THE ADAPTIVE CONTRACT:
INNOVATION AND COLLABORATION IN AN UNCERTAIN WORLD

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Note to readers: This is a preliminary draft of the first three chapters of a book that is still very much a work in progress. While the chapters being circulated offer a fairly complete overview of the project's ambition, our work exploring the ways that contract adapts to the current environment has yet to be completed much less reduced to words on a page.

CHAPTER ONE

INTRODUCTION: CONTRACT IN A RAPIDLY CHANGING ECONOMY

INTRODUCTION

We live a world of rapid changes in business practice. That much seems uncontroversial. The sources of the changes and of the resulting uncertainty that it creates may be less clear: change may be prompted by the technological revolution or by the effects of globalization or by a combination of many interrelated factors. What is clear is that innovation—disruption in business practice that leads to a new way of doing things— plays a large role in the roiling of the current business environment. But this is not a book about innovation and its causes. Rather our project is to focus on the uncertainty that accompanies innovation and the ways in which *contract* – informal arrangements that reflect the parties' past and anticipated patterns of dealing, formal contracts that seek to specify what happens in the event of predictable future events, and "braided" contracts that use formal process-oriented contracts to support informal substantive commitments – has responded to the increase in uncertainty.

But lumping into a single category these very different ways of organizing how parties coordinate their contributions to an innovative project also masks each of these contracting techniques' very distinctive character, use and operation. Each is readily understandable in stable times, when the organization and pattern of economic activity is predictable and when change is incremental and linear. Then the boundaries that define when different contract forms appear vary little and therefore are observable. The more interesting, and more current question, the one that occupies us in this book, is what happens to contracting patterns and contract law when uncertainty increases as the pace of change in a particular business environment speeds up?

What we are seeing is that the world of practice is outpacing the world of theory; a profound transformation of contracting practice (and contract law) is occurring under our noses.

We see the rapid spread of new forms of collaborative contracting among independent firms at the pioneering and most productive frontier in nearly every area of the economy.[1] Large pharmaceutical companies now routinely develop new drugs in concert with specialized biotech firms.[2] Automobile producers routinely co-develop key components ranging from sophisticated fuel injection systems to transmissions to lithium powered batteries with specialist suppliers.[3] For decades the very existence of the large firm was explained by the need for a single owner of all key inputs to avoid what seemed the unacceptable risks of the very kind of collaboration with independent suppliers that have now reemerged. Mutual dependency among contracting parties, it was assumed, allowed self-seeking suppliers to hold up their customers (hence the term of art), withholding vital supplies until they secured better terms. U.S. automobile makers, such as General Motors, who acquired suppliers in the 1920s were often invoked to illustrate the imperatives of vertical integration.[4] Yet, today in every sector of the economy, including

[1] For an extended discussion of the new forms of collaborative contracting and their role in adapting to an uncertain world, see Ronald J. Gilson, Charles F. Sabel & Robert E. Scott, *Contracting for Innovation: Vertical Disintegration and Interfirm Collaboration*, 109 Colum. L. Rev. 431 (2009).

[2] The development of new drugs based on biotechnology often entails contracting across organizational boundaries. Large pharmaceutical companies frequently lack the depth of scientific knowledge and experience that provide the foundation for biotech research. Smaller biotech firms typically lack the experience and capital both to take the drugs through the arduous process of obtaining FDA approval and then to commercially market the drug. *See* Leslie Gladstone Restaino, BioPharma Collaborative Agreements: Choosing the right Deal Structure, Metropolitan Corporate Counsel 47 (Nov. 2007), available at http://www.metrocorpcounsel.com/pdf/2007/November/47.pdf A prototypical exemplar of this form of collaborative contracting is the research, development, and license agreement between Warner-Lambert, a large pharmaceutical company, and Ligand Pharmaceutical, a much smaller biotech company, to discover and/or design small-molecule compounds which act through the estrogen receptors, to develop pharmaceutical products from such compounds and to take such products through the FDA approval process and commercialization. Research, Development and License Agreement between Warner-Lambert Company and Ligand Pharmaceuticals Inc. (Sept. 1, 1999). [Add reference to Tesla battery factory joint venture.]

[3] See e.g., Component Supply Agreement between American Axle & Manufacturing, Inc. and General Motors Corporation (June 5, 1998) (requirements contract for motor vehicle components to be supplied by AAM to GMM); Development Agreement between Nanosys, Inc. and Matsushita Electric Works, Ltd. (Nov. 18, 2002) (collaboration agreement to develop photovoltaic devices with nano components); Long Term Agreement between John Deere & Company and Stanadyne Corporation (5 year supply contract for the purchase of fuel filtration systems, injection nozzles and related products by Deere from Stanadyne).; Airbus A320 Purchase Agreement between AVSA S.A.R.L. and New Air Corporation (April 30, 1999)).

[4] See e.g., Benjamin Klein, *Vertical Integration as Organizational Ownership: The Fisher Body-General Motors Relationship Revisited* in THE NATURE OF THE FIRM: ORIGINS, EVOLUTION AND DEVELOPMENT 213 (O. Williamson & S. Winter eds., 1991); Benjamin Klein, *Fisher-General Motors and the Nature of the Firm*, 43 J. L. & Econ. 105 (2000). But see, Ronald Coase, *The Conduct of Economics: The Example of Fisher Body and General Motors*, 15 J. Econ. & Mgmt. Strategy 255 (2006). MICHAEL J. PIORE & CHARLES F. SABEL, THE SECOND INDUSTRIAL DIVIDE: POSSIBILITIES FOR PROSPERITY (1984), provide the canonical account of the historical contingency of the vertically integrated automobile company, with assembly lines based on specialized machinery and semiskilled workers, whose vertical disintegration we chronicle here.

especially the automobile industry, we see vertical integration replaced by supply chains linked together by previously unknown forms of contracting. And so in this book we ask what has changed to make the most capable and innovative firms today routinely embrace forms of contracting that had previously been unthinkable?

This transformation in contracting practices coincides with the increased rate of change in the business environment. Increases in the complexity of the technology necessary for successful product development and in the rate of change in those technologies have made it difficult for a single firm to sustain state-of-the-art capacity across all the needed technologies. The response has been collaboration across organizational boundaries with, for example, upstream and downstream participants in a supply chain specializing in particular technologies and the ultimate product resulting from cooperation among different organizations, each having contributed its special expertise. In these new arrangements, the product is a joint effort by two or more organizations; it is metaphorically situated between them and is dependent on both.[5] The challenge for the firms that are seeking to bring the innovative product successfully to market is clear: The uncertainty that is the evil twin of innovation requires a collaborative and iterative process quite different from the familiar story of a discrete product supplied by a party upstream in the supply chain according to specifications set by a downstream customer.

The transactions governed by this collaborative process share a number of characteristics. First, the primary output is an innovative "product,"one whose characteristics, costs, and manufacture, because of uncertainty, cannot be specified ex ante. Second, neither party alone has the capacity to specify and develop the product; hence, there must be collaboration among companies with different capabilities. Third, the process of specification and development will be iterative: Individual design elements will depend on the recurrent input from those working upstream or downstream and from those working on other design elements. Thus, central to these transactions are contracting techniques that facilitate

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[5] The development of the Boeing 787 aircraft is a good example of these new arrangements. Innovation in the design and manufacture of the wing, the province of one supplier (or group of suppliers), is dependent on the design and manufacture of the fuselage, the province of a different supplier (or group of suppliers), and vice versa. Innovation in one structure must mesh with innovation in the other in order for either to be successful. The design of the wing must not only be compatible with the design of the fuselage on all relevant dimensions; the two must physically fit together.

communication and cooperation across the two (or more) firms—the design, specification, and product characteristics will be the result of repeated interactive collaborative efforts by employees of separate firms with distinct capabilities.

CONTRACT ADAPTS TO UNCERTAINTY AND THE IMPERATIVE OF COLLABORATION

One part of the answer to the contemporary embrace of inter-firm collaboration lies in a deep transformation of the economy itself: uncertainty has blurred the direction of technological change. Mastery of current technology is no longer a reliable guide to what is coming next. Technology now advances so rapidly—and solutions in one domain so often prove applicable in other, apparently unrelated ones—that no single firm can remain on the cutting edge in all of the disciplines that are, or could prove to be, relevant to competitive success. There is much inconclusive debate about the extent of innovation—whether it is confined to a small vanguard of advanced firms, or whether it is percolating generally through the economy; further debate questions whether even a successful incumbent firm can recover when the direction of technology shifts away from the firm competencies that fueled the incumbent's success. But there is little doubt that technological trajectories have become surprising; and that the effects of pervasive technological surprises are disruptive – a word whose ubiquity in the business press is itself a sign of change.

The second part of the explanation for the emergence of collaboration and co-development is the innovation in contract itself. As we will see, contract is not rigid and inflexible; it adapts to changes in the economic environment. Familiar forms of fully specified contracts that work well in low uncertainty environments are incompatible with collaborative exploration of new possibilities. A sharp increase in uncertainty necessarily forces the parties to shift their contractual strategy from specifying what to make in an explicit contract, to establishing a process to discover jointly what could be made in a business environment that has changed in unexpected ways. Innovation in contract then is needed to support the cooperative search for innovative opportunities in the product or service markets.

As conventionally understood, contract is an exchange of precise promises: I give, so that you will give in return — *do ut des*. It follows that if the joint purpose is discovery through collaboration, then one might assume that the terms of the contract would specify the precise division of labor necessary to accomplish that goal. Under uncertainty, however, defining the goal and determining whether it is feasible is what the parties intend the collaboration to accomplish; a detailed and binding division of labor would be a self-deluded and self-defeating speculation. The very uncertainty -- the inability to anticipate future states of the world -- that makes collaboration between independent parties indispensable to innovation makes it impossible for conventional contracting techniques to manage the effort.

Driven by the urgent need to collaborate in response to uncertainty, lawyers and managers in innovative firms have experimented with novel contractual adaptations that avoid a collision between commercial necessity and the inadequacy of existing contractual techniques. Instead of attempting to specify the outcome—what each party must actually contribute to realize the common purpose—the lawyers and managers have designed agreements that set the terms of the collaborative process. The key design innovation is to use *formal* contracts to create governance processes that support iterative joint effort to discover the characteristics of the product that the parties will decide whether to make. In the following section we describe one notable example of this mode of collaborative contracting.

CONTRACTING FOR INNOVATION: A PROTYPICAL EXEMPLAR

The transformation in contracting practices that we will call *contracting for innovation* began several decades ago with the evolution of co-development in the bio-tech industry. We begin, therefore, with a prototypical exemplar of the phenomenon that will form the lens with which we will examine both the linkages between innovation and contract and the ways that contract itself adapts to different economic environments. We choose this example deliberately because it illustrates both the possibilities for successful collaboration as well as the possibility of failure.

In 1997, the major pharmaceutical firm Eli Lilly entered into a Research Collaboration and Option Agreement with Emisphere Technologies, a relatively small bio-tech firm, to collaborate in

research on new chemical "carrier" compounds. The goal was to use these molecules to deliver therapeutic proteins to patients orally, carrying them intact through the human digestive system. The collaboration calls for the parties to conduct joint research under an annual research plan approved by a Research Steering Committee (RSC) with the goal of identifying one or more compounds with "activity in the field."[6] The collaboration is to proceed interactively, each party using "reasonable efforts" to perform the work under the plan, providing quarterly reports to the RSC, disclosing all inventions, keeping an open research laboratory for the other party to visit and permitting open inspection of all data and research materials.[7]

The RSC consists of three members from each firm. It meets quarterly to review, approve and modify research plans, measuring research progress against benchmarks, and selecting the lead compounds for each target. It requires open information exchange and keeps detailed records of its own activities. Importantly, the agreement provides that all decisions of the RSC must be unanimous. If the RSC cannot reach unanimity on any matter, the issue is referred to senior Vice Presidents for each firm. If they disagree, the decision-making process then moves up the respective firms' hierarchy to the two CEOs. Only if the CEOs fail to resolve the differences can Lilly terminate its funding.

As in many pharmaceutical research collaborations, the contract contemplates the commercialization of an eventual product of the collaboration by the funding entity, in this case Lilly. In view of this possibility, Emisphere grants Lilly a world-wide license to make and develop all active and derivative compounds resulting from the research.[8] Lilly is to pay a designated license

[6] Clause 2.1.

[7] Clause 2.7(b). The annual research plan establishes specific benchmark objectives consistent with Lilly's contract funding obligations. The initial term of the research collaboration is three years, with an option to extend the collaboration for an additional two years by mutual agreement.[7] Either party could terminate for breach or insolvency or if the respective CEOs could not resolve a dispute under the contract's internal dispute resolution mechanism

[8] NDA filing and NDA approval pursuant to the New Drug Application and Approval processes of the Food and Drug Administration are a prerequisite to the marketing of a new drug therapy to the general public.

fee on the effective date of the agreement, and pay Emisphere a designated royalty on aggregate net sales of the product.[9]

An important feature of the contract is the series of options granted to each party as the collaboration approaches the end of the research phase. The contract gives Lilly an initial option to attempt to commercialize the product of the research under the initial license and royalty arrangement. But if Lilly either fails to pursue this option diligently or decides to abandon the option, then Emisphere has the option to acquire the product at a price to be negotiated in good faith and to market it elsewhere.

The novelty of agreements such as these that have been adopted in literally hundreds of pharmaceutical collaborations both in the US and in Europe is that the agreement between Lilly and Emisphere is radically incomplete. The parties establish a formal governance structure that dictates iterative exchanges of private information together with an internal dispute resolution process. But the parties do not commit to producing any product nor do they attempt to price the contributions that each makes to the collaboration during the research period. This presents several pressing questions that contract law and theory seem unable to address: What explains the apparent success of these collaborations given the risk that asymmetric investments by either party will tempt the other to use the resulting sunk costs to extract an advantage? And, assuming occasional evidence of opportunistic behavior, can contract law enforce this agreement so as to declare a breach and assess a sanction? We begin with the explanations for success notwithstanding the challenge both to law and theory and then consider the consequences of failure.

How do These Collaborations Constrain Exploitation and Strategic Behavior?

Despite the absence of terms providing for precise duties of performance and specifying the consequences for non-performance, the available evidence is that these collaborations often succeed in achieving the parties' goals. The success of the formal governance arrangement depends on two closely linked components. The first critical component is the commitment to

[9] The parties agree that royalties are owed regardless of whether the product is covered by a patent since the principal contribution of Lilly is to accelerate the time to market.

an ongoing mutual exchange of private information designed to determine if a project is feasible, and if so, how best to implement the parties' joint objectives. The second component is the procedure for resolving disputes arising during the course of the first. Its key feature — what we will call the "contract referee mechanism" – is the requirement that the collaborators reach unanimous (or near unanimous) agreement on crucial decisions, with persistent disagreement resolved (or not) by unanimous agreement at higher levels of management from each firm.[10] Together these two mechanisms render observable, and forestall misunderstandings about, each party's character traits and substantive capabilities; working under uncertainty they can expect to encounter unanticipated problems that can only be solved jointly and that can be expected to generate occasions of disagreement. If an innovative project misses a milestone, raising doubts about its feasibility, the agreement makes it easy for skeptics to demand further compelling information in lieu of proceeding further, while at the same time penalizing self-interested or carelessly bull headed opposition to promising but unexpectedly difficult work.[11]

This formal commitment to a collaborative process makes the parties' behavior transparent to each other. Transparency, in turn, means that incapacity, self-dealing or even the fact of a poor match between the counterparties is detected before a failed effort at collaboration produces ruinous results. Conversely, successful collaboration, forged in the crucible of joint problem-solving, builds the mutual understanding and trust that makes continued collaboration even more resilient. As a consequence, litigation is an infrequent outcome.[12]

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[10] Requiring unanimity for project decisions makes it easy for reasonable skeptics to require more information from enthusiasts; bumping disagreements up to impatient superiors discourages obstinacy. Gilson, Sabel & Scott, *Contracting for Innovation*, supra note 1 at 479-81.

[11] Taken together, these iterative, cooperative techniques play an important part in shaping the links that connect firms in the vertically disintegrated economy. As each collaborating party monitors and learns from the others' participation in the process, observation renders tacit knowledge at least partly explicit, easing long-range collaboration (by reducing the chances that the parties take incompatible things for granted) and reducing the chance that all the parties cling to limiting assumptions held by any single party. We discuss these techniques in detail in Chapter ***.

