilities Theory Introduced

The capabilities theory of the firm[180] goes beyond the notion of the firm as a bundle of contracts and takes seriously the multifaceted factors that determine the existence of firms. Although the notion of capabilities does not currently permit the same degree of analytical rigor as formal economic models of the firm, it does capture some important truths relevant to a theory of the firm: information processing and organizational learning on the one hand, and firm competences and know-how on the other hand. The capabilities notion derives from work adding informational costs to TCE analysis.[181] Harold Demsetz, in particular, argued that firms are "a bundle of commitments to

[179] Sabel & Dorf, *supra* note 52.

[180] The term "capabilities" is preferred to alternatives such as knowledge-based or resource-based views insofar as the latter terms may not fully reflect a broader conception of resources including such things as routines, capabilities, or competencies. *See* NICHOLAI FOSS & KIRSTEN FOSS, LEARNING IN FIRMS: KNOWLEDGE-BASED AND PROPERTY RIGHTS PERSPECTIVES 4 (Copenhagen Bus. Sch. Dept. of Indus. Econ. and Strategy, Working Paper No. 2000-2, 2000).

[181] *Id.*

technology, personnel and methods all constrained by an insulating layer of information that is specific to the firm, and this bundle cannot be altered or imitated quickly."[182] Firm capabilities are defined as firm know-how that enables an organization to perform activities that produce outputs characteristic of that firm.[183] Similarly, firm capabilities indicate the capacity to bring about certain outcomes from intended actions.[184] One can get a sense for what capabilities are by considering the operations of large firms that have distinctive products and have developed firm-specific knowledge relevant to production. By developing unique production practices, these firms generate firm-specific resources that yield competitive advantages. It is precisely the fact that firms develop know-how unavailable to market participants outside the firm that creates the unique value associated with particular firms. "The very essence of capabilities," one article contends, "is that they cannot be accomplished by using the price system (i.e., the market)."[185] This conception affords a much richer answer to the Coasean firm-versus-market question[186] than the simple explanation of economizing on transaction costs. The notion of capabilities is thus an attempt to transcend traditional economic theory that views the firm as a black box or simple production function and takes seriously the internal workings of the firm.

B. The Building Blocks of Capabilities

Although related, routines differ from capabilities. Routines involve no evident purpose and no conscious choice.[187] Indeed, unlike routines that are largely automatic,

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[182] DEMSETZ, *supra* note 26.

[183] Giovanni Dosi et al., *Introduction* to THE NATURE AND DYNAMICS OF ORGANIZATIONAL CAPABILITIES, *supra* note 2, at 1.

[184] *Id.* at 2.

[185] David Teece et al., *Dynamic Capabilities and Strategic Management*, *in* THE NATURE AND DYNAMICS OF ORGANIZATIONAL CAPABILITIES, *supra* note 2, at 339.

[186] *See* Coase *supra* note 26.

[187] *Id.*

"capabilities are infused with intentionality."[188] Capabilities involve the ability to organize repetitive activities, whereas routines constitute "chunks" of repetitive activities.[189] One should think of capabilities as thus involving the competence to make productive decisions, some of which may involve the creation of routines. Because of their intentional nature, capabilities, not routines, are the proper focus of corporate governance. Firm capabilities must support appropriate governance structures.

Firms manifest two types of capabilities. The first type consists of "the ability to organize (coordinate, integrate) existing resources."[190] These capabilities to recombine relate to the information gathering and accessing that knowledge management enables.[191] The second type of capabilities sometimes referred to as dynamic capabilities, pertain to firms' abilities to learn.[192] Dynamic capabilities are most evident in the process of innovation. Both types of capabilities are essential in determining the competitive advantage of firms and firm performance.

The notion of dynamic capabilities yields a comprehensive view of production and the firm that also gives full standing to the role of organizational learning. Teece and his co-authors argue that dynamic capabilities can be broken down into three parts: processes, positions, and paths.[193] Processes refer to the way things get done in the firm, including routines, patterns of current practice and learning.[194] Routines involve the function of coordination and integration of activities, in such areas as outsourcing, quality control, monitoring and coordination of production across internal

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[188] *Id.*

[189] *Id.*

[190] FOSS & FOSS, *supra* note 180, at 4-5.