[12] In addition to the litigation between Lilly and Emisphere described here, there are several other instances of failed collaborations that led to litigation. See e.g., In the matter of the Arbitration between Pharmacia & Upjohn Co. v. Elan Pharmaceuticals, 781 N. Y.S. 2d 95 (2004) (contractual relationship breaks down when Pfizer acquired Pharmacia and allegedly used information transferred to the collaboration to support a "separate research program."); Static Control Components v. Mitsubishi Kagaku Imaging Corp., 2007 WL 586710 (M.D. N.C.) (plaintiff claims defendant breached confidentiality provision by selling co-developed products to third parties, and favored other competitors over plaintiff.)

What is the Role of Contract Law in Bio-tech Collaborations?

In this case, however, the relationship between Lilly and Emisphere broke down in a dispute over whether Lilly breached the contract by pursuing its own secret research projects with Emisphere's proprietary carriers.[13] Emisphere contended that in 2000 Lilly began carrying out secret, independent research projects using Emisphere's carriers with proteins other than those committed to the collaborative project. Emisphere also contended that Lilly further violated the agreement by having the employees who worked on the joint program provide confidential Emisphere information to the Lilly team working on the secret projects. The issue for the court was whether Lilly's violation of the adaptation protocols only gave rise to a suit for patent infringement by Emisphere, or whether it gave rise to an independent remedy for breach of contract and, if so, whether Emisphere could terminate the contract and thereby capture the fruits of a valuable, jointly created opportunity.

The court found that the agreement was much more than just a patent license. Rather, the parties had agreed to a close and collaborative research relationship in which Emisphere provided Lilly with a great deal of information, not all of which might be protected by patent law. Thus, held the court, there was an implied covenant not to use that information outside the scope of the license agreement. In short, the parties had entered into a form of cooperative contracting that had important—and legally enforceable—limits. When Lilly undertook its secret research projects, it not only risked a claim of patent infringement, but it breached the contract that gave it the limited license in the first place. Holding that Lilly had therefore forfeited its investment in the joint project, the court held that Lilly had breached the research collaboration agreement and that breach entitled Emisphere to terminate the agreement and retain its investment in the collaboration.[14]

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[13] See Eli Lilly & Co. v. Emisphere Technologies, Inc., 408 F. Supp. 2d 668 (2006). The agreement provided, inter alia, that "Lilly shall not have any rights to use the Emisphere Technology or Emisphere Program Technology other than insofar as they relate directly to the Field and are expressly granted herein." Id. at -- (Clause 2.1).

[14] Id. at --. A similar result was reached in an analogous case, Medinol Ltd. v. Boston Scintific Corp., 346 F. Supp. 2d 575 (S.D.N.Y. 2004). In *Medinol*, the parties entered into "a close and extensive contractual relationship" for research, development, manufacture, and distribution of stents for medical uses." *Id.* at 581. Medinol was to manufacture the stents and Boston Scientific was to sell them in the United States under license from Medinol. The parties agreed that Medinol would establish an "Alternative Line" for manufacturing stents, which Boston Scientific would be permitted to operate under license from Medinol so as to reduce the risk of supply disruptions. That license was limited to "the operation of the Alternative Line." *Id.* at 597. Boston Scientific then set up a secret manufacturing operation outside the scope of the

Lilly v. Emisphere illustrates how courts can use formal enforcement to support a collaborative relationship when informal mechanisms have failed. By only sanctioning "red-faced" violations of the collaborative agreement, such as the secret research group formed by Lilly outside the informal exchanges created by the agreement itself, the court did not attempt to regulate the nature of the collaborative interactions. Thus, the maintenance of the adaptation protocols established by the parties was left entirely within the province of the internally generated enforcement mechanism. The formal enforcement only excluded a (secret) alternative process that undermined the trust that was in fact generated through the braiding of formal and informal mechanisms.

Beyond Bio-Tech Collaborations

The transformation in contracting practices just described began several decades ago with the evolution of co-development in the bio-tech industry. More recently, however, we see a similar transformation in the development of platform production in nano-technology and software production, in the displacement of the vertically integrated corporate form by the modern supply chain and in collective efforts by private parties and the state to mitigate the risk of latent hazards generated by the innovative activity. Thus, it is a mistake to see this transformation as a phenomenon that has run its course. Rather, the changes in business practices and the uncertainty that demands new forms of collaboration continue to transform key industries. The radical uncertainty confronting the automobile industry as we write this book provides a salient example of the linkage between the technological environment, business practices and contract. Across the industry, large manufacturers have entered into strategic alliances and collaborative partnerships to jointly develop electric vehicles, autonomous technologies and cooperate in ride-sharing efforts. Others have tried to develop the same technological capabilities within their existing organizational structure. The result is a challenge

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Alternative Line. Although there was no express covenant against such manufacture, the court found that the parties' close collaborative relationship showed that the unauthorized manufacturing amounted to a breach of contract, *id.* at 598, without limiting Medinol to a patent infringement suit. The court further found that Boston Scientific's stealth and secrecy showed it had acted in bad faith by setting up the unauthorized line. *Id.* at 596. The court granted summary judgment for Medinol on liability for the breach, leaving only the issue of damages for trial. See also, Shaw v. E.I. DuPont De Nemours & Co., 126Vt. 206, 226 A. 2d. 903 (1967) (affirming a damage award for breach of an implied covenant not to use a patent beyond the scope of license).

for the large manufacturers to both develop the competencies necessary for success and to determine the best venue within which to locate them.[15] In turn, this has led to a corresponding increase of new entrants to the industry, in some cases through startups, who possess skills that only now are relevant, and to an uncertainty-driven variety in possible strategies to compete successfully, and a corresponding increase in the range of contractual and organizational techniques used to implement these different strategies.[16]

ELEMENTS OF THE CONTRACTUAL ADAPTATION TO RAPID CHANGE

The rapid changes in organizational and contracting practices that are just now occurring in the auto industry and elsewhere reflect four novel shifts from the traditional contracting law and practice that dominates in quieter times. First, the thrust of business agreements are shifting from allocating risk between the parties to addressing the uncertainty they face jointly as the rate of change increases. Second, the taxonomy of contracts is changing in a fractal fashion – as the shift from vertical integration to supply chains accelerates in response to uncertainty, contracts increasingly are composed of a braided set of explicit and implicit contracts, the explicit contracts governing the collaborative process and the implicit contracts covering the manner in which efforts to innovate will go forward when they prove to be successful. Third, networks of participants play a large role as a means of gathering, assessing and distributing the information necessary to find collaborators in the new environment where potential collaborators have non-traditional skills. Finally, courts have a much more circumscribed role than under the traditional legal-centric orientation. Together, these four elements mark a fundamental change in the architecture of contract and set the stage for this book's account of the shape of contract in a landscape carved by risk, uncertainty and scale.

From Risk to Uncertainty

[15] See Ronald J. Gilson, *Locating Innovation: Technology, Organizational Structure and Financial Contracting*, 110 Colum. L. Rev. 885 (2010).
[16] We discuss the changes in the automobile industry and its profound effects on contracting practices in Chapter ***.

The novel changes in contracting practices that are taking place begin with a shift in the purpose of agreement from allocating risk between the parties to addressing the uncertainty they face jointly. This transformation highlights the distinction between risk and uncertainty that Frank Knight identified almost a century ago.[17] Begin with risk: along with every promise to produce a particular outcome there is a known chance—expressible as a probability—that some eventuality will prevent or compromise performance. Therefore, in addition to assigning obligations for performance, conventional contracts allocate responsibility for risks as well, together with a schedule of sanctions and rewards to induce the parties to take precautions to lessen the chances of breakdowns. Fresh produce can spoil in transit. Who bears the cost of spoilage, the buyer or the seller? If the seller bears the risk—perhaps because she is in the best position to take precautions—does the buyer nonetheless have the responsibility of recovering the salvage value of the spoiled shipment, or may she simply leave it to rot on the freight dock?[18]

But under uncertainty too little is known about these eventualities to anticipate precise risks and their probability. To be sure, we anticipate problems with every innovative project. Yet it would be wishful thinking to imagine that we can anticipate what those problems will be, and it is fantasy to think we can know–-or incentivize a partner to know —the precautions best taken to avoid them. Indeed, in Knight's famous definition, what distinguishes uncertainty from risk is the impossibility, under uncertainty, of assigning probabilities to future states of the world.[19] The best we can do faced with uncertainty is to learn as rapidly as we can about the possibilities and hazards of the situation we face, and how best to respond. When we discover that our powers of prediction are insufficient, and we must collaborate with others to master the

[17] See FRANK H. KNIGHT, RISK, UNCERTAINTY AND PROFIT (1921).

[18] See the discussion of Hart and Sack's seminal study—The Case of the Spoiled Cantaloupes – in Ronald J. Gilson, Charles F. Sabel & Robert E. Scott, *Text and Context: Contract Interpretation as Contract Design*, 100 Cornell L. Rev. 23 (2014). The problem of lost value by inefficient salvage is largely solved in the UCC. See §§ 2-603 and 2-604. The problem of opportunistic rejection is only partially solved by § 2-508.

[19] See KNIGHT, supra note ---. In Knight's usage there is risk when alternative future states of the world occur with quantifiable probability: the future can be expressed as a probability distribution. Since we can through insurance and other means mitigate or even eliminate the effects of unfavorable states, a risky world is one in which we can with near certainty live in the conditions we choose. The Knightian distinction between risk and uncertainty is a useful way to illustrate the way accelerating technology and global competition have created unique circumstances that resist probabilistic classification.

unknown, then the best we can do is organize effective joint learning through collaboration. That is what the adaptive contract for innovation does.

Braiding the Formal and the Informal.

A second distinctive feature of contract as it adapts to a world of uncertainty is the importance of explicit formal obligations—to exchange information on progress routinely and to solve problems jointly— in developing the informal norms and trust needed to pursue the projects conceived through formally specified processes of collaboration but which change as they advance. This combination of formal and informal features-- illustrated by the Lilly and Emisphere collaboration-- is the distinctive mechanism that produces trust in both the character and the capability of the counterparty. In contrast to more traditional accounts of contracting practice, trust is the product of the collaboration specified in contracts for innovation rather than its precondition.

Perhaps there is nothing in the study of contract law as controversial as the relation between the formal law of the written document and the informal norms of reciprocity embedded in the business practices and unwritten understandings that accompany exchange, as well as the related ties of friendship and trust.[20] For this reason, contract interpretation remains the single most important source of commercial litigation and the least settled, most contentious area of contemporary contract doctrine and scholarship. Initially framed by the clash between the two intellectual giants of contract, Samuel Williston and Arthur Corbin, and continuing to the present, two opposing positions have competed for dominance in contract interpretation. Many (indeed most) states follow a traditional common law, "textualist" approach to interpretation. Here, when the writing is clear, courts are disabled from inquiring into the context surrounding the contract. In contrast, in states that follow California, and in all states where the subject matter involves the sale of goods under the UCC, the courts are "contextualist." Here, courts are invited to consider the context regardless of the clarity of the written contract. Thus, the battle is joined: text versus context.

[20] See Gilson, Sabel & Scott, *Text and Context*, supra note ---.

For the contextual school of contract law, pervasive social and industry norms do the most important work, silently adjusting the contextual terms of the contract in response to shifting exigencies without requiring so much as a glance at, let alone deference to the formal document.[21] In the exceptional case, when one of the parties does not meet the contextual obligations of reciprocity, a court corrects the outcome in light of the working norms that should have governed the transaction.[22] Contextualists thus take trust to be indispensable to the normal course of contracting; but they hold that, rather than being cultivated by contract, trust simply exists (or not) as an outgrowth of social life.

For the contrary textualist school, the formal document replaces business practices and informal understanding as the central source of the terms of the parties' agreement; social ties and prior informal understandings that are not incorporated into the written agreement are at best incidental. The written contract contains precise instructions that allow for reliable planning and coordination and can incorporate any of the informal understandings that parties may wish to invoke in the event of a dispute. In this way, the aggregation of understandings into a written document is a bulwark against the destructive combination of a self-interested party's invocation of vague and therefore easily manipulable norms and a generalist judge functionally ignorant of the actual context and practices of the parties.

But this debate between text and context has failed to see that, except in the (largely hypothetical) case of the fully specified contract, the practice of combining *both* explicit and implicit contract terms has a distinguished pedigree. Increases in the level of uncertainty has for many decades led parties to write "relational contracts"-- such as long term supply and

[21] For a representative sampling of the literature, see Stewart Macaulay, *Non-Contractual Relations in Business: A Preliminary Study*, 28 Am. Soc. Rev. 55 (1963); Robert E. Scott, *Conflict and Cooperation in Long-Term Contracts*, 75 Calif. L. Rev. 2000 (1987); David Charny, *Non-Legal Sanctions in Commercial Relationships*, 104 Harv. L. Rev. 373 (1990); John McMillan & Christopher Woodruff, *Private Order Under Dysfunctional Public Order*, 98 Mich. L. Rev. 2421 (2000); Robert E. Scott, *A Theory of Self-Enforcing Indefinite Agreements*, 103 Colum. L. Rev. 1641 (2003).

[22] The principal exponent of this view was Karl Llewellyn. Llewellyn advocated a commitment to context, although he located the meta principle that courts must apply in the common "working rules" found in the practices of commercial parties. The course of prior dealings between the parties together with the usages in the trade formed the implicit background for the explicit contracts between merchants practicing within any particular commercial community. See Robert E. Scott, *The Rise and Fall of Article 2*, 62 La. L. Rev. 1009, 1023-4 (2002).

marketing agreements -- that function to develop norms of trust and reciprocity as parties who are granted discretion by the broad standards of obligation the formal contract imposes mutually adjust to an uncertain future.[23] So, it is perhaps not surprising that what we see at the innovative frontier today is neither formal law fully supplanting informal norms and sociability, nor formality giving way to spontaneous self-regulation by sociable parties. Rather, formal contractual requirements establish a rigorous information exchange regime: information exchange makes for transparency, allowing each party to judge reliably the capacities and intentions of the other. From continuing transparency comes intimacy and from continued intimacy arises the trust that further buffers the relation against inadvertent missteps on the road to innovation.

We call this entwining of formal contract and informal contracts *braiding*. [24] Braiding makes trust internal to the process: in academic terms, it is endogenous to the collaboration. Trust allows nodding acquaintances, if not total strangers, to collaborate productively and integrate the knowledge that arises in separate communities. Its creation through braided contracts makes contracting for innovation one of the key connectors or linking mechanisms that facilitate the continual recombination of the ever-changing pieces of the innovative, new economy. Similar braiding mechanisms seem to be at the heart of institutions such as venture capital contracting[25] and some forms of strategic alliance between firms, which likewise function to increase the development and recombination of specialized resources in the high innovation economy.

[23] Here we adopt the definition of a "relational contract" that is common to legal scholars: A contract is relational to the extent that the parties are unable (at reasonable cost) to reduce important terms of the arrangement to well-defined obligations. The parties may find it impractical to reach agreement on specific terms either because they are unable to identify all the possible uncertain conditions that might occur in the future or because they find they are incapable of working through all the complex adaptations that future events might require even where the contingencies can be identified in advance. As in the case of long term supply contracts or distributorships, these relational elements may well be embedded in a formal, written agreement. See Charles J. Goetz & Robert E. Scott, *Principles of Relational Contracts*, 67 Va. L. Rev. 1089 (1981).

[24] See Ronald J. Gilson, Charles F. Sabel & Robert E. Scott, *Braiding: The Interaction of Formal and Informal Contracting in Theory, Practice and Doctrine*, 110 Colum. L. Rev. 1377 (2010).

[25] See Ronald J. Gilson, *Engineering Venture Capital Markets*: *Lessons from the American Experience*, 55 Stan. L. Rev. 1067 (2003).

The Role of Networks: Searching for Partners and Coordinating on Innovation

In saying that trust is endogenous to contract as it adapts to uncertainty and innovation we are not suggesting that the social context—the network in which many business entities operate – plays no role in how contract adapts to its environment in innovative collaborations. On the contrary, existing social connections among parties provide the third essential component of contracting for innovation. They provide indispensable cognitive resources—knowledge about the world and its possibilities—and frameworks for addressing coordination problems without which collaboration under uncertainty, and conventional forms of contracting as well, would often be difficult if not impossible.[26]

Critically, in a period of rapid change, where new capabilities are necessary for success, the parties who now need each other have limited information about the universe of possible partners because those skills and knowledge of the parties who had them were not useful in the pre-change business environment. Potentially successful collaborators would struggle to find one another without the information social or business networks provide. The more uncertain the setting, the less likely answers to novel questions are to be found close to home – whether literally or metaphorically – because the parties know too little about the industry "space" potential partners occupy and too little about the potential partners themselves.[27] It then follows that it is rewarding to search widely for potential partners who know, or might quickly discover, solutions a single party could not reach alone.[28] Existing ties—to former collaborators, to university labs, to others in the relevant social community—are the gateway to distant, initially unknown and unsuspected sources of information. The more extensive and dense the initial network of connections, the broader and deeper the search -- among friends, friends of friends, and so on -- and the higher the chances of finding a promising partner. Looked at the other way

[26] See Lisa Bernstein, *Beyond Relational Contracts: Social Capital and Network Governance in Procurement Contracts,* 7 J. Legal Analysis 561 (2016).

[27] AVINASH DIXIT, LAWLESSNESS AND ECONOMICS: ALTERNATIVE MODES OF GOVERNANCE (2004), develops how the potential for reputation-based exchange diminishes with distance, whether physical or social.

[28] We discuss the value of networks in providing information about potential partners in Chapter Five.

around—from the vantage point of the candidate partner rather than the individual or firm searching for a collaborator—the better connected you are, or the more central your position in the relevant business network, the more likely you are to be found, and the better your chances of entering a new collaboration—and possibly generating ties that lead to subsequent ones.[29]

In this sense the network certainly matters: it reduces the costs parties incur in searching for collaborators and thus increases the amount of search undertaken and therefore the likelihood of finding a successful partner. But once collaboration begins, prior history becomes irrelevant: the same formal regime for reporting and review applies to all collaborations, regardless of whether they entered the relationship as a trusted, long-time associate, or as a recent acquaintance. This is what we would expect under uncertainty. We can depend on trusted associates not to use our intimacy to exploit us, and to make their best efforts to achieve our joint goals. But we cannot rely on them to respond effectively to new situations that neither of us have previously encountered or could foresee. Prudence demands that we rely instead on mutual review of performance, not the expectations generated by our prior relationship.[30]

Existing networks can also be a resource or frame for contracting parties to address coordination and collective action problems. In an industry with many participants, all of whom stand to be harmed by dangerous failures of any one of them, common rules are needed to mitigate potential harms resulting from individual mistakes. In low uncertainty environments where the contractual problem is risk allocation, the rules can be formulated as precise contract terms that motivate the party best situated to take standard precautions to do so and imposes the

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[29] DIXIT, supra note 24. *See also* Y. L. Doz, *The Evolution of Cooperation in Strategic Alliances: Initial Conditions or Learning Processes?*, 17 STRAT. MGMT. J. 55 (1996); and Bruce Kogut, *A Study of the Life Cycle of Joint Ventures*, 28 MGMT. INT. REV. 39 (1988).

[30] In low uncertainty environments—for instance in commodity trading or other routine transactions involving various pairs of a relatively closed group of traders—prior relations may count even more, to the point where membership in a common community or trade association may be a precondition for trading. But we will see that on close examination, and certain exceptional circumstances aside, in this case, too, one set of—often highly formalized—rules applies to all. We discuss how contractual networks adapt to low uncertainty environments in Chapter Three. Lisa Bernstein's work has been especially important here. See Lisa Bernstein, *Opting out of the Legal System: Extralegal Contractual Relationships in the Diamond Industry*, 21 J. Leg. Stud. 115 (1992); Lisa Bernstein, *Merchant Law in a Merchant Court: Rethinking the Code's Search for Immanent Business Norms*, 144 U. Pa. L. Rev. 1765, 1771-77 (1996); Lisa Bernstein, *Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions*, 99 Mich. L. Rev. 1724, 1745-54 (2001).

cost of not doing so on that party. Here, the common interests of the contracting parties combined with the sense of reciprocity intrinsic to the network often result in a trade association that sets and updates such rules.[31] Under significant uncertainty, however, trade association rules cannot play the role they occupy in low uncertainty environments. Confronting uncertainty, contract adapts and here we observe novel forms emerging.

An example is the US leafy greens industry comprised of numerous, highly diverse farms growing lettuce, spinach and related produce and the large wholesaler–processors who buy their output.[32] Because produce from a single farm will be combined with produce of other farms for distribution, contamination at a single farm, perhaps propagated by secondary contamination of packaging equipment, can lead to disease outbreaks in home or restaurants that affect overall consumption, and hence reduce the sale of all parties, for months or longer. Since the conditions of production at individual farms are likely to be highly idiosyncratic and subject to rapid change at the level of a single farm, simple rules assigning responsibility, or even prescribing safety measures, are unlikely to reduce the inadvertent mistakes that can cause massive harm across the industry. But a contractual regime that mandates continuous monitoring of quality and review of shortfalls is well suited to prompt detection and correction of inattentive error.[33] Even if, as with leafy greens, the diverse actors do not form a single community, some do (the wholesalers, for example). Again,. their social ties and common interests make coordination and effective collective action likely (often with the assistance of regulatory entities). So despite the differences in high and low uncertainty environments between the rules underpinning collective action, in both cases social networks critically shape both the coordination problems and contractual responses to them or crucially shaped by the social network.

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[31] Id.

[32] For discussion see Ronald J. Gilson, Charles F. Sabel & Robert E. Scott, *Contract and Innovation: The Limited Role of Generalist Courts in the Evolution of Novel Contractual Forms*, 88 N.Y.U. L. Rev 170 (2013).

[33] California Leafy Greens Handler Marketing Agreement, (Jan. 27, 2007) available at www.caff.org/policy/documents/lgph_**agreement**.pdf. There is a parallel regime in Arizona. The state of California recognized the LGMA under the authority of a state marketing act that confers antitrust immunity on organizations of agricultural producers for various purposes. There are currently about 120 members, accounting for about 99 percent of California leafy green production (which in turn accounts for about 75 percent of national production). See Gilson, Sabel & Scott, supra note 30.

The Role of Courts

Discussion of coordination and collective action problems points directly to a fourth salient feature of how contract adapts to innovation – the remoteness of an adaptation from the traditional common law judicial role in policing contracts and its proximity to the legislation-based regulation of markets and public health and safety. Contract is normally seen as purely private ordering. The state and public authority generally is only involved when one of the parties asks a court to adjudicate an otherwise intractable dispute, hence the centrality of judges. In this frame, regulation – here imposed by a court in response to private litigation – intrudes on the private agreement, if at all, only as a limitation on what the parties generally can undertake. Here, the contract itself is not part of a regulatory structure, except in so far as it obligates the parties to respect the relevant public requirements.

But as contract adapts to facilitate innovation, the relative importance of these links to the state – courts, legislatures or regulatory agencies – is reversed: courts become less prominent and regulation more so. The mutual monitoring that is central to collaborative innovation allows the parties to identify—and if possible resolve—breakdowns in their relations before they cause the kinds of harms that harden into litigation. The significance of regulation increases because the active search for novel solutions goes hand-in-hand with the possibility of creating novel, latent hazards; the possibilities for catastrophic outcomes are as unforeseeable as the outcome of the innovation process itself. Of course, the level of threat posed by such latent hazards depends on the nature of the innovative industry--failures on offshore drilling platforms or in medical devices cause more harm to life and property than failures in toys. But both private parties and regulators are increasingly aware that latent hazards are, so to speak, the evil twin of innovation; and both look to the monitoring regimes associated with contracting for innovation as an indispensable countermeasure.

BEYOND CONTRACTING FOR INNOVATION

The recognition that contracting for innovation adapts to conditions of uncertainty in the ways we have just described leads us logically to ask three further questions: First, in what ways does the adaptive character of contract challenge the conventional understandings of what contract is and is not? Second, what are the distinctive conceptual features that determine how contract adapts in other environments? And, third, does contracting for innovation require us to rethink the organizational principles of other key institutions of the high-innovation economy, most especially the corporation itself?

Contract is Not Unitary

The adaptive contract that facilitates innovation in the face of uncertainty is distinct and novel, but it does not stand completely apart from contract law and practice in less uncertain environments. Nonetheless, the novelty of the adaptation that we call contracting for innovation leads us inevitably to rethink familiar forms of contract and to challenge the limitations of conventional understandings of contract. Of these conceptual limits, none is more fundamental (and perverse) than the idea that agreements as different as those between two large manufacturing firms, or between a cotton trader and a textile mill or between auto producers and franchise dealerships, or dealerships and individual car buyers are all similar enough to be treated as a single conception of contract. Yet, under traditional legal principles all business to business contracts and all business to consumer contracts are governed by a unitary regime of contract law. The idea of contract as a distinct unitary category germinated in the 19th century and flowered in treatises of Samuel Williston in the 1920s and later of Arthur Corbin. Since then it has gone to seed, bearing fruit again and again, an influential but almost unnoticed assumption in commentary and doctrine.

The clearest sign of the influence of the assumed but typically unstated unitary character of contract is that the large controversies in this domain have been cast as disagreements about the nature of contract as a whole. We have already met the most persistent of these controversies in the dispute between textualists and contextualists. For textualists, the prototypical transaction is between two sophisticated parties, together able to formalize enough of the context of their dealings that the written agreement is a reliable guide to their intentions and mutual obligations, binding on both of them and a court called to decide an eventual

dispute. For the contextualist, at least one of the parties in the prototypical transaction is legally unsophisticated -- the consumer or small supplier contracting with the large corporation, or two small businesses dealing with each other. In such cases, the agreement by definition cannot fully reflect the intentions and obligations of such different parties, and thus a court, relying on an understanding of the backdrop of such transactions, supplies what is missing. But despite the clear differences in referents, the argument never turns to the question of which form of interpretation – text or context – might suit the distinct settings.[34] Conventional debate, hostage to the idea of the unitary character of contract, is focused instead on the question of which prototypical is in fact representative of the whole category of exchange and thus which mandatory rules of interpretation should apply generally. The result is getting it wrong half the time.[35]

A second limiting idea, a presumed attribute or incident of contract that supports and helps explain the unitary conception, is that contract is an agreement binding one party to something specific in return for a corresponding promise by the other. That contract is always about (promises to do or not do) something specific is the fundamental point on which textualists and contextualists agree. Their disagreement goes to the correct method to ascertain what in fact was agreed; the controversy between them would be pointless if contact were understood as a general and open-ended agreement to work together, easily modified by one party or another as circumstances change. This seems entirely straightforward. In a relatively stable world, where outcomes and attendant risks are largely foreseeable, parties can be

[34] Although scholars and courts generally assume that interpretive styles are mandatory rules that apply to all contract cases in a given jurisdiction, there are strong arguments that, given the varied contexts in which parties write their contracts, the rules of interpretation ought to be defaults from which individual parties are free to opt out. See Alan Schwartz & Robert E. Scott, *Contract Theory and the Limits of Contract Law*, 113 Yale L. Rev. 541, 584-590 (2003); Alan Schwartz & Robert E. Scott, *Contract Interpretation Redux*, 119 YALE L.J. 926, 957–63 (2010).

[35] The same limiting assumption of a unitary contract doctrine is at work in periodic speculation about the death of contract. The idea—a concern to some, welcomed by others—is that in domain after domain the general legal rules that define contracts as a unique form of transaction are giving way to concerns for substantive justice. In the early avatars of the idea, tracing back to Max Weber a century ago, the prospect was that legislation and its administrative implementation would in part displace contract, in part bending it to reflect the need to conform contractual rules to the requirements of different domains. In more recent versions, the prospect is rather that contract will be absorbed into tort --the law of wrongful harms—which regulates, taking into account the particular setting, the duties of care and mutual regard that private actors owe one another, regardless of the terms of any agreement between them. See GRANT GILMORE, THE DEATH OF CONTRACT (1970). In all these speculations, however, contract as a unique body of law of broad application to identifiable circumstances, "lives" or "dies" as a whole.

expected to deliver on their promises, and are bound to do so when they make them. But the clear implication is that agreements that don't promise anything specific are not contracts at all. This limit on the application of contract law, however, raises a barrier to collaborative contracting; it does not allow for any understanding of agreements to collaborate with provisional or indeterminate goals or to address activities that could not have been anticipated and to which traditional rules growing out of a unitary legal regime are predictably ill-suited. These are just the kinds of agreement that we show become important as uncertainty, and hence innovation, increases.

A third limiting idea—another incident of the unitary conception—is that contracts are quintessentially private agreements, arrived at and controlled by the consenting parties, without interference of public authorities acting on political motives. The background conception is of two wholly distinct realms, one private, ordered only by voluntary agreements among individual actors, each pursuing her own well-being as she defines it; the other public, subject to the power of the state, authorized at best by democratic majorities, but even then a continuing limitation on the autonomy of private parties. From this perspective, the deference of contract to regulatory requirements—and therefore to public norms—means the end of it. Even the judge in this Manichaean conception is a threat to the integrity of contract; unless she is bound by textualist respect for the instructions of the written agreement, she exercises public power invoking norms alien to the parties. This distinction has been attacked, and with good reason: in many settings the markets within which private parties exercise contractual autonomy do not arise spontaneously from the transactions themselves, but depend rather on prior public regulation to establish rules that make regular and reliable exchange possible. Under uncertainty, where collaboration aimed at innovation can produce latent hazards—threats to both the parties and the public—and thus the need for ongoing regulatory surveillance as well, the distinction between private autonomy and intrusive state regulation obscures insight more than it explains what we actually see.

The Design Space for Contract

We turn now to the idea that exchanges between firms, or between firms and consumers of their products, take different forms depending on the circumstances in which they occur. We

will call the universe of environmental features of transactions relevant to the choice of contractual form the design space for contract. The assumption is simply that the designers of contracts—the lawyers and managers who experience most directly the successes and failures of the instruments they create—notice the distinctive features of the settings within which they operate, and adapt their agreements accordingly.

Discussion of the novel aspects of contracting for innovation and the blind spots in the conventional concept of contract help to suggest the contextual features relevant to contractual design and how to construe these as two axes of variation. One axis marks the progression from low states of uncertainty to high. At the low-uncertainty pole the outcome of exchange is foreseeable: here, agreements can be reliably specific and the focus of contract is on the allocation of well understood risks. At the opposite pole, where innovation is the explicit goal, outcomes are inherently unpredictable: here, agreements focus on the process of collaboration, and there will be attention to the possibility of latent hazards.

A second axis marks the density or thickness of the market, and with it the nature of the network that is likely to connect firms and the scope of the regulatory problems they are likely to face together. At one pole markets are thin; transactions are idiosyncratic to particular parties. In this environment, agreements are either bespoke or tailored to the exact needs of the parties or collaborative and manifestly incomplete. Because transactions in either case are idiosyncratic they will not have regulatory implications for the industry as a whole. Thus, social networks may well play an informational role and so facilitate the search for partners but will not figure in contract formation through the creation of industry standards or form contracts. At the opposite pole markets are thick, with many actors engaged recurrently in similar transactions. At this pole the mutual reliance of the industry participants both makes regulatory issues more salient and encourages the collective writing and updating of rules and the creation of a monitoring regime to capture economies of scale.

Leaving aside important intermediate cases and qualifications, which we address in more detail in Chapter Three, these two axes produce a space with four distinct regions: the combination of an activity's location on the risk/uncertainty continuum on the one hand, and the

market scale-thickness continuum on the other, broadly dictates how contracting practices adapt to the particular business environment,[36] and all of the resulting organizational forms are inherently contractual.[37]

Contracting for Innovation and the Theory of the Firm

While contracting for innovation provides a useful vantage point for rethinking contract and conceiving how contract design adapts to different conditions of uncertainty and scale, it also opens a window onto the governance structure and organizational principles of other key institutions of the high-innovation economy -- venture capital, some types of corporate alliances, and, above all, the corporation itself. Here our claim goes to the relation between the kinds of contractual governance problems presented and the contractual governance techniques available to address them. In transaction cost economics, at its most reductive, this relation was one-to-one: hold-up problems can only be solved by vertical integration in the firm; the firm's boundary therefore is dictated by the breadth of hold-up problems.[38] The core criticism of transaction cost economics is that the link between the character of transactions costs and organizational form is far less precise; transaction costs appear in far richer combinations, and there is more than one organizational response to particular transactions costs. The relation is, at least, one to many: hold-up problems can be solved by contract as well as by vertical

[36] We describe the ways these two axes intersect to form the design space for contract in Chapter Three. They are set out visually in Figure Three on page 63.