[191] *See* B. Kogut & U. Zander, *What Firms Do? Coordination, Identity and Learning*, 7 ORG. SCI. 503 (1996). On this view, firms produce new capabilities by recombining existing ones with other knowledge.

[192] FOSS & FOSS, *supra* note 180, at 5.

[193] Teece et al., *supra* note 185, at 341.

[194] *Id.*

facilities.[195] Learning occurs as a way of improving production processes, through experimentation and repetition.[196] Similarly, reconfiguration allows firms to alter practices to respond to changing environments. Firms may learn of changing environments by such means as watching the market for new developments and searching for best practices.[197] In this respect, reconfiguration arguably also involves organizational learning.

Positions relate to the location of the firm in the competitive landscape. Factors such as the firm's current technological and intellectual property resources, complementary assets, customer base, external relations with suppliers and competitors all determine firm position.[198] The paths of the firm pertain to the strategic alternatives available to it based on activities in the past.[199] In other words, history matters.[200] The path dependency of firms may not be determinative of future prospects, but as Patel and Pavitt have remarked, a Harris Tweed jacket producer cannot readily morph into a computer manufacturer.[201] Processes, positions and paths together offer a comprehensive understanding of the constitutive determinants of dynamic capabilities.

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[195] *Id.* at 342.

[196] *Id.* at 344.

[197] *Id.* at 345.

[198] *Id.* at 345.

[199] *Id.* at 341, 346.

[200] *Id.* at 346.

[201] Pari Patel & Keith Pavitt, *How Technological Competencies Help Define the Core (not the Boundaries) of the Firm*, *in* THE NATURE AND DYNAMICS OF ORGANIZATIONAL CAPABILITIES, *supra* note 2, at 315. It is even questionable whether a firm like Kodak, with substantial experience in the photographic supply business, can transition into a digital photographic supplier. *See* Amy Yee, *Kodak's Woes Continue With Poor Film Sales*, FIN. TIMES, Oct. 22, 2003, at 1, *available at* 2003 WL 64595494 (explaining that Kodak's stock fell to 15 year lows following its announcement that the company would reduce dividends to finance a shift into digital technology and that shareholders were meeting in order to discuss alternatives to the company's new strategic direction).

The factors that determine capabilities are important because they facilitate organizational learning.[202] Firms refine their capabilities, particularly in relation to processes, through organizational learning over time.[203] Organizational learning will facilitate refinements in practices, involving coordinating production and interfirm monitoring, that improve firm capabilities overall. Given the tacit nature of much organizational knowledge, learning that improves production may occur, even though participants are largely unaware of the process.[204]

Capabilities theory has helped clarify the way in which firm boundaries are determined. Firm boundaries are determined in relation to the bundle of capabilities that a firm possesses. In deciding whether to make or buy, or in evaluating opportunities for strategic alliances, firms determine strategic choices based on assessments of internal capabilities versus what is available on the market.[205] When considering the practical question of whether a firm chooses to have suppliers, franchisees or licensees provide a given product or service, or produce it in-house, firms must weigh the cost of educating such outsiders in firm-specific knowledge.[206] When the cost of buying a good or service is high relative to firm capabilities, firms will choose to make it themselves. As firms engage in new knowledge creation—enhanced through new production and knowledge management practices—internal capabilities may increase and greater clarity in understanding firm potential can develop.

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[202] Christopher S. Boerner et al., *A Review and Assessment of Organizational Learning in Economic Theories, in* HANDBOOK OF ORGANIZATIONAL LEARNING & KNOWLEDGE, *supra* note 111, at 109-10.

[203] *Id.*

[204] DOSI et al., *supra* note 2, at 11.

[205] *See generally* FOSS & FOSS, *supra* note 180, at 5-6.

[206] RICHARD N. LANGLOIS & NICOLAI FOSS, CAPABILITIES AND GOVERNANCE: THE REBIRTH OF PRODUCTION IN THE THEORY OF ECONOMIC ORGANIZATION, (Danish Research Unit for Indus. Dynamics, Working Paper No. 97-2, 1996) *available at* http://www.druid.dk/wp/pdf_files/97-2.pdf (last visited Feb. 4, 2004).