[37] In the United States, for example, corporate law is composed largely of default rules that the parties can alter through a corporation's organizational documents, and some forms, like the limited liability company are explicitly contractual. [cite to literature]

[38] See e.g., Much of this literature is an extension of the work of Oliver Williamson. See e.g., OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM (1985); OLIVER E. WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS (1975); Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J. L. & Econ. 233 (1979. As an example, Williamson sets out a stylized mapping of transaction form based on the presence of three forms of transaction costs: bounded rationality, opportunism and costly information. If bounded rationality and opportunism were present, but information was not costly, then a state contingent contract was the appropriate transaction form. If, instead, bounded rationality was still present, information was costly, but opportunism was not present, then a relational contract was the form that resulted. Finally, if all three forms of transaction costs were present, the transaction would be integrated within a firm. OLIVER WILLIAMSON, ECONOMIC INSTITUTIONS, supra at ….

integration.[39] But beyond that, contracting for innovation shows that the relation is many-to-many: There are various governance tasks and various instruments for managing them. Each task can be addressed by more than one instrument depending on the level of uncertainty and the scale or thickness of the particular market, and each instrument can, alone or in combination with others, be used to address more than one task.

It is clear that the original dichotomy between hierarchy and contract originating with Coase[40] and extended by Williamson, cannot survive the proliferation of relations we see in the current business environment. For one thing, there are no governance tasks done only by firms or only by market contracts; vertically integrated firms compete with firms that secure inputs or distribution by contracting with independent suppliers or distributors. For another, there are entire classes of governance mechanisms that simply cannot be usefully categorized as either hierarchy or contract. Information flows in both firms and markets are often managed neither by hierarchy nor contract, but rather by social or business networks, such as supplier clubs or benchmarking groups. Similarly, we see the proliferation of dual-sided platforms, where the characterization of the structure as contract or firm currently bedevils the application of existing regulatory structures to new forms of organization.[41] Seen in this light, the essence or nature of the firm is not to solve this or that governance problem. The firm does not in this sense have an essence or nature: It bundles governance instruments as the calculus of advantage in particular contexts suggests, and retains that form as a result of path dependency even as changed circumstances cause new competitors to adopt different arrangements, until such point as the capabilities developed for a particular form no longer fit the problems presented by new circumstances.[42]

[39] See e.g., Goetz & Scott, *Principles of Relational Contract*, supra note ---.
[40] Ronald H. Coase, The Nature of the Firm, 4 Economica 386 (1937).

[41] Cites to conflicting cases as to whether Uber drivers are employees or contractors. In the United States, see {fill in]. In the European Union see [UK case holding yes and other case saying no]. The issue is addressed more generally in, e.g., [Lobel [find cite]; Jordan M. Barry & Elizabeth Pollman, Regulatory Entrepreneurship, 90 U.S.C. L.Rev. __ (2017) [others?]

[42] We address this problem in Chapter [ ].

In sum, contracting for innovation can be thought of as a further development of the many-to-many relation of governance instruments to tasks. Instead of matching several instruments to several problems, and vice versa, contracting for innovation creates a single, novel regime that fuses and transforms elements of contract, bi-lateral governance and hierarchical management. It uses this regime to coordinate investment, resolve agency problems and direct information flows in a context in which the skills necessary for product development cannot be cabined within a single firm or other form of organization.

We turn now to a more finely tuned examination of the various challenges to contracting practices identified in this introductory chapter. We begin in Chapter Two by focusing more intensively on the dramatic changes in the form of contracting that are (or appear to be) stimulated by the uncertainty that accompanies disruption in business practices.

CHAPTER TWO

RAPID CHANGE, DISRUPTION AND CONTRACTUAL ADAPTATION

*"**The key is to embrace disruption.…You can't fight innovation."***
Ryan Kavanough

Our principal task in this chapter is to explore the relationship between three seemingly independent variables. First, we observe an innovation — an acute change in business practice in a particular economic environment; second, the innovation produces uncertainty—parties cannot rely on established routines to effectively adapt to dramatically new practices; and third, the way in which these parties contract changes dramatically. The question is: Do the ways that contract adapts to these new practices enable the parties to respond effectively to this rapid change in their environment? And if contract is the instrument that responds efficiently to changes in the level of economic uncertainty, is it likely that the contracting parties, and not the courts, drive the contractual adaptation? If so, what role does contract law play in either facilitating or impeding the innovative practice?

Central to our analysis is recognizing that the standard discussion of contract law is court-centric: the inquiry addresses legal rules as applied by general purpose courts. In this view, contract law, as developed by generalist judges, approximates the ideal image of the common law as a highly decentralized and sensitive institution for responding incrementally to incipient changes in the parties' relations. Thus, common law courts are generally believed to be fully capable of extending the reach of existing legal principles to emergent forms of commercial organization, thereby addressing innovative activities without undermining the security of actors

who continue to rely on traditional contract doctrine to support their efforts. In this view, contract law and generalist courts can do it all: Courts can apply traditional rules to activities that are more or less stable, but promptly develop new rules that address the problems posed by fast-paced innovation and the resulting changing patterns of contract without undermining the overall coherence of the legal structure.

This conventional view of the courts' capacity to adapt to change is, on its own terms, seriously flawed.[43] Even if courts could adapt during ordinary periods of economic activity, innovation outpaces the capacity of generalist courts to adapt the common law of contract to a more rapidly evolving business environment and more rapidly changing commercial relationships. Again, the standard legal view is court centric. A contract provides legal recourse that reflects the duality of the common law: a court resolves the particular parties' dispute and, at the very same time, adapts contract law to new circumstances and so addresses future contracting parties. But both prongs of the common law – backward facing dispute resolution and forward looking modernization of contract law – operate only after a dispute arises and the formal resolution system is invoked, with all of its procedural expense and delay. Only then do the parties "bargain in the shadow" of the newly updated law.[44]

But the need to conduct business in real, not litigation, time causes parties to turn predictably to contract design in order to adapt to the new demands of innovative arrangements faster than law and the courts can respond. And, until contract doctrine adapts to the new design arrangements, law can act as a friction on the innovation process rather than as a facilitator. Put differently, the law's shadow becomes more blurred. In response, we observe

[43] The conventional vision of the common law adapting to economic change by fashioning substantive rules to fit the new enviromennt is itself seriously flawed. In truth, the central contributon of the common law courts to contract law occurred during the 100 years following the industrial revolution when common law courts developed a relatively small set of default rules that could apply across different contracting contexts. Beyond judicial application of these default rules, the task of adapting U.S. contract law to the needs of a modern heterogenous economy has fallen to the drafters of the UCC and the Restatement of Contracts who have proposed substituting broad standards for the less flexible common law default rules. Here the evidence is that business parties, alarmed by the moral hazard risk created by standards, reject the attempts by these private law makers to respond to changing environments for business contracts. For discussion, see Alan Schwartz & Robert E. Scott, *The Common Law of Contract and the Default Rule Project*, 102 Va. L. Rev.1523 (2016).

[44] Lewis Kornhauser & Robert Mnookin, *Bargaining in the Shadow of the Law: The Case of Divorce*, 88 Yale L.J. 950 (1979) coined this evocative and hence long lasting term.

parties in rapidly changing industries turning to non-judicial institutions, ranging from trade associations that interpret and enforce contractual relationships to emerging network structures that facilitate informal interpretation and enforcement of obligations.

What then are the circumstances in which different contractual patterns are used to organize different kinds and speeds of innovative activity? This inquiry has both positive and normative elements: how have parties responded to changes in their business environment as a result of innovation, and then how can courts most effectively facilitate that evolutionary process given the institutional limits on their performance? As stated earlier, our thesis is that the techniques and institutional arrangements that allow the parties to contract over rapidly evolving commercial activity are driven by the interaction of two critical characteristics of the underlying substantive activity: the combination of risk and uncertainty associated with the activity on the one hand, and its scale – the number of parties engaged in that activity -- on the other. A final point highlights the critical role of risk and uncertainty in how parties' structure their relationships. Put simply, the rate of change in important business environments is accelerating. In terms of high school calculus, the second derivative of change in those environments is positive. It follows that we begin our analysis by seeking to understand better how business practices have responded to this accelerated instability in their business environment and the impact of those responses on evolving contractual techniques.

THE ACCELERATING RATE OF CHANGE AND DISRUPTION.

In their book the Second Machine Age, Erik Brynjolfsson and Andrew McAfee illustrate the concept of a rapidly increasing rate of innovation with an Indian folk tale. In brief, a scholar responds to the emperor's offer of a boon for having invented chess, by asking that the emperor put one grain of rice on the first square of a chess board, and then double the number of grains in each successive square. The scholar gets the rice in return for his innovation. Half way through the chess board, the rice associated with the 32nd square is the entire product of a single field. Then the curve turns up ever more sharply, doubling again on each of the next 32

squares.[45] For our purposes, imagine an innovation rate that starts slowly but accelerates exponentially. Brynjolfsson and McAfee argue that we are now entering the second half of the chessboard – the slower windup that lays the groundwork for ever faster rates of innovation.

For example, ten years ago a self-driving car was an example of an activity that would be beyond the competence of artificial intelligence for decades.[46] Five years later, the presence of Google's self-driving cars had become commonplace on Silicon Valley highways. By 2015 they had driven over a million completely autonomous miles.[47] The continuing acceleration in the speed with which the technology is developing and entering the commercial space was illustrated recently by two independent announcements made on March 15, 2016, one by General Motors and one by Ford. GM announced a $1 billion acquisition of Cruise, an early stage autonomous vehicle company. The steep rise in Cruise's value serves as a rough measure of the pace of change. Cruise's last private funding round in December 2015 valued the company at some $90 million. Three months later the purchase price paid by GM reflected a 10-fold increase. On the same day as the GM acquisition announcement, Ford announced that it was setting up a new division named Ford Smart Mobility to concentrate its efforts in innovative mobility products.[48] Autonomous transportation has shifted from a feature of science fiction novels to a near term expectation.[49]]

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[45] ERIK BRYNJOLFSSON & ANDREW MCAFEE, THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES 45-47 (2014).

[46] Levy and Murnane presented the pessimistic account as follows: "[A]rticulating [the vast amalgamation of sounds and images encountered while driving] and embedding it in software for all but highly structured situations are at present enormously difficult tasks . . . Computers cannot easily substitute for humans in [jobs like driving]." FRANK LEVY AND RICHARD J. MURNANE, THE NEW DIVISION OF LABOR: HOW COMPUTERS ARE CREATING THE NEXT JOB MARKET 30 (2004).

[47] Google Self-Driving Cars Monthly Report, May 2015, https://static.googleusercontent.com/media/www.google.com/en//selfdrivingcar/files/reports/report-0515.pdf. [Update]

[48] Robert Wright, Tim Bradshaw & Peter Campbell, GM's $1bn entry in driverless car race. Financial Times, March 12, 2016, p.1.

[49] Tesla, BMW, Audi, and Mercedes already sell vehicles with hands-free driving systems meant to assist, not replace human drivers, which could be described as semi-autonomous. Google has said that it may release a fully autonomous vehicle as early as 2019. Ford and BMW have also announced plans to develop fully autonomous vehicles by 2021. Peter Campbell & Patti Waldmeir, Ford plans mass-market self-driving car by 2021. Financial Times, August 16, 2016.

To be sure, Brynjolfsson and McAfee's account of explosive innovation and therefore growth has a counterpoint in economic historian Robert Gordon's thesis that the pace of innovation in fact has declined despite the technological breakthroughs of the computer and software revolution of the last 20 years. From Gordon's perspective, the impact of electrification on industry, the effect of antibiotics and the spread of literacy on the productivity of human capital, and the emergence of the internal combustion engine led to productivity growth that current technological gains will never match.[50] While interesting and obviously important in its own right, we need not resolve the seeming disagreement between Brynjolfsson and McAfee on the one hand, and Gordon on the other. The puzzle that the two sides square off over is what appears to be the absence of a large gain in productivity as a result of the technological progress of the last several decades.[51] Our purpose here, however, is quite different than that of those engaged in the productivity debate. We seek to understand the effect on contracting practices of changes in the level of uncertainty brought on by innovation. The increased rate of change in the business environment is central to this end regardless of whether the change is accompanied by large productivity gains and so ushers in a new era of prosperity, or whether the innovation allows us only to keep our heads above water.

There is a second important disagreement over the character of the increased rate of change in the business environment, this one building on Clayton Christensen's now seminal concept of disruption.[52] In its current popular sense, the term disruption reflects the capacity of

[50] ROBERT GORDON, THE RISE AND FALL OF AMERICAN GROWTH: THE US STANDARD OF LIVING SINCE THE CIVIL WAR (2016). There is a substantial debate over whether the claimed drop in production is real given the measurement difficulties. For a recent assessment of the measurement difficulties, see Chad Syverson, Challenges to Measurement Explanations for the U.S. Productivity Slowdown, NBER Working Paper No. 21974 (February 2016). Phillipe Aghion, Antonon Bergeaud & Timo Boppart, Missing Growth from Creative Destruction, working paper, (Jan. 13, 2017), builds models that allow empirical estimates of the understatement of productivity growth in standard empirical work resulting from Schumpetarian creative destruction. [update this literature – see SSRN]

[51] Brynjolfsson and McAfee predict that the innovation curve and productivity will now turn up sharply; in their terms, we are entering the second half of the chessboard. Gordon, in contrast, predicts a continued slowing of productivity gains regardless of the enormous changes in technology; in his view, these changes will not alter our lives as did the innovations of the 19th and 20th centuries. Accessible accounts of the debate can be found in Emily Cadman, Link between tech and productivity is elusive. Financial Times, October 4, 2016 and N. Gregory Manikaw, One Economic Sickness, Five Diagnoses, NY Times June 19, 2016, available at http://www.nytimes.com/2016/06/19/upshot/one-economic-sickness-five-diagnoses.html?_r=1

[52] CLAYTON M. CHRISTENSEN, THE INNOVATOR'S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL (1997).

a new idea, most familiarly deployed by a new company, to fundamentally change the structure of a product market to the advantage of the newcomer and at the expense of the existing leaders in that market: The newcomer is a disruptor.[53]

As is not uncommon, the current broad usage of the disruption theme has expanded from a particularized hypothesis to a more general concept.[54] Framed more broadly, as the public discourse now does, disruption is simply innovation that dramatically shakes up the status quo in an industry, closer to Schumpeter's less limiting concept of creative destruction,[55] than to Christensen's more tailored mechanism. The academic literature matches the much broader current conception of the term: industry structure can be fundamentally altered and its leading companies displaced for reasons other than management's cognitive failure to anticipate the trajectory of an early stage technology. One strand of literature focuses on how a new technology can undermine the firm competencies on which industry leadership is based: what the leading firms are good at is no longer important to competitive success.[56] More recently, a

[53] This image of the power of innovation allowing a new company to change the structure of an industry and thereby vault over the existing industry leader resonates powerfully in the venture capital world. The David versus Goliath outcome represents the central Silicon Valley saga; of course, venture capital backs the Davids. Thus, one technology after another and one industry after another becomes subject to "disruption" by an innovating VC-backed newcomer and new business models are increasingly described as disruptive. Not surprisingly, the consulterati then propose to teach companies how to disrupt themselves See Mark de Jong & Menno van Dijik, *Disrupting Beliefs: A New Approach to Business-Model Disruption*, McKenzie Quarterly (July 2015).

[54] For Christensen, disruption reflects a particular dynamic. The problem is not that the industry leaders have bad managers. Instead, the problem arises precisely because the industry leaders are so good at what they do. Rather than simply extending the existing method of production, a disruptive technology reflects so sharp a break with existing products, and is of such low quality initially, that neither a leading producer nor its sophisticated customers see the technology's potential. And because the market for the disruptive technology is so small at the outset, a rational manufacturer would ignore the innovation, sensibly concluding that the returns on an investment would not be worth the effort. As a result, a disruptive technology takes root in secondary markets of no interest to the industry leaders. Later, developments in the disruptive technology allow it to be generalized to the industry core; dominant firms are then displaced because they cannot respond quickly enough to the change in the architecture of production. Christensen himself recognized the broadening of his term to encompass large changes in industry structure and leadership resulting from different mechanisms. He emphasizes the mistake in conflating "disruptive innovation with any breakthrough that changes any industry's competitive patterns." Clayton M. Christensen, Michael Raynor & Rory McDonald, *Disruptive Innovation*, Harvard Business Review, December, 2015, p. 44 at 46.

[55] JOSEPH SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY 82-83 (1942).

[56] While highlighted by the new focus on innovation, recognition of the incumbents' burden of competence in the face of change has been with us for some time. See Rebecca M. Henderson & Kim M. Clark, *The Reorganization of Existing Product Technologies and the Failure of Established Firms*, 35 Admin. Sci. Qtly. 9 (1990). Keynes, writing in 1935, framed the problem in contemporary terms: "The difficulty [posed by new ideas] lies, not in the

second strand of academic literature frames the loss of competencies explanation for disruption in contract terms: the difficulties of sustaining informal contracting within a firm – between managers and workers, among and between teams – that allow the firm to organize production where specific rules are difficult to specify or enforce. These arrangements, based on trust and reciprocity, require time to develop because they must be both credible and have sufficient clarity that each party knows what is expected. As a result, they can collapse under the breadth and rapidity of the new innovation. Thereafter, the industry leaders must start from scratch in remaking old relationships when the disruptive firms have production patterns that already reflect the new order.[57]

For purposes of understanding how contracting practices respond to these seismic changes and how contract law best adapts to facilitate them, it is the fact of innovation and disruption that is important and not the growing list of different mechanisms through which it occurs.[58] We may or may not be entering the second half of Brynjolfsson and McAfee's chessboard: where and when innovation occurs and how much is being produced in the current environment are hotly debated questions. Similarly, the disruption that takes place may operate through managerial cognitive limitations, through the deterioration of leading firms' competencies due to changes in production technologies, as a result of changes in consumer demand that require different manufacturing skills in production and marketing or through the interaction of a number of influences.[59] In all cases, however, the increased rate of change disrupts the contracting patterns that supported the disrupted firms and industries. The parties and perhaps then the courts must respond. How this is accomplished is our focus here.

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new ideas, but in escaping from the old ones which ramify, for those brought up as most of us have been, into every corner of our minds." JOHN MAYNARD KEYNES, THE GENERAL THEORY OF EMPLOYMENT, INTEREST AND MONEY VIII (1935).

[57] See Steven Blader, Claudine Gartenberg, Rebecca Henderson & Andrea Prat, *The Real Effects of Relational Contracts*, 105 Am. Econ. Rev. 452 (2015), Papers and Proceedings.

[58] We can also ignore for our purposes the ongoing debate over whether the case studies on which Christensen relies in fact fully support the disruption mechanism that is central to his account. Jill Lapore, The Disruption Machine: What the Gospel of Innovation Gets Wrong, The New Yorker, June 23, 2014, presents the popular account of this criticism. Andrew King & Baljir Baatartogtokh, *How Useful is the Theory of Disruptive Innovation*, 57 MIT Sloan Manag. Rev. 77 (2015), provide an academic critique.

[59] See, e.g., Ron Adner & Peter Zemsky, *Disruptive Technologies and the Emergence of Competition*, 36 Rand J. Econ. 229 (2005).

CHANGING CONTRACTUAL PATTERNS IN INDUSTRY DISRUPTIONS

We turn now to a contemporary example of the accelerating rate of change in current business practices and organization that help motivate the chapters that follow. We are currently seeing rapid changes in the automobile industry whose stability has recently been shaken by dramatic technological and market changes. At one level the changes in the automobile industry involve the shift from vertical integration to contract. Automobile manufacturers have elected to acquire by contract components that in the past they would have made themselves, substituting supply chains for internal upstream production and so shrinking the organizational boundary of the firm.[60] But the changes in the industry are even more fundamental, reflected both in dramatic changes in the dramatic shift in the governance of contracts between the manufacturers and their suppliers that is occurring just as we see the fundamental changes in the technological and market environment. We sketch both of these developments here as a prelude to a more complete analysis of this transformation in a subsequent chapter.

Innovation in Contract Governance: The GM Example

The US auto industry is an unlikely place to look for innovation in the governance of contract. The industry was in the middle decades of the last century the leading example of vertically integrated production and the very emblem of industrial efficiency. As Macaulay documented in the early 1970s, the original equipment manufacturers (OEMs) made in their own plants some portion of almost all of the parts for an assembled automobile.[61] Outside suppliers helped to stabilize the

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[60] The rapid vertical disintegration of large firms replacing internal production with supply chains linked by contract stands in sharp contrast to the predictions of conventional industrial organization theory that the risk of opportunism will drive parties away from contracts and toward vertical integration. This pressure toward common ownership is thought to be especially powerful in innovative industries where rapid technological change produces uncertainty in supply relationships. When contract cannot address opportunism successfully, the theory predicts that firms should dominate markets as a means to organize supply relationships. See e.g., OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM (1985); OLIVER E. WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS (1975); Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations,* 22 J. L. & Econ. 233 (1979).

[61] Stuart Macaulay, *The Standardized Contracts of United States Automobile Manufacturers* in 3-21 Int'l Encyclopedia Comp. L. 18 (1974). provides a useful baseline. The starting point for his analysis of relations between the OEMs and their suppliers was the large, vertically integrated corporation. Within the system of vertically integrated

"bureaucratic operation" of the vertically integrated firm in two main ways. First, the external market provided a benchmark for assessing the efficiency of internal operations.[62] Second, the outside suppliers acted as a buffer against fluctuations in demand[63]— with the additional advantage of creating the opportunity for the OEM to disclaim legal liability for defective parts. More recently, however, and through the financial crisis which included GM's bankruptcy, the industry was seen as a tragic victim of its earlier success, at once a symbol of the paralyzing legacy of the past and the cost of obstinate resistance to change.

But then the story takes a surprising turn. In the last several years, as market conditions improved generally, GM successfully introduced a fundamentally new regime of contract governance with its suppliers, based on the kinds of information sharing and review that we argue are key to innovative collaboration under uncertainty. Looking back from the vantage point of these latest developments, as we do here, between the 1970s and today the organization of the industry, and governance of the contracts between the OEMs and their suppliers, turned topsy turvy. At the beginning of the period the industry was vertically integrated; suppliers competed to provide the OEMs with buffers against fluctuations in demand; contracts were instruments for shifting nearly all the risks of the relationship to the suppliers. At the end of the period the industry is vertically disintegrated; suppliers are such indispensable collaborators in the development of new technology that OEMs are beginning to compete to be preferred customers to gain early and reliable access to supplier knowhow; the governance of contracts is increasingly focused on constructing a regime for regular, mutual review of performance and expectations that fosters this collaboration. Moreover, the deliberate introduction by GM—alone among the US OEMs—of the new routines of information pooling and review constitutes a kind of natural experiment that strongly suggests that it is this new regime and not a number of other possible causes that explain an exceptional and promising change in that company's relations with its suppliers.

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mass production the outside suppliers played an important part in the OEMs strategy of "risk avoidance and minimization." Id.

[62] If a part was available more cheaply on the outside market, the OEM had reason to suspect that the internal supplier was mismanaged or had overlooked some possibility for improving the part's design. Corrective action would follow.

[63] Because mass production entails high fixed costs—especially for specialized capital goods that produce only a single make or model of product—disruptions in supply are extremely costly. But so too is excess or underutilized production capacity. If outside suppliers can be induced to deliver when needed, but only then, outside suppliers mitigate demand risks.

The contractual mechanism that has been historically used by the OEMs to shift to suppliers the risks of shortfalls in demand, warranty claims and even increases in the price of materials and other costs, while buffering the OEMs against disruptions of supply is the master service agreement or "blanket order." Before the beginning of a new model year the OEM issues to the supplier a blanket order for a specific part, at a price assuming eventual purchases in quantities needed to achieve efficient economies of scale. The blanket order, however, does not obligate the buyer to actually purchase anything. That obligation is created only when the OEM issues, month by month, if not more frequently, a purchase order for a set number of parts, at the agreed price, to be delivered during the following period. Under the blanket order, the OEM can demand an increase in supply simply by sending additional purchase orders. The supplier is naturally tempted to hedge against this possibility by building inventory in the part, but does so entirely at its own risk. The blanket order assigns the buyer responsibility only for costs incurred for parts ordered; allows the buyer, on top of that, to cancel orders for parts that have yet to be delivered, reimbursing the supplier for costs, but not for foregone profit; and places responsibility for warranty costs on the supplier as well.

Over time, burdened by the enormous pension and health-care insurance costs of an aging work force and rigid work rules, the US automobile manufacturers endured company-threatening losses to less encumbered and more efficient competitors. A 2006 study by Ben-Shahar and White showed that vertical disintegration had fundamentally changed the organization of the industry in the intervening years.[64] The oil price shocks of the 1970s and the resulting wild fluctuations in demand, together with the increasingly rapid changes in technology and the entrance of low-cost competitors from emerging-market economies, had undermined the stability on which long-term investment in internal capacity depended.[65] But Ben-Shahar and White found that the system of long-term and non-binding blanket orders and short-term purchase orders remained very much intact. Many of the forms used in contracting had survived, with modest modifications, from the 1980s and before. Above all the same lopsided terms were still in use.

[64] Omri Ben-Shahar & James J. White, *Boilerplate and Economic Power in Auto Manufacturing Contracts*, 104 Mich. L. Rev. 953 (2006).

[65] Before the degree of vertical integration began to decline in the early 1980s, GM produced roughly 70 percent of its parts and components internally, and purchased the remainder from outside suppliers; by the early 2000s the ratio was reversed. Whole divisions (Delphi, Visteon) were divested.

Despite this formal continuity, Ben-Shahar and White detected features of the relationship between OEMs and suppliers which made dealings between them both less one-sided and more tense. Importantly, the costs to buyers of changing suppliers—their switching costs—were high. [66] For their part the suppliers were aware of their hold up power to disrupt normal operations.[67] The result was a fragile truce, with perverse incentives for self-protective action by both sides at the cost of the efficiency of the industry as a whole.[68]

But this dark picture overlooks deep changes then at work in the organization of the industry--changes that are today reshaping the governance of OEM-supplier relations, and the exercise of contractual power. The first was the development, by a succession of industry working groups, of a set of common quality standards, beginning with QS 9000 in 1994, elaborated under the auspices of Daimler Chrysler, Ford and General Motors.[69] To be certified under the standard suppliers must rigorously demonstrate the ability to detect and report incipient problems, trace and stop installation of defective parts, and rapidly identify and eliminate the underlying or root causes of the breakdown. A supplier certified under the common standard is thus in effect certified by all the OEMs, and qualified to bid on contracts with them.[70]

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[66] The OEMs were careful not to drive the supplier out of the relationship or into bankruptcy for fear of having to pay dearly to find a substitute. Ben Shahar & White, supra note ---.

[67] The very magnitude of the harm a hold up would impose on OEMs without internal production capacity or buffer inventories motivated restraint. By paralyzing the buyer's production, the supplier would make itself liable for enormous damage claims and severely damage its own reputation as a reliable partner, greatly reducing the chances of selling its products to potential customers. Id.

[68] Because the OEMs could, by contract, indemnify themselves against warranty costs, they had no reason to respond quickly to defects; delay dramatically increased the costs of warranty claims. Warranty costs per US OEM vehicle were four times greater than for Japanese manufacturers in large measure because the US OEMs took on average 180 days from the first indication of a defective part to resolution of the problem, while their Japanese competitors needed only 40. The suppliers fought back, imposing agency costs on the buyer by complying with formal obligations where compliance was easily verified, but withholding cooperation—providing the bare minimum of technical support, holding knowhow and knowledge of potential innovations close. Id.

[69] In the following years representatives of the European automobile manufacturers joined the original sponsors and formed an ad hoc group of stakeholders—the International Automotive Task Force—which in 1999 integrated the initial standard with the leading international norms (as TS 16949:1999), and continues to oversee revisions. "Automotive Quality Management System Standard, IATF 16949" *International Automotive Task Force.* 1st Edition. 1 October 2016. Not available online. Article on file.

[70]"IATF 16949- Customer Specific Requirements," *General Motors*, International Automotive Task Force Oversight, 6 September 2017. Last accessed on 9/26/17, available online at: .

Common certification had two long-term effects. First, it reduced the supplier's switching costs. Since a buyer could be sure that a supplier to any competitor was qualified to meet its own general requirements as well, supplying one OEM amounted to pre-qualification to bid on the work of others. But an additional, and no doubt an unintended, consequence of certification was to make suppliers all the more aware of any gap between a buyer's profession of commitment to the collaboration and its actual behavior. The differences in buyer behavior, especially differences in the aptitude and dedication to collaborative problem-solving and improvement and willingness to share the resulting gains, were becoming public knowledge: by the turn of the century it was becoming clear that some suppliers were to be preferred to others. In 2001, responding to this perception, a Michigan consultant, Planning Perspectives, introduced a (now closely watched) annual ranking of *buyer* performance based on a survey of suppliers' experience with their customers.[71] Thereafter, some units and teams within the OEM responded to their poor rankings in the performance survey by collaborating with outsiders on significant projects thereby acquiring hands on experience of the possibilities of cooperation and how to manage it.

All of these changes—common certification that required suppliers to augment their capacity for self-correction and improvement; public rankings that showed the limits of US OEMs as partners; and the accumulation of collaborative projects—have begun to crystallize into a new form of OEM-supplier relation, with a corresponding change in the governance of contracts between them, as the economy recovered after the financial crisis. The changes that have gone the farthest, and seem most likely to be resilient, are at GM. After 2010, as the auto market recovered more rapidly than expected, GM was becoming acutely aware that OEMs were increasingly competing on

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This example follows the use of industry standards under mid-level uncertainty and large scale participation. We discuss the segment of the contract design space in Chapter [].

[71] One component of the Supplier Working Relations Index (SWRI) survey asks buyers to rate the extent to which buyers' help in reducing their costs and quality; another about the extent to which buyers hinder collaboration by late or excessive engineering changes or conflicts among corporate functions such as purchasing and design; a third about the buyer's willingness to share the gains of cost savings and rewards high performance with additional business. Since the inception of the survey Toyota and Honda have consistently, and by a wide margin, outranked Ford, GM and FCA (Chrysler in its current reincarnation). 2017 N.A. Automotive OEM Study Shows General Motors Jumps to Third Place, Nissan falls to last, in Supplier Relations.

technological innovation, and cooperation with suppliers generally was key to rapid progress.[72] This in turn implied, as one manager put it, that becoming the suppliers' "customer of choice is increasingly an imperative," to assure the partner's best efforts. But in those years GM ranked at the bottom of the SWRI. Suppliers were more likely to avoid GM than to prefer it.

Relations with GMs suppliers could not be reformed directly, for example by a change in the terms of the contract. The commitment to use best efforts implied in a relationship with a "customer of choice" is not contractable: except in egregious cases, GM would not be able to verify to a court that a supplier had stinted in its efforts or withheld emergent understanding of technological prospects. But what could not be verified could be observed: Regular review of supplier performance could alert GM to problems and the supplier's response would reveal further information about its capacities and intentions. Making the review reciprocal, and jointly reviewable, could alert GM to its own shortfalls in the collaboration and help address the systematic complaints reflected in its low ranking on the supplier survey. The new governance system at GM thus emerged in a rapid succession of formally specified steps. [73] In short order, by building an

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[72] A successful collaboration with LG Chemical, which resulted in the lithium-ion battery for the widely admired Chevrolet Bolt, became the internal embodiment of this promise. John Voelcker, "Bolt EV Powertrain: How Did GM And LG Collaborate On Design, Production?" *Green Car Reports*. Internet Brands Automotive Group, 3 February 2016. Last accessed on 9/26/17, available online at: http://www.greencarreports.com/news/1102176_bolt-ev-powertrain-how-did-gm-and-lg-collaborate-on-design-production; Jue, Ivan. "LG Chem- - the Unsung Hero for Chevrolet's Bolt EV and a Great Example of Collaboration." *Torque News.* 15 September 2016. Last accessed on 9/27/17, available online at: https://www.torquenews.com/1/lg-chem-unsung-hero-chevrolet-s-bolt-ev-and-great-example-collaboration.