C. Capabilities and Contractual Accounts of the Firm

In transcending contractual theories of the firm, it is not entirely clear that the notion of capabilities contravenes traditional economic analysis. Learning within organizations may ultimately represent a response to market forces. On this view, rationalizing the use of firm capabilities makes good economic sense. Learning in firms simply furthers the efficient use of resources.[207] Through improvements in production generated by organizational learning, firms can raise productivity overall. This view is appealing in that it can explain the link between knowledge and production and thus markets as well. By conceptualizing the firm as an entity that seeks to exploit competitive advantages from collective learning, one can simultaneously gain an enhanced understanding of the nature of the firm, organizational boundaries, and production. Foss and Foss argue that the efficiency gains from organizational learning are realized primarily in terms of finding a lower-cost way of coordinating production.[208] In addition, the strategic component of developing new technology helps to generate new products. Firms that can employ their knowledge to create products in greater quantity, of higher quality, and of less expense than their competitors will keep production in-house. Firms that cannot develop those capabilities will lose business or outsource production. An economically oriented capabilities based theory of the firm that encompasses the full range of organizational learning, including production know-how and enhancements generated through knowledge management, provides a more complete account of the firm than presently offered by any contractual account standing alone.[209]

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[207] FOSS & FOSS, *supra* note 180, at 11.

[208] *Id.* at 18.

[209] This article agrees with critics of some versions of capabilities theory who argue that firm capabilities are conceptualized in an overly general fashion, constituting something like a black box. *See id.* at 8-9 (arguing that "the links between individual learning processes, firm-level learning and capabilities as the outcomes of learning processes are only vaguely described" in the literature). To overcome this objection, this

To suggest that a firm owns all knowledge specific to that firm through contractual arrangements misses the tacit nature of much organizational knowledge. The accumulated tacit knowledge of the firm walks with the employees. Firms may contract for services that employ specific forms of tacit knowledge but cannot acquire such knowledge on the market. It requires an investment of time and efforts at integration before know-how can be recreated. To the extent knowledge management codifies tacit knowledge it also in a sense monetizes it. However, know-how is still required to use the codified knowledge; the tacit knowledge and human capital that the concept represents are crucial to the output firms produce. Know-how, though, cannot be reduced to simple contractual terms nor be simply bought and sold, yet human capital investments are noticeable and valuable, despite the fact that they cannot be sold or traded.[210] Combined with operations analysis they provide a more organic understanding of the nature and boundaries of the firm. In contrast, neither nexus of contracts nor agency theories teach us much about how firms manage such an unruly set of assets.

In an era in which knowledge may be the greatest asset held by a firm, this oversight limits the usefulness of contractual theories. Indeed, by failing to develop a robust account of organizational knowledge, TCE, for example, is unable to account for the crucial role of knowledge in determining firm boundaries.[211] As an example of this influence, TCE theorists contend that firms wishing to retain strong controls over firm-specific knowledge may be inclined

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article seeks to develop a more complete theory of the firm that takes account of specific production practices that determine firm capabilities.

[210] Hart, *supra* note 11, at 1767 ("Since human assets cannot be bought or sold, management and workers presumably own their human capital both before and after any merger."). To the contrary, it is precisely because a firm holds human capital that certain mergers take place. In seeking to merge in order to realize certain productive purposes, firms rely in part on the likely application of employee know-how to carry on production after the merger's completion.

[211] FOSS, *supra* note 27, at 8.

to vertically integrate.[212] Where firm-specific knowledge cannot be legally protected through patents, it is said, firms may be less willing to enter collaborative arrangements with other firms. Neither example reflects the more complicated forms of cooperation that occur within and between corporations today.[213] In criticizing Williamson's claim that the large corporation was formed to reduce uncertainty and transaction costs, Manuel Castells cites the example of the Asian economies to contend that the modern business enterprise is best characterized as a network of independent firms.[214] Instead, Castells maintains, the emergence of networks of individual firms demonstrates that economic actors can choose to cooperate without the need to resort to vertical integration.

TCE suggests that a common means of overcoming problems of agency costs and incomplete contracting in market transactions involves resort to hierarchical organizational structures. In today's business environment in which economic activity is increasingly performed through both intrafirm and interfirm horizontal groupings, resort to hierarchy may no longer be tenable. In addition, the fact that firms have successfully carried out production through alternative organizational structures (i.e., decentralized) implies that they have already achieved some control over opportunism and bounded rationality without resort to hierarchy.

Given the discussion of new production developed earlier, TCE appears also to lack an appreciation for the extent to which production systems can contribute to overcoming problems such as agency costs and incomplete contracting. Through the application of teamwork and flexible production, problems of bounded rationality can be minimized.[215] Moreover, with the aid of information technology and knowledge management applications, team

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[212] *Id.*

[213] It is not even clear whether this type of interfirm cooperation is novel. *See, e.g.*, Helper et al. , *supra* note 19, at 443.

[214] CASTELLS, *supra* note 44, at 190.

[215] *See* Helper et al., *supra* note 19, at 475-76.

members can collaborate to solve problems that individually would be intractable. Flexible production techniques that are attuned to markets can overcome problems of internal informational asymmetries. Likewise, error detection and correction techniques hold the possibility of reducing opportunism through improved monitoring. To overcome the descriptive limitations of TCE, what is needed is a theory that "supplement[s] the notion of the firm as a contractual entity with the notion of the firm as a bundle of capabilities."[216]

Capabilities theory, more than any other contender, best captures the nature of the firm described in the analysis of contemporary production. Developments such as just-in-time manufacturing, modular production, real time error detection, and knowledge management all illustrate highly developed firm capabilities. To the extent that organizational learning is the fuel that drives continuous improvements in these practices, only capabilities theory can account for the existence and crucial importance of learning for the production process.

V. IMPLICATIONS OF CAPABILITIES THEORY FOR CORPORATE GOVERNANCE

Team production theory in corporate law is a suitable model with which to posit the governance arrangements relevant to new organizational realities. While variants exist, this article will discuss one of the most influential and cogent explications of the theory as developed by Margaret Blair and Lynn Stout in a series of articles. Blair and Stout have developed a substantial critique of the principal-agent model, what they call the "grand-design principal-agent model", and posit in its place a team production model ("TPM") of the firm that gives full standing to the fact that in addition to shareholders, "executives, rank-and-file employees, and even creditors" make specialized contributions to the firm and have significant interests in the

[216] FOSS, *supra* note 75, at 9.

success or failure of the enterprise.[217] Contrary to the principal-agent model that holds on both descriptive and normative grounds that the shareholders "own" the firm, Blair and Stout argue that the situation is much more complicated. If shareholders indeed *own* the firm, they ask, then how can one explain the lack of control they have over firm conduct?[218] Moreover, with shareholder rights reducible to the right to elect directors, the right to vote on extraordinary transactions, and the right to sue derivatively in connection with breaches of fiduciary duty by directors, one cannot seriously contend that shareholders play much of a governance role.[219] Because of the attenuated nature of shareholder rights, Blair and Stout argue that boards of directors are best likened to trustees, or in their parlance, "mediating hierarchs," of the corporation.[220] While recognizing the supervisory role of directors, they point to many of the modern production practices discussed in this article, particularly the flattening out of the corporate structure, to argue that, rather than dictate all corporate practices, boards must mediate between competing teams comprising the firm.[221]

According to Blair and Stout, team production problems arise in situations in which there is a team, some of the resources that team members produce are team-specific, and the gains from team production cannot be allocated to specific members.[222]

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[217] Blair & Stout, *supra* note 7, at 250.

[218] *Id.*

[219] *Id.*

[220] *Id.*

[221] *Id.* In a similar vein, Oliver Williamson argues that courts refuse to hear disputes between divisions of the same firm. WILLIAMSON, *supra* note 31.

[222] Margaret Blair and Lynn Stout posit a particular notion of team that departs from the conventional understanding of the term. In their analysis, a team has a broader scope, spanning various communities of practice that constitute the firm. The first condition is that economic production requires a team. In other words, production requires the combined inputs (of time, money, or other valuable resources) of two or more individuals. The second condition is that at least some of the

Because investments by team members are "team-specific," the fates of all parties involved in team production are inextricably linked. Of course, each team member is to a greater or lesser degree free to leave and try to sell transferable skills and knowledge, but in practice, this decision has a cost. When one works as part of a team, intangible factors like loyalty come into the picture, bonding participants to a venture in a way the principal-agent model cannot conceive. Moreover, because inputs in the production process are difficult to separate, it becomes difficult to determine to whom benefits accrue. The danger of rent seeking in such an environment is real.[223] Team members have great incentive to shirk or free ride on the efforts of others. This problem must be resolved in order to explain the widespread production that we experience. Social norms of cooperation are one possible explanation of how the free rider problem is minimized.[224] Whatever the answer, it does not appear that the principal-agent model is of much help.