[73]. The first step was the development in 2014 of a new tool for reporting on supplier performance, created in consultation with GM's supplier council and piloted with various supplier groups. The performance indicators are grouped in two general categories. "Business Performance"—updated monthly—compares target and actual performance on key dimensions of current operations such as quality and material cost; "Cultural Performance"—now updated annually—measures important aspects of the aptitude for longer term collaboration such as communication and responsiveness, transparency and innovation and engineering. To ensure consistency of judgment, and afford the supplier some protection against competing demands from the buyer, scores are based on a canvass of the GM units engaged in the relation, such as engineering, quality and procurement. The following year GM made the review reciprocal with SSE 360°, a survey of suppliers' views of their customer. The questions mirror those in the Cultural Performance component of the SSE; and the supplier questionnaire is signed by a supplier representative just as the SSE review is signed by a GM manager. Finally, in 2016, GM complemented the expanded SSE program by creating a framework for regular—often weekly—discussion between a high-level manager of each of GMs 50 most important suppliers and a GM counterpart. The aim is to jointly review SSE metrics, discuss work on which the supplier may bid (or explain why a recent bid was unsuccessful) and address issues that might affect longer term collaboration.
See Bob Trebilcock, "How They Did It: Supplier Trust at General Motors." *Supply Chain Management Review.* May/June 2017. Last accessed on 9/26/17, available online at: http://bt.e-ditionsbyfry.com/publication/?i=408179&article_id=2783132&view=articleBrowser&ver=html5#{"issue_id":408179,"view":"articleBrowser","article_id":"2783132"}

information exchange regime with the supplier that allowed each party to take the measure of the other by observing its performance in joint problem solving, GM created a method for governing the actual use of the contract that improved day-to-day operations, its reputation with suppliers—and in time opened the way to a transformation in its relations with them.

Taken together these measures produced an unprecedented turnabout in GMs' ranking as buyer. Between 2015 and 2017 GM rose in the rankings from tied for last to third, within striking distance of the leaders, Toyota and Honda (the two firms that were the pioneers in collaborative contracting with their suppliers). GM improved moreover in 5 of the 6 procurement areas included in the survey, providing further evidence of corporate-wide change.[74] As the ratings rose, suppliers reduced the selling price of parts to GM, suggesting that the new relation was yielding mutually beneficial efficiency gains.[75] In addition 80 percent of the 50 key suppliers participating in the intensive program of regular, high-level review expanded their business with GM.[76]

The rapid introduction by GM—and no other US OEM—of a governance structure of reciprocal review mechanisms creates a type of natural experiment: Given GMs erratic, and generally poor buyer ranking, and the persistently poor showing of the US OEMs that did *not* introduce reforms when GM did, we can eliminate the slow accretion of informal relational norms between OEMs and suppliers as the explanation for GM's improvement. The improvement in ranking was too abrupt and too restricted to GM to be explained by long-term developments. Nor is there any sign of a change in the basic structure of the contracts with suppliers at GM or elsewhere in the industry. To all appearances the traditional system of non-binding, long-term blanket orders and binding but short-term purchase orders continues as it has historically. The *only* significant change in the relation between GM and its suppliers was a change in contractual governance that coincides with, and thus best explains, the improvement in relations between them: the introduction of a highly formalized regime for continual reciprocal review, designed to induce, and braid with, informal mechanisms for resolving eventual disagreements.

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[74] Henke, John W. "2017 N.A. Automotive OEM Study Shows General Motors Jumps to Third Place, Nissan falls to last, in Supplier Relations." *CISION PR Newswire*. Planning Perspectives Inc, 15 May 2017. Last accessed on 9/26/17, available online at: http://www.prnewswire.com/news-releases/2017-na-automotive-oem-study-shows-general-motors-jumps-to-third-place-nissan-falls-to-last-in-supplier-relations-300457268.html.

[75] Trebilcock, supra note 70 at 24-25.
[76] Id.

Looking at the success of Japanese competitors or US firms in related industries that have apparently prospered by using these collaborative practices[77] -- the very techniques we have described as contracting for innovation -- and ignoring for a moment the enormous difficulties of changing large, established institutions, one might marvel that it has taken a US OEM so long to adopt them. But one might marvel all the more at how quickly, once the new regime of information exchange is rigorously in place, the routines of joint problem solving overcome the legacy of the past.

Disrupting the Automobile Industry.

The rapid development by GM of collaborative innovation with its suppliers required the firm to wrap a formal governance process around the master service agreement that has remained virtually unchanged for 70 years. This innovation in contracting practice presages much more dramatic changes in co-development that are on the horizon. Few mature industries have confronted the broad level of technological and market changes that now confront the automobile industry. A recent research report stated simply that "the global vehicle market is facing a substantial upheaval between [2015] and 2020."[78] The world's largest asset manager characterized the result of the uncertainty facing the industry starkly: "[the] race to the future of vehicles will create a significant dispersion between winners and losers."[79] As illustrations of the change that is rocking the industry, consider the following three developments, which taken together effect the range of capabilities a participant in the industry must develop to succeed in the future and the range of possible strategies to acquire them.

The first development is the shift from the internal combustion engine to an electrical engine. The skills necessary to produce an electric vehicle are dramatically different than those associated with an automobile manufacturer's current capabilities in running an efficient assembly line. For example, both the science and the technology of manufacturing an automobile quality-lithium

[77] See the description of John Deere's "Achieving Excellence" program of collaborative governance with its suppliers in Gilson, Sabel & Scott, *Contracting for Innovation*, supra note – at ---.

[78] Navigant Research, Transportation Outlook: 2025- 2050 (2017).

[79] BlackRock Investment Institute, The Future of the Vehicle (April 2017).

battery are radically different than those necessary to design and manufacture an internal combustion engine. Existing automobile manufactures do not have those skills; battery makers for the technology industry do. Similarly, the nature of the assembly process is radically different for an electric vehicle than for an internally combustion-powered auto. Estimates are that producing a Tesla electric vehicle requires approximately 8,000 parts while producing a comparable internal combustion-powered automobile requires more than 30,000; the difference, of course, is in the engine. While there are general capabilities in designing and operating an assembly line common to both forms of propulsion, the reduction in complexity reduced the entry barriers for Tesla to enter the automobile market and approach scale while at the same time pushing Tesla (and others) to partner with battery companies, in Tesla's case with Panasonic, to build a $5 billion dollar "giga" factory to achieve the scale necessary to make extending the range of electric vehicles without an as yet uncertain breakthrough in battery technology.[80] Nonetheless, Tesla's delay in achieving scale in manufacturing its new Model 3, the result in part on difficulties in achieving scale in its battery factory, demonstrates that manufacturing skills remain critical.[81]

In turn, the impact of the move toward electric vehicles is magnified by the increasing regulatory push to lower pollutants through mandatory increases in fuel efficiency and targets for moving to electric vehicles, as well as to shift away from reliance on diesel engines. The latter is especially important in Europe, driven in part by the Volkswagen scandal involving software that reduced performance and hence emissions of the engine during testing, where until recently diesel engines represented more than half of automobile sales.[82] The regulatory induced increase in the speed of the transition to electric power devalues the engineering and manufacturing expertise of existing market participants, further reducing entry barriers to competitors.

[80] This is not to say that assembly design is of little consequence. The development of assembly procedures that took advantage of Japanese-developed just in time inventory structures fundamentally changed automobile manufacturing and paved the way for Japanese companies' successful entry into the world market. This shift is described in JAMES P. WOMACK, DAVID T. JONES & DANIEL ROOS, THE MACHINE THAT CHANGED THE WORLD: TOYOTA'S SECRET WEAPON IN THE GLOBAL CARS WAR THAT IS NOW REVOLUTIONIZING THE WORLD (2007).

[81] Cite. Textual description of factory, and delays in Model 3.

[82] Cite. Textual description of impact on diesel sales in Europe.

The second shift, taking place virtually simultaneously with the first, is the rapid growth in the ride-sharing industry. Uber and Lyft's stunning expansion is aptly illustrated in the recent drop in the market price of a New York taxi medallion by some 50 percent – from over $1 million to less than $500,000 over two years.[83] The shift to ride-sharing is itself sufficient to affect the automobile industry: the increasing cost of owning a vehicle in urban areas is expected to reduce overall automobile sales by increasing the sales of high-utilization shared vehicles and more than proportionately decreasing the sales of low-utilization personal vehicles. But the impact of ride-sharing on the automobile industry is multiplied significantly by the third and related development: the shift toward autonomous cars.

The development of autonomous vehicles reflects two different trajectories. The first is the growth in advanced driver-assisted systems, including emergency braking, backup cameras, adaptive cruise control, pedestrian protection and self-parking systems in ordinary production automobiles. The second reflects the impact of ride-sharing. Ride-sharing is a low-profit margin business if the market for drivers is competitive. Not surprisingly, ride-sharing companies, especially Uber, were early entrants in the race to build a fully autonomous car, one that did not require a driver at all.[84] Technology companies, especially Google, also moved in this direction, recognizing that their software capabilities, coupled with sophisticated hardware that fed software information about the automobile's environment, gave them a head start in developing the technology necessary for a completely autonomous automobile. Google (now through Waymo, a wholly owned subsidiary) anticipated this market opportunity and by mid-2017 its vehicles had logged more than 2.5 million miles on California highways, 636,000 in 2016 alone.[85] From this perspective, the value added in automobile manufacturing shifts from hardware to software. The intensity of this competition was

[83] http://toddwschneider.com/posts/taxi-uber-lyft-usage-new-york-city/. The price of taxi medallions serves as a proxy for the decline in taxi market share in New York: In 2014, taxi medallions were regularly bought and sold for over $1 million; now, prices for such medallions are regularly in the $500,000 range, with some priced as low as $250,000. See Elena Holodny, Uber and Lyft are demolishing New York City taxi drivers. Business Insider, October 12, 2016.

[84] The standard measure of automobile autonomy has 5 levels, starting with driver assistance at the lowest level such as automatic changes in acceleration based on information about the driving environment without the intervention of the driver, to the third level in which the automated driving system controls all elements of dynamic driving decisions and implementation but with the expectation that the driver will intervene if the system so requests, to level 5, in which the automated system controls driving decisions and implementation without the expectation of any intervention by the car's occupant. Navigant Research Leadership Report: Automated Driving, 4 (Q2 2017).

[85] Id. at 25.

highlighted by the intensely pursued litigation brought by Waymo against Uber claiming that Uber had benefited from Waymo technology stolen by a former Waymo employee whose early stage autonomous truck startup was acquired by Uber for some $800 million.[86]

The traditional automobile manufacturers quickly recognized the threat to their business. If the shift to electric vehicles devalued their engineering and manufacturing capabilities with respect to internal combustion engines, and if the shift to ride-sharing and autonomous vehicles caused the high value-added element of car manufacture to shift from engineering and manufacturing to software, the traditional automobile manufacturing business would become a low margin business. From this perspective, the physical car becomes only a repository for the software.

For our purposes, the critical feature of this response is the variety of different strategies adopted by the auto industry. Given the technological and market uncertainty, different industry participants have developed different and often multiple strategies, which require different contracting techniques. A number of examples illustrate the point. For the large automobile manufacturers, some firms reduced manufacturing scale and some increased it. General Motors is reported to be freeing up capital to compete with technology companies in developing car-sharing and autonomous vehicle software by cutting back on car-selling operations. In contrast, the existing Nissan, Renault and Mitsubishi alliance is deepening their cooperation in order to increase sales, which they believe is necessary to compete in developing the technology necessary to compete in the future.[87]

Across the board, large manufacturers have entered into strategic alliances and collaborative partnerships to jointly develop electric vehicles, autonomous technologies and cooperate in ride-sharing efforts. For example, Tesla and General Motors partnered to make a $500 million investment in Lyft, the second largest U.S. ride-sharing company. Daimler entered into a partnership with Uber to develop ride-sharing efforts in addition to Daimler's own Car2Go business. Volkswagen invested in Get, an Israeli-based ride-sharing company. In contrast, Ford intends to

[86] Textual description of events giving rise to the litigation, Uber's former CEO statement that the issue was existential for Uber, and the settlement.

[87] John D. Stull, Car Chief Bets Big on Growth, Wall St. J. p. B1, col. 5 (September 16-17 (2017).

develop a fully vertically integrated autonomous vehicle, investing $1 billion in Argo AI, a wholly owned effort intended to develop autonomous technology, but with the structure and employee equity participation of a venture capital-backed startup. BMW has developed most of its technology with tier one suppliers Bosch and Continental, but recently entered into a partnership with Intel and its recently acquired sensor company Mobileye using Intel processors and Mobileye sensors.

Technology companies including Google (Waymo) and Apple are focusing on developing the software and some of the hardware to provide the technology platforms to automobile manufacturers for use on the manufacturers' vehicles. They are hardly alone. A recent Wired Magazine listed the 263 technology companies competing for partners in the autonomous automobile market.[88] In this circumstance, we observe the development of a "spiderless network" – a self-organizing relationship among participants in a market for partners that economizes on the information costs of searching for partners.[89]

Thus, we observe different organizational responses in reaction to radical market change. Some participants vertically integrate. But for most the expanded range of technological expertise necessary for success forces vertical disintegration and adaptive contracting through collaboration. At the same time, the shift in the necessary firm capabilities resulting from innovation encourages new entrants into an industry and dramatically expands the range of potential partners giving rise to informal networks. On a theoretical basis, we see a shift in how we understand the theory of the firm and the definition of its boundaries. As we address in Chapter [ ], the theory of the firm itself disintegrated into an organization whose border shifts constantly, an organizational form whose most significant capability is the capacity to adapt quickly to changing markets and opportunities.[90]

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[88] Jack Stewart, The Top 263 companies Racing Toward Autonomous Cars, Wired Magazine (May 10, 2017). available at , https://www.wired.com/2017/05/mapped-top-263-companies-racing-toward-autonomous-cars/.

[89] For discussion of these self-organizing networks, see Ariel Porat & Robert E. Scott, *Can Restitution Save Spiderless Networks?*, 8 Harv. Bus. L. Rev. (forthcoming 2018). We discuss more generally the role and character of networks and the resulting contractual arrangements in Chapter ….

[90] In this important respect, we take a more aggressive approach in Chapter [ ] to reframing firm capabilities than an important recent contribution. See Gary Pisano, *Toward a Prescriptive Theory of Dynamic Capabilities: Connecting Strategic Choice, Learning, and Competition*, Harvard Business School Working Paper 16-146 (2016), available at http://.ssrn.com/abstract:2802183.

WHITHER CONTRACT?

Rapid economic change and the effects of disruption are the exogenous influences to which contract adapts. As illustrated by the GM example, we see patterns of innovation in contract design and practice in response to these systemic shocks. But precisely how do sophisticated parties (and their skilled transactional lawyers) – the contract designers of this world -- address the problem of disruption and the demands of innovation? Is it possible to design a contract in which a court plays only a superintending role that is sensitive to the context the parties have created? We tackle these questions throughout the book, but remain mindful that our data base is preliminary: contract design remains something of a mystery, largely neglected to date by both legal and economics scholars.

Indeed, there is a large and growing literature that demonstrates the resistance of contracts to change even in the face of a significant exogenous shock. We know, for example, that boilerplate terms in corporate indentures, sovereign bonds and other standard form contracts resist improvements that would appear to enhance contractual efficiency.[91] Even customized, bespoke contracting emerges from law firm precedents that are tightly protected and resistant to amendment even when the parties are familiar with the contractual terms and even when the new terms plausibly would improve things absent the uncertainty concerning how the new and improved terms would be interpreted should they come before a court. Yet despite these frictions, contracts do change in many different ways and the changes appear to be the product of intelligent design, perhaps aided by a quasi-Darwinian evolutionary process of trial and error from time to time accelerated by punctuated events as developed by evolutionary theorist Steven Jay Gould.[92] Our studies of contemporary commercial practices over the past eight years show

[91] See Steven J. Choi, Mitu Gulati & Robert E. Scott, *The Black Hole Problem in Commercial Boilerplate,* 67 Duke L.J. 1 (2017); THE MITU GULATI & ROBERT E. SCOTT, THE 3 ½ MINUTE TRANSACTION: BOILERPLATE AND THE LIMITS OF CONTRACT DESIGN (2012). See also Marcel Kahan & Michael Klausner, *Standardization and Innovation in Corporate Contracting (Or, the "Economics of Boilerplate),* 83 Va. L. Rev. 713 (1997); Omri Ben-Shahar & John Pottow, *On the Stickiness of Default Rules,* 33 Fla. St. U. L. Rev. 651 (2006); Ronald J. Gilson & Reinier Kraakman, *The Mechanisms of Market Efficiency,* 70 Va L. Rev. 549, 613-622 (1984) (discussing the barriers to changes in the language of financial instruments).