As described in this article, contemporary production is an intricate affair. Too many actors with too much discretion perform too many tasks *cooperatively* for hierarchy to be a tenable governance tool. The team production model of corporate governance offers a way to gather these diverse productive inputs. It also represents the nature of board control more realistically. Analogous to the argument that Osborne and Gaebler make with respect to government, the job of the board is to steer, not row.[225] To play out this

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resources of the team members must invest to produce are 'team-specific,' meaning that they have a significantly higher value when used in the team than in their next best use. The third condition is that the gains resulting from team production, the economic "rents," are joint or non-separable, making it difficult to attribute any particular portion of the gains to any single team member's contribution. Margaret M. Blair & Lynn A. Stout, *Team Production and Corporate Law*, 24 IOWA J. CORP. L. 743, 745 (1999).

[223] *Id.* at 746.

[224] *See, e.g.*, Mitchell, *supra* note 8.

[225] DAVID OSBORNE & TED GAEBLER, REINVENTING GOVERNMENT: HOW THE ENTREPRENEURIAL SPIRIT IS TRANSFORMING THE PUBLIC SECTOR 25 (1993).

metaphor, the analysis of the firm in this article shows that the process of rowing is in fact what makes the firm a firm. Rather than unfettered power, the board's ability to steer is a function of a firm's capacity to row. Given the account of production in which cooperation emerges as the tie that binds the firm together, a cooperative vision of governance, what one might call shared managerialism, is a better fit.

Existing views of the firm are impoverished. To the extent they propose any model of the firm, that model is hollow. The actual life of the firm, represented by the capabilities view, offers a more realistic account. A theory of the firm that integrates TPM and capabilities theories as enhanced by an analysis of modern production, provides a theoretical basis for the firm's governance. A model of team production in which managers and directors must mediate between diverse stakeholder interests, holds some promise in avoiding the kind of opportunism witnessed in corporate America of late.[226]

VI. APPLICATIONS

Following the presentation of new production techniques and in light of the theoretical foundations for the firm proposed, this section proposes applications for this theoretical approach, particularly in the areas of corporate law and regulatory compliance.

A. Corporate Law Implications

Looking at the intricacies of production exposes the limitations of conventional corporate law scholarship. Put simply, too much of what happens in firms occurs below the radar of corporate law. Likewise, contractual arguments offer insufficient explanations. The development of firm capabilities happens in a fashion relatively autonomous from corporate law. Of course, corporate law plays a role in facilitating the creation of entities that house capabilities.

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[226] *See generally* Lucian Arye Bebchuk et al., *supra* note 14; Landon Thomas Jr., *Consultant to Grasso on Pay is Also an Advisor to Exchange*, N.Y. TIMES, Sept. 24, 2003, at A1.

For the most part, however, that role is consigned to the background.

Examining the chief pillars of corporate law—the fiduciary duties of loyalty, good faith and care—illustrate corporate law's background role. Generally speaking, Delaware case law holds directors to a fiduciary duty to manage the corporation for the benefit of the shareholders.[227] The duties of loyalty, good faith, and care are all highly circumscribed. First, Delaware courts have articulated standards for determining violations of the duty of loyalty in only limited circumstances. The example of self dealing is clearly encompassed by the principle.[228] Likewise, a failure to communicate truthfully to shareholders in connection with public statements to the market or shareholders, statements regarding the affairs of the corporation without a request for shareholder action, and statements concerning the affairs of the corporation in connection with a request for shareholder action violate the duty of loyalty.[229] Delaware courts have also ruled that directors are subject to heightened duties of loyalty in change of control situations.[230] Second, the duty of care is no more rigorous. It is limited to the requirement that decisions of the board be reached on an informed basis and evidenced by a rational business purpose.[231] As an initial matter, the bedrock fiduciary duties upon which corporate governance must rely place relatively minor constraints on board decision making.

Despite the relatively light restrictions these duties place on directors, they have become even less onerous through the affirmative defense of the business judgment rule. The purpose of the rule is to provide directors with the degree of

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[227] DEL. CODE. ANN. tit. 8, § 141(a) (1981); Malone v. Brincat, 722 A.2d 5, 9 (Del. 1998).

[228] Cede & Co. v. Technicolor, 634 A.2d 345, 362 (Del. 1994).

[229] *Brincat*, 722 A.2d at 11.

[230] Unocal v. Mesa Petroleum Co., 493 A.2d 946, 954 (Del. 1985) (referring to the "omnipresent specter that a board may be acting primarily in its own interests, rather than those of the corporation and its shareholders" when confronted with a takeover offer).

[231] *Cede & Co.*, 634 A.2d at 361.

discretion needed to manage the affairs of the corporation.[232] Under the rule, decisions directors reach "on an informed basis (i.e., with due care), in good faith, and in the honest belief that the action taken was in the best interest of the company" are presumed valid.[233] Under any analysis, the fiduciary duties to which directors are held by Delaware courts afford substantial discretion. So long as they act honestly and rationally, corporate law has little to say to them. The purpose of such a rule cannot be to place substantial external controls over business decisions of corporations.[234] Corporate law thus has little to do with the day-to-day operations of firms.

One implication of this view is that almost all decisions of a business nature undertaken by the board are immune from judicial scrutiny. Corporate law entitles directors to use their business judgment in "managing the business and affairs of the corporation."[235] Because there are no teeth to the analysis of duty of care breaches, it is ultimately reducible to a prohibition on egregious mismanagement. As a governance principal, the duty of care is limited to maintaining the corporate form within which directors may freely exercise their discretionary decision making power.

Likewise, the duty of loyalty is intended to preserve the integrity of the decision making process. Decisions of the board will not be challenged under this principle unless directors may be shown to have exercised bad faith. Here too, the essential purpose of the doctrine appears designed to ensure the preservation of the corporate form through objective decision making. It is a prudential rule that is essential for the corporate entity to maintain its status independent from the individuals acting as directors.

Both duties serve not as governance tools in the sense of daily decision making but as the conditions for the maintenance of the corporate form. What happens within

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[232] *Id.* at 360 ("The rule operates to preclude a court from imposing itself unreasonably on the business and affairs of a corporation.").

[233] *Id.* at 360.

[234] Blair & Stout, *supra* note 7, at 298-310.

[235] DEL. CODE ANN. tit. 8, § 141(a) (1981).

the corporation is ultimately a matter over which the participants in the corporate venture, the team members, have much discretion. Corporate law requires directors to steer the business and affairs rationally and nonselfinterestedly, but allows a vast array of approaches to accomplish such mandates.

B. Rethinking Regulatory Compliance

Theories of regulation that seek to harness firms' resources in achieving regulatory objectives have grown increasingly influential. Declining state resources, the inefficacy of traditional command and control regulation in reducing negative externalities, increased autonomy of complex functional subsystems,[236] and the relative shift in the tendency towards vertical as opposed to horizontal integration have driven regulators towards self-regulatory or management-based regulatory strategies.[237] While directing regulatory strategies towards firm-level compliance concerns, relatively little attention has been devoted to the question of firm capabilities to achieve regulatory objectives.[238]

The analysis of contemporary production in this article illustrates highly developed capabilities in many firms today. It also provides a compelling basis for defining firm compliance obligations. By conceiving of the firm in terms of capabilities, the scope of firm compliance obligations can be understood through analysis of the feasible range of firm conduct. In other words, the risk that regulatory norms will

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[236] *See generally* JURGEN HABERMAS, BETWEEN FACTS AND NORMS (1995); GUNTHER TEUBNER, JURIDIFICATION OF SOCIAL SPHERES: A COMPARATIVE ANALYSIS IN THE AREAS OF LABOR, CORPORATE, ANTI-TRUST, AND SOCIAL WELFARE LAW (1987).

[237] *See generally* IAN AYRES & JOHN BRAITHEWAITE, RESPONSIVE REGULATION: TRANSCENDING THE DEREGULATION DEBATE (1992). *See also* Christine Parker, *Reinventing Regulation within the Corporation: Compliance-Oriented Regulatory Innovation*, 32 ADMIN. & SOC. 529 (2000); Cary Coglianese & David Lazer, *Management Based Regulation: Prescribing Private Management to Achieve Public Goals*, 37 LAW & SOC'Y REV. 691 (2003) .