[92] cite

that sophisticated parties choose several different means of anticipating and responding to the effects of disruption in the design of their contractual regimes.[93]

To understand how contract adapts as exogenous shocks alter the business environment in unpredictable ways, we first must distinguish two fundamental design categories. The first and most common is customization or "tailoring" of familiar contractual formulations. One example occurs in contractual markets with many parties engaging in similar transactions. In these "thick markets," collective bodies have emerged as mechanisms for coordination and cooperation between formally independent but functionally interdependent firms. Here, organized networks such as trade associations use an updating mechanism external to the particular contracting parties to propose changes in identified contract terms that will ultimately be adopted by most if not all members of the collective body.[94]

Another example of customization – one that presages the transformation of contract that is now occurring – involves changes in the terms within a particular instrument so as to better address uncertain future states that had not been anticipated when the form of bespoke contract was first used. Thus, over the past fifty years contract designers have adapted to the rise in uncertainty occasioned by various exogenous shocks (such the energy crises of the 1970s) by crafting relational contracts that rely on both formal and informal methods of enforcement.[95] For example, long term supply contracts grant parties broad discretion over quantity and price based on a seller's "output" or a buyer's "requirements;" distributorship and marketing agreements regulate sales quotas with broad standards such as "best efforts."[96] Previously held

[93] *See* Gilson, Sabel & Scott, *Contracting for Innovation,* supra note; Gilson, Sabel & Scott, *Braiding* supra note--; Gilson, Sabel & Scott, *The Limited Role of Generalist Courts*, supra note --- ; Gilson, Sabel & Scott, *Text* and *Context,* supra note --.

[94] See Lisa Bernstein, *Opting out of the Legal System: Extralegal Contractual Relations in the Diamond Industry*, 21 J. Leg. Stud. 115, 119–130 (1992); Lisa Bernstein, *Merchant Law in a Merchant Court: Rethinking the Code's Search for Immanent Business Norms*, 144 U. Pa. L. Rev. 1765, 1771–77 (1996); Lisa Bernstein, *Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions*, 99 Mich. L. Rev. 1724, 1745–54 (2001).

[95] Recall that we adopt the legal usage of relational contract that refers to contracts that combine formal and informal elements to address the imperative of granting party's discretion in adjusting to an uncertain future. See Robert E. Scott, *A Relational Theory of Default Rules for Commercial Contracts*, 19 J. Legal Stud. 597 (1990).

[96] Goetz & Scott, *Relational Contracts*, supra note ---.

unenforceable at common law on grounds of indefiniteness, these relational contracts work by using mutual opportunities to adjust cooperatively to build trust and by contextualizing the standards, combining them with expressions of purpose or precise instructions on how the standards were to be applied under the contract.[97]

A quite different design challenge has emerged, however, as a product of the enhanced uncertainty triggered by the "information revolution." The changes in contract design that first appeared in bio-tech research agreements and that we now see occurring at GM and other OEMs are innovative in a much more fundamental way: they involve mutations in the basic conception of what it means to contract. Here we see parties designing radically incomplete collaborative agreements to manage supply chains,[98] to pursue new drug development by contracting across organizational boundaries,[99] and to structure complex platform production relationships.[100] But even more fundamentally, innovative contract design is spreading across the productive landscape. We see novel contractual forms fundamentally changing established modes of dealing, from how to create binding preliminary commitments[101] to how to build networks of

[97] See ROBERT E. SCOTT & JODY S. KRAUS, CONTRACT LAW & THEORY 336-341 (5TH ED. 2013); Schwartz & Scott, *The Default Rule Project*, supra note ---. Because parties cannot foresee all contingencies in these contexts, they first delegate to their counterparty the discretion to adjust responsibly as states of the world are revealed and, thereafter, if cooperative adjustment cannot be achieved, they delegate to a court the task of completing the contract ex post by considering relevant context. Parties indicate this intention by adopting a general contract term – a standard such as 'best efforts'-- that initially directs the counter party to exercise sound discretion and subsequently directs a court, in the event of a dispute, to recover the context evidence relevant to assessing the discretion that was exercised. With the aid of interpretation maxims, parties can design combinations of specific instructions and vague standards that more precisely define the "space" within which the parties and a reviewing court has discretion. Robert E. Scott & George G. Triantis, *Anticipating Litigation in Contract Design*, 85 Yale L. J. 814 (2006).

[98] Gary Gereffi, et al., *The Governance of Global Value Chains*, 12 Rev. Intl. Pol. Econ. 78 (2005); Timothy J. Sturgeon, *Modular Production Networks: A New American Model of Industrial Organization*, 11 Indus. & Corp. Change 451 (2002).) See e.g., Long Term Agreement between John Deere & Company and Stanadyne Corporation (5-year supply contract for the purchase of fuel filtration systems, injection nozzles and related products by Deere from Stanadyne).

[99] See note 3 infra.

[100] ANNABELLE GAWER & MICHAEL A. CUSUMANO, PLATFORM LEADERSHIP: HOW INTEL, MICROSOFT AND CISCO DRIVE INDUSTRY LEADERSHIP (2002). See, e.g., General Terms Agreement between the Boeing Company and Spirit Aerosystems Inc. (June 30, 2006) (general terms agreement covering purchase orders by Boeing for particular product to be supplied by Spirit).

[101] See Alan Schwartz & Robert E. Scott, *Precontractual Liability and Preliminary Agreements*, 120 Harv. L. Rev. 661 (2007).

pharmaceutical alliances.[102] Parties in this environment of enhanced uncertainty are doing something different that, we will argue, reflects an effort to solve the problem of increasing levels of uncertainty in novel ways, certainly faster and we expect better, than can general purpose common law courts.

[102] Bruce Kogot et al., *Interfirm Cooperation and Startup Innovation in the Biotechnology Industry*, 15 Strat. Mgmt. J. 387 (1994); Walter W. Powell et al., *Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology*, 41 Admin. Sci. Q. (1996).

CHAPTER THREE

THE DESIGN SPACE FOR CONTRACT: RISK, UNCERTAINTY AND SCALE.

"Uncertainty is the key to everything"
Myron Scholes (2016)

In this chapter, we set out in more detail the analytic foundations of the book. We make the simple and therefore grand claim that the structure of commercial contracts, and of critical concern here, the structure of contracts addressing efforts to innovate, is driven by the particular combination of risk and uncertainty on the one hand, and the scale of the underlying activity – the number of parties who engage in similar transactions with a common level of risk/uncertainty – on the other. These two components connect in a straightforward way: the level of risk and uncertainty defines the problem that the contracting parties must address to go forward with their project. In turn, the scale of that activity defines the range of available solutions to the problem and, hence, the transactional forms in which they can be implemented.

Holding the scale of the activity constant, the lower the level of uncertainty, the more contracting will take the form of explicit, state contingent contracts. As uncertainty increases and continuing to hold scale constant, we will observe greater reliance on relational contracts together with standards to describe the parties' obligations, shifting the focus of contract design from ex ante drafting to cooperative adjustment over time and ex post enforcement. As uncertainty increases further, and parties' ability to predict and assign probabilities to future events is further compromised, we observe a shift that more explicitly links implicit contracting based on reputation and trust to the formal written contract, with the braiding of the two techniques serving to endogenize reputation and trust.

Turning now to scale and holding the level of risk and uncertainty constant, the greater the number of parties engaging in similar transactions, the more likely it is that the parties will

move away from dyad-based contract design and institutionalize the contracting process through a formal or informal collective process. For example, at low levels of uncertainty where parties can allocate future risks, we will find formal networks, like an industry association, that develops and interprets contract terms of general applicability to industry specific transactions and provides mechanisms for interpreting and adjusting them as circumstances change. Sometimes non-judicial dispute resolution will be provided collectively as well.[103] The scale analysis differs in the face of high uncertainty. In that circumstance, scale economies and information efficiencies may be achieved through more informal social networks. But as we will soon see, changes in the level of risk and uncertainty will critically influence the nature of the network's information and coordination functions.

This chapter is framed by what we term the *contracting for innovation conundrum*. Parties who want to contract for activities that they hope will give rise to innovation confront an immediate problem. For those projects whose goal can be specified in advance and the steps necessary to achieve them under different circumstances largely anticipated, then contract designers can craft an explicit contract that specifies the if/then framework from the project's beginning to its end and build a process that supports resolution of issues that arise as unanticipated events occur during the performance period. But the problem is that these projects are not innovative precisely because we can predict from the outset the specifications of the outcome of the contract and the steps necessary to reach the desired outcome. In contrast, where the project contemplates an innovation, neither the goal to be achieved nor the path necessary to reach it can be fully anticipated, and so a state contingent explicit contract cannot be written; too much uncertainty exists. Moreover, unlike a long term supply contract, where the objective is known but the means of achieving it are not, here an intrinsic part of the innovative project involves determining *both* the substance of the innovation and how to accomplish it. Because these initial elements of the innovation process cannot be addressed in an ex ante explicit contract and because, as we described in Chapter Two, the demands of technology have made vertical integration as a response to high uncertainty less effective, the contracting for innovation conundrum arises.

[103] The development of industry association specified contracts and dispute resolution provide a useful example. In Chapter [ ], we extend Lisa Bernstein's work on contract and dispute resolution in the cotton industry by linking the stability of the industry efforts to the level of uncertainty in the industry.

Addressing this conundrum requires that we are precise by what we mean by risk and uncertainty, which frames the contracting problem, and how scale, which bounds the range of approaches to the contracting problem, interacts with risk the risk/uncertainty continuum. As we will see, the role of risk and uncertainty in contract design has its modern origins in the work of Frank Knight and John Maynard Keynes but, as we will also see, a more nuanced framing is necessary to operationalize the concept for contract design. We begin with an analysis of risk and uncertainty, and then turn to the institutional structure of contract design, by which parties contracting over similar projects can through formal or informal coordination achieve economies of scale and where the institutions through which these economies are achieved depend on the level of risk and uncertainty the activity presents. In this way, we hope to introduce and illustrate the interaction between the two axes of variation in contract design.

RISK AND UNCERTAINTY

For purposes of contract design, risk is a creature of time. Imagine a simultaneous exchange where one party can first assess the item being purchased and then provide the other party the agreed consideration. In this setting, the value of both the item and the consideration are observable and verifiable. Now simply add the passage of time between specifying the item to be exchanged and its delivery and payment. In that gap events can occur that alter the value of the item to one or both of the parties.[104] The longer the time between contract and performance, the more things can be expected to change. Figure 1 illustrates the phenomenon.

[104] The same problem can arise with respect to the medium of payment. If the payment is to be made in a different currency than the buyer utilizes, then changes in the exchange rate during the gap between contract and performance may occur.

Figure 1

The Relation between Time and Dispersal of Outcomes[105]

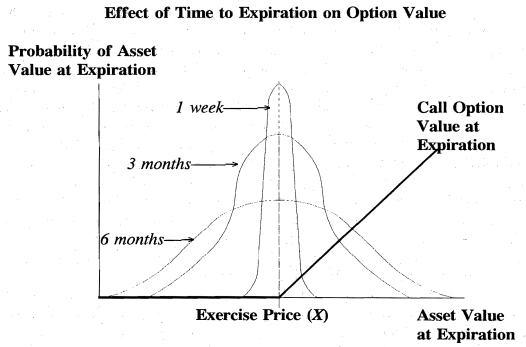

Figure 1 shows what happens to the value of an option as the time that remains until the option expires lengthens. Under the standard option pricing model, the value of the option turns centrally on the variance in the value of the asset subject to the option: the higher the variance in that value, the more valuable the option. The intuition is simple: the more the value of the asset moves, the more likely the asset's value on expiration will be higher. If one holds only an option, then the variance increases the up-side value of the underlying asset but the option holder does not bear the corresponding increased down side risk. If events result in a downside outcome that results in a value below the exercise price, the option holder simply does not exercise; in effect, the value of the option to the holder is bounded at zero. A higher variance and hence an increased likelihood of a higher value of the underlying option benefits the option holder, who gets the benefit of the increased upside but does not bear the cost of the corresponding increase in the downside.

[105] Source: Ronald J. Gilson & Bernard Black, The Law and Finance of Corporate Acquisitions __ (2nd ed. 1995).

The next step demonstrates the importance of time. Again, the standard option pricing model specifies that the longer the time until an option expires, the more valuable the option. The intuition is simple. The longer the time until the option expires, the greater the opportunity for the value of the underlying asset to change and so the higher the variance. Figure 1 shows the effect of time to expiration on the value of an option. If the option expires in a week, the probability distribution of values is narrow. There just isn't much time for something good to occur that will increase the asset's value. As the time to expiration increases in Figure 1 from a week to 6 months, the tails of the probability distribution of the asset's value on expiration increase, and the mean of that distribution goes down. There is more time for things to happen that affect the option's value.

While not highlighted in Figure 1, the importance of the tails of the distribution goes up when the returns to the underlying activity compound, as will be the case in many innovative activities. For example, projects that are characterized by first mover advantages – network effects are a good illustration – present significant compounding effects. Similarly, the cascading effects of unanticipated outcomes in complex staged projects can result in enormous delays, as was the case in the development of the Boeing 787 and the Airbus 360 projects.[106]

The same problem confronts the contract designer. The more time between the contract's execution and the performance date, the greater the opportunity for things to happen that will affect the value of the transaction to both parties. Put differently, the more time, the more uncertainty the contract designer has to address. This brings us to consideration of the centrality of risk and uncertainty to contract design.

As we described in Chapter One, Frank Knight in 1921 drew a critical distinction between risk and uncertainty that frames the discussion of how the two concepts shape contract design. For Knight, "risk" exists when we cannot state with certainty which among a number of possible future states will occur but, critically, the probabilities of each of the future states occurring can be precisely specified. For the contract designer, this circumstance can be addressed in a straightforward fashion. The designer crafts an explicit contract that assigns the

[106] [cites]

consequences of the risk's resolution to one or the other party.[107] In turn, the party assigned the risk can then transfer it to a third party, for example, by either purchasing an insurance contract covering the outcome of the event, or accomplishing the same result through the derivatives market. As Knight put it, "risk, in the ordinary sense, does not preclude perfect planning …."[108] But anticipating the contracting for innovation conundrum, Knight also recognized that risk as now defined cannot lead to innovation; if you can perfectly contract over the object of the contract, then the object is not an innovation and so the return is limited. In Knight's terms, "a known risk will not lead to any reward or special payment at all. … [T]he risk involved in entrepreneurship is not and cannot be a known quality."[109] The best you can do at a craps table is get a payout that is not reduced by a house edge.[110]

John Maynard Keynes echoed Knight's recognition that taking quantifiably determinable risk does not lead to innovation.

> Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities. …. Thus, if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die … .[111]

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[107] Kenneth Arrow framed the outcome in technical terms. "[I]nstead of contracts to buy and sell fixed amounts of goods, it would be better to have conditional contracts, or contracts in *contingent commodities*, to use the technical term, that is, each unit contract is for the delivery of a one unit of some good if a specified state has occurred. Since the state of the world completely specifies demand and supply conditions, it is possible to prescribe that contingent contracts always be carried out, since we need to offer to deliver exactly as much would be available in the state which the contract is contingent. Prices can be attached to these contracts…. A commodity in the ordinary sense is replaced by a contingent commodity." KENNETH J. ARROW, THE LIMITS OF ORGANIZATION 34 (1974).

[108] KNIGHT, supra note -- at 21.

[109] Id. at 44.

[110] The only bet in craps that pays off based on probabilities undiminished by a house cut is backing your bet on the pass line.

[111] JOHN MAYNARD KEYNES, THE GENERAL THEORY OF EMPLOYMENT, INTEREST AND MONEY 161-62 (1935). Knight's and Keynes' insight that bearing risk, in Knight's terms, is not rewarded, presages the debate over whether publicly held corporations should ever hedge. The short outcome of this debate is that hedging is valuable only if it

Innovation, then, depends on the presence of the antithesis of risk, in Knight's terms, uncertainty. And so, we will see, does designing contracts for innovation.

For Knight, uncertainty in contrast to risk exists when we cannot express the probabilities associated with an event with precision; the likelihood of particular outcomes may be unknown; the full range of possible outcomes may be unknown and, at the limit, both may be unknowable.[112] Again, Keynes offers the same thought. Uncertainty describes our knowledge about future events "where there is no scientific basis on which to form any calculable probability whatever. We simply do not know."[113] This is the realm of innovation, where at the outset we lack the knowledge to specify what we hope to achieve, and so lack the capacity to specify how to go about achieving it, and it follows, cannot assign meaningful probabilities to either the process or the outcome.