[238] *See, e.g.*, OECD, REGULATORY POLICIES IN OECD COUNTRIES: FROM INTERVENTIONISM TO REGULATORY GOVERNANCE 136-37 (2002).

surpass firms' abilities to adhere to such norms declines substantially. Through an understanding of firm capabilities, regulatory norms may better map operational structures. Determining what regulators should expect from firms in the compliance context requires an understanding of what firms are capable of doing. Performance-based regulation that is not informed by an understanding of firm capabilities risks setting the bar too low. Rather than engaging in an analysis of contemporary firms, we may determine performance criteria against an implied background understanding of firm capabilities.

When we view highly developed capabilities in industry today, it is at least worth considering whether we ask enough of firms. Business practices such as just-in-time production, zero defects policies, and improved controls over logistics and inventories suggest that firms can meet incredibly demanding production goals. Performance standards must reflect these capabilities. Similarly, regulators can demand much improved information from firms. Given the minimal marginal cost of collecting additional information relevant to regulatory compliance, regulators can demand and receive richer information from regulated entities. Making such requests requires regulators to have a true picture of the capabilities of firms. Without an understanding of the extent to which operations are IT enabled, regulators may not optimize their ability to collect information.

Similarly, this analysis suggests that compliance models such as the Organizational Sentencing Guidelines ("OSGs") are lacking in rigor. The OSGs are the single most authoritative compliance guidance in the United States.[239] The OSGs were developed by the United States Sentencing Commission as part of its comprehensive guidance for sentencing criminal defendants.[240] They were specifically

[239] *See* U.S. SENTENCING COMMISSION, SENTENCING GUIDELINES MANUAL, ch. 8 (2002).

[240] The United States Sentencing Commission was created pursuant to the Sentencing Reform Act of 1984. Sentencing Reform Act of 1984, Pub. L. No. 98-473, 98 Stat. 1987 (codified as 18 U.S.C. §§ 3551-3742 (1994) and

designed to provide just punishment, adequate deterrence, and incentives for organizations to maintain effective programs for preventing, detecting, and reporting criminal conduct.[241] An effective program is defined as one "that has been reasonably designed, implemented and enforced so that it generally will be effective in preventing and detecting criminal conduct."[242]

Elements of the OSGs that bear reconsideration in light of the capabilities theory of the firm include the concept of centralized compliance standards, firm-wide training, and ex post monitoring. To receive the benefits of the OSGs, organizations are required to demonstrate that they have put in place a compliance plan. Typically, that plan covers the entire firm. Such an approach seems out of step with the local nature of much of the production described earlier. Similarly, the concept of providing training to employees throughout a firm seems likely to overlook the particular challenges faced by discrete business units and production lines. Finally, the approach to monitoring advocated by the OSGs appears too reliant on ex post methods. The analysis of zero-defects manufacturing and real-time error detection and correction seems much more rigorous. Rather than identifying compliance failures long after the fact, firms should be encouraged or required to identify them as soon as possible. The turn to management-based regulatory strategies makes the capabilities of firms crucial. More work will need to be done to explore the full implications of this hypothesis.

VII. CONCLUSION

This article has described the implications of high-performance production and work practices for theory of the firm and corporate governance. This analysis suggests that the changes that have occurred are revolutionary rather

28 U.S.C. §§ 991-998 (1994)). Under 28 U.S.C. § 994(a), the Commission was given authority to promulgate the OSGs.

[241] SENTENCING GUIDELINES MANUAL, *supra* note 239, at 423.

[242] *Id.* at 427.

than evolutionary. In light of these new realities, fundamental concepts of economic organization and corporate governance need rethinking. Research in the field of organizational capabilities provides a potentially fruitful basis for engaging in this reconceptualization, yet this expanded understanding of the firm suggests the need for alternative governance arrangements. The team production theory of corporate law seems best able to explain how governance of disparate production groups can emerge. Herculean efforts to rearrange incentives will not make hierarchical organizational structures work. This article hopes to have shown that the world has already changed—it's time our theories caught up.