The contract designer's core problem, then, is how to go about contracting over the uncertainty that innovation generates rather than contracting over known risks through state contingent contracting. How do we structure a transaction when we do not yet know what we seek to accomplish or how we will go about it and, critically, where each party must make relationship specific investments that cannot be protected by contract from opportunistic behavior by their counterparty when the passage of time resolves elements of uncertainty?

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increases the returns to an activity, as opposed to just reducing the variance in the outcomes. For an accessible account, see Froot, Scharfstein & Stein, *A Framework for Risk Management*, 72 Harvard Business Review 91 (1994).

[112] KNIGHT Ch. 7, supra note ---.

[113] Id. Donald Rumsfeld's famous quip concerning the categories of risk and uncertainty captures much the same thought but with a framing whose opaqueness matches the uncertainty described: "Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know. And if one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones." Department of Defense News Briefing, February 12, 2002, available at http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=2636 .

The problem is made both easier and harder when we extend Knight's risk and uncertainty distinction by dividing uncertainty into two categories: discrete and continuous. The distinction becomes clear when we recognize that sometimes innovation is a circumscribed process and sometimes the process continues indefinitely. As an example of the former, consider the big pharma and little pharma research and collaboration agreements such as the one described in Chapter One: these efforts to innovate start with a general idea about the possibilities of a new drug therapy that cost considerations confine to a specifiable end point. During the defined period they move through an iterative process between desired outcomes and the capacity to achieve them: what we want is influenced by what we can do and vice versa. In this situation, the level of uncertainty is reduced over time: if successful, the parties learn what they want and what they can achieve, if not, they abandon the effort. In either event, at that point, uncertainty has dissipated, the project having evolved to the point where outcomes can be specified and the manner in which they can be achieved set out. In Knightian terms, uncertainty has turned into risk, which the parties' can address with traditional contracting techniques.

In some circumstances, however, uncertainty is continuous. An example is the invention of the wheel. It is tempting to argue that once someone had the idea of the wheel it was no longer an innovation; that is, that innovation is never continuous but always discrete. But consider the uses of a wheel in the process of manufacturing a product for market. Each innovation spawns others. Changes to the tensile strength of the material in can alter in fundamental ways the design of other inputs to the finished product, as can the increase in the number of revolutions per second, or the speed or the cost with which to build one? In short, innovation in the production process is fractal. As uncertainty is gradually resolved through the parties' collaboration with respect to an existing product generation, technology driven market evolution creates new uncertainty going forward. Put differently, in business environments where the rate of change is positive, the length of the experience curve – the measure of the parties' learning from doing and collaboration – shortens so that the parties cycle from uncertainty to uncertainty with ever less of an equilibrium between contracting cycles. Here parties operate under continuous uncertainty. The two forms of uncertainty – discrete and continuous – require different contracting techniques.

A final comment about the character of uncertainty in contract design recognizes that, as reflected in Figure 2, the Knightian dichotomy is in fact a continuum, with elements of risk and uncertainty present in most transactions.

Figure 2

The Risk and Uncertainty Continuum

Over a significant range parties may recognize broad categories of uncertainty where the probabilities associated with the uncertainty cannot be approximated by reference to relative frequencies of roughly comparable instances. But the parties are not entirely unaware of the uncertainty or entirely unable to form estimates of the probabilities associated with the underlying events. Rather, in this "vast range of economic problems, where probabilities are nether explicitly given nor approximated by relative frequencies or regression analysis," subjective estimates of probabilities are used when objective estimates cannot be defined, a mix of risk and uncertainty.[114]

As we will see, the contract designer can address the movement along this continuum in different ways, using rudimentary combinations of explicit contracting techniques and trust building through mutual adjustment to deal with lower levels of uncertainty, and by creating an explicit collaborative process based on the trust created through that collaboration for higher

[114] Itshak Gilboa, Andrew Postlewaite & David Schmeidler, *Probability and Uncertainty in Economic Modeling*, 22 J. Econ. Lit. 173, 175 (2008). Once probability estimates of uncertainty (as opposed to risk) are recognized as subjective, behavioral concerns may influence parties' estimates. This has given rise to an interesting literature concerning the extent to which parties are averse to uncertainty, referred to as ambiguity aversion in contrast to risk aversion, and how that aversion affects choices. Eric L. Talley, *On Uncertainty, Ambiguity and Contractual Conditions*, 34 Del. J. Corp. L. 755 (2009), reviews this literature in connection with applying it in a contracting context -- understanding the structure of material adverse change clauses in acquisition agreements.

levels of uncertainty. In both cases, explicit contracts operate to support implicit contracting, a braiding of explicit and implicit techniques.[115] In this sense, braiding in either its rudimentary or more developed form is ubiquitous, including both the broad mid-range of more familiar distributorship, marketing and long term supply contracts as well as the collaborative processes that form the core interior solution to the contracting for innovation conundrum in the space where uncertainty is high and innovation concentrated.

SCALE AND THE ROLE OF NETWORKS

Having seen how different levels of risk and uncertainty define the problem that contract designers must confront, we now sketch how the scale of the activity – the number of parties who engage in similar transactions with a common level of risk and uncertainty – defines the range of available solutions to the problem. For this purpose, a market is thick when many parties participate in similar transactions and will benefit from coordinated responses to the contracting environment. When markets are thick in the sense that many actors face similar changes in their dealings, the affected parties often will institutionalize their innovative contract forms and terms through collective action. Put differently, there are scale economies in contracting.

Consider the institutional response when uncertainty increases moderately and parties in thick markets need to rely on standards to harness the hindsight advantage of a court. This is the domain, for example, of the Delaware Court of Chancery in which the legal rules governing the fiduciary obligations of boards of directors in corporate acquisitions are applied. The specialization of the court and its equitable powers assure parties that, despite the impossibility of codifying decision rules, judicial decisions will be taken with the fullest possible awareness of current understandings of good practice, that is, the court can with reasonable accuracy assess the context because it is part of it.[116]

[115] Gilson, Sabel & Scott, *Braiding*, supra note ---.

[116] See Gilson, Sabel & Scott, *The Limited Role of Generalist Courts*, supra note---. We further develop the role of specialized courts in Chapter [ ].

As scale increases even more networks form as a product of those economies. The nature of the network, moreover, will vary according to the level of uncertainty faced by the actors. When uncertainty is low we are more likely to observe the network, whether in form a trade association or other cooperative entity, providing formal contract terms and private dispute resolution that reduces contracting costs for traders in the community. As uncertainty increases, contracting parties need to search farther and farther afield for potential partners. Here, networks provide a second resource – information about trustworthy partners. Supply chains, modular platforms and credit card organizations are examples of these moderate uncertainty networks. Finally, when uncertainty is high, the information necessary for a private entity or self-organizing network to play the organizational and monitoring role is too diffuse. Instead, the state must supply the coordinating and information gathering role to create what we will call a regulatory network that functions to reduce novel hazards that are the byproduct of innovation.

Thus, depending on the precise character of the collective action problems parties face, the resulting network structure may be entirely private and formal (with contract terms developed by industry associations and disputes resolved by private arbitration), or private and informal (with parties linked to each other in the common search for partners), or largely public (with terms developed by a public agency in consultation with the affected contracting parties).

THE DESIGN SPACE FOR CONTRACT

We will illustrate the combinations of risk and uncertainty and scale in subsequent chapters. Here our goal is to provide an introductory overview of how contract design is shaped by the interaction between risk and uncertainty and by the networks that form with increases in scale.

Thin Markets, From Low to Moderate Uncertainty.

When markets are thin and uncertainty low, we see bespoke state contingent contracting: explicit formal contracts between two parties that take the if-then format made possible by low uncertainty. The thinness of the market makes unavailable any scale economies from collective action by networks to frame common contractual terms. As a result, contracts are bilateral and

the low uncertainty makes it possible for contract designers to anticipate and address (most of) the future states of the world and specify what should happen on the occurrence or non-occurrence of each.

As uncertainty increases from low to moderate levels, however, efforts to craft fully state contingent contracts come under pressure. Parties then turn to more traditional relational contracts that pair discretion in how explicit obligations are fulfilled as events evolve through the use of a standard that governs key terms such as price, quantity and effort. In contracts such as these, in which uncertainty is significant and the cost of formalizing anticipated contingencies and their consequences is high, parties typically rely on a mix of enforcement strategies, motivating performance through the threat of formal legal enforcement as well as relying on informal or self-enforcing mechanisms, including reputational sanctions, the loss of future dealings and social norms of trust and reciprocity.

Two examples illustrate this mixed design strategy. For example, long-term procurement contracts must adjust to exogenously induced changes in the efficient quantities of goods the buyer requires or the seller is obligated to supply. If the parties were to attempt to specify fixed quantity and price terms in the contract despite uncertainty about future needs and commodity prices, they inevitably would be forced to renegotiate their contractual obligations when future events transform partially anticipated uncertainties into facts and unanticipated uncertainties into current conflict. Instead, the parties are motivated by the reality of an uncertain future to reach agreement on contextualized standards that permit quantity to be adjusted as circumstances change over time: for example, a buyer cannot demand nor can a seller produce a quantity that is "unreasonably disproportionate" to the quantities *the parties themselves* traded in prior periods.[117] The standard is not free floating because courts adjudicate disproportion by anchoring on the parties` experience under the contract.

Allowing flexibility (or discretion) in such relational contracts saves parties "haggling costs," the transaction costs from continually having to update or renegotiate price or quantity in

[117] See e.g., UCC § 2-306(1) ("any minimum or maximum set by the agreement shows a clear limit on the intended elasticity. In similar fashion, the agreed estimate is to be regarded as a center around which the parties intend the variation to occur." 2-306 cmt. 3); Cf., Empire Gas Corp. v. American Bakeries Co., 840 F.2d 1333 (7th Cir. 1988) (Posner, J.).

light of changed external circumstances, and the risk of the effort's failure. A further advantage of a flexible long term procurement contract is that it permits the parties to "smooth the bumps'' in the inevitable variations in supply and demand that otherwise may threaten short term business disruption: Here, the goal of the contract designer is for both parties to be better off under the contract than under the next best alternative in every period in the life of the agreement.[118]

The retention of expert services that require skills one party does not have is a second example of the advantage of coupling an explicit statement of an obligation with a standard that gives discretion in how the obligation is fulfilled. For example, parties to franchise or distribution contracts often require franchisees or distributors to use their "best efforts" (and similar standards) in performing the contract.[119] Or consider a small biotech-large pharmaceutical marketing agreement where the pharmaceutical company is charged with commercializing a drug developed by the bio-tech company. What efforts are appropriate will depend on the resolution of future uncertainties such as the outcomes of human trials and use limitations that may result, as well as the number of competing drugs that appear. Here specifying a standard like "commercially reasonable efforts" provides a context in which future decisions by both parties can be evaluated.[120] Such standards often are preceded by instructions that contextualize the broad standard. For example, parties may describe in the contract the context that will be relevant—what industry, what kind of products and, when possible, the evidence the court should use to measure performance under the standard.[121] Alternatively, the contract may provide a list of specific actions the agent is required to undertake as exemplars of behavior that meets the best efforts standard.[122] In either case, a reviewing court can infuse

[118] See Schwartz & Scott, *Contract Theory*, supra note – at 562-65.

[119] *See*, University of Missouri-Columbia, Contracting and Organizations Research Institute, *CORI Contracts Library*, at http//cori.missouri.edu (last visited Feb. 25, 2016) (Total contracts in CORI database: 24,965. Contracts with "best efforts" terms: 4,328 (17.34%).

[120] See Scott & Triantis, supra note --- at --- (discussing how parties contextualize standards to fit their circumstances).

[121] See e.g., the "purpose" clause from the Fountain Manufacturing Agreement between Apple Computer, Inc. and SCI Systems, Inc., available at http://contracts.onecle.com/apple/scis.mfg.1996.05.31.shtml; http://cori.missour.edu.; Gilson, Sabel & Scott, *Text* and *Context*, supra note 65 at 58-60.

[122] See e.g., Distribution Agreement between Microblend LLC and Mobil Oil Corp. (June 6, 1998) (on file) ("Best efforts" obligation contextualized by instructing Mobil to "provide demonstrations of the Products to potential

content into a standard such as best efforts by inferring the parties' general goals from the contract's descriptive clauses and the contract's detailed rules.[123]

Unfortunately, formal legal standards (even those that carry with them directions about the context in which the standard should be applied by a court), cannot easily regulate either the renegotiation or the adjustment processes where expectations of the outcome of litigation shape those processes. Rather, parties to these relational contracts can (and do) turn instead to informal means of enforcement, relying on the trust created by repeated opportunities to mutually adjust as the future unfolds.[124] The interaction between these formal and informal mechanisms is complex, however, and informal norms do not always forestall the legal disputes that can result from dramatic exogenous shocks.[125]

The rudimentary linking of explicit and implicit obligations that we see in long term procurement and distributorship agreements is a precursor to the more complex collaborative agreements that have evolved as the speed of technological change has raised the level of uncertainty ever higher, where we will see the formal elements of the contract are designed to facilitate the growth of trust that regulates the substantive elements of the parties' relationship. The cooperative behaviors induced in purely relational contacts are not formally braided with explicit obligations and the trust that results from mutual opportunities for adjustment signals

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customers; assist Microblend in discharging Microblend's obligation under its warranties relating to the Product; submit to Microblend at least 30 days prior to the start of each calendar quarter, a quarterly forecast for the upcoming six months; assist Microblend in determining the credit worthiness of any distributor; and otherwise assist Microblend in the sale and marketing of the Product as the parties may from time to time agree.")

[123] See Scott & Triantis, *Anticipating Litigation*, supra -- at 851-56 (reporting the results of a sample of contracts that combine standards with rules so as to contextualize the standard). A standard on its own gives the court a relatively large space within which to decide whether the agent's actions constitute best efforts. Where the parties combine standards and rules that relate to the same subject matter, the *ejusdem generis* canon applies. The meaning of the general language is then limited to matters similar in kind or classification to the enumerated precise terms. *See, e.g.*, Tate v. Ogg, 195 S.E. 496, 499 (Va. 1938) (holding that an enumeration which included "any horse, mule, cattle, hog, sheep, or goat" excluded turkeys).

[124] Parties to relational contracts such as these are constrained by several informal forces, including the desire to maintain a good reputation in the relevant trade or community, or the prospect of losing profitable future dealings. In many contexts, reputation, repeat dealings and norms of reciprocity provide the best available means of regulating the inevitable renegotiation and adjustment process so as to reduce the risk of exploitation of the parties' vulnerabilities. See Robert E. Scott, *Conflict and Cooperation in Long Term Contracts*, 75 Cal. L. Rev. 2005 (1987)

[125] See e.g., Eastern Air Lines v Gulf Oil Corp., 415 F. Supp. 429 (1975) (long term relationship fractured by the energy crisis of the 1970s).

the counterparties character but not their capability to adapt to an uncertain future. Nevertheless, as mutual adjustment proceeds cooperatively, contracting parties who operate under these conditions of moderate uncertainty are able to execute their obligations more efficiently without recourse to the threat of litigation. In this example and others in which one party contracts for the other's exercise of judgment, the trust created by repeated opportunities to cooperate enable the party with discretion to apply that expertise to adjust effectively to new conditions.

Thin Markets, High Uncertainty.

Many efforts to contract for innovation operate in thin markets with high uncertainty. With low uncertainty, the central contract design problem is the moral hazard risk caused by relation specific investments by individual parties. In practice and in the academic literature, this holdup problem is addressed either by state contingent contracting or by vertical integration. But when uncertainty is high state contingent contracting is infeasible and vertical integration can fail. Technology changes make it harder for a firm to deal with the difficulties of contracting under these conditions by vertically integrating: a single company confronts substantial challenges in trying to stay on the technical frontier in the increasing range of areas required for success. But contracting with those who have the necessary technical expertise is also difficult because the parties cannot specify in advance the desired product's goal and how it can be achieved, let alone what a particular supplier would produce, the cost of production and the appropriate profit. These central features of the parties' relationship have to be determined in the very contract the parties cannot write.

In this setting we see the transformation of contract that we have highlighted: the use of formal governance structures to establish a process of collaboration through which the parties mutually evaluate their capacities and intentions. This joint development regime substitutes for an ex ante specification of the desired product and its manufacture that high uncertainty renders impossible. The formal agreement addresses the governance problems arising from the mutual vulnerability inherent in such open-opened collaboration between separate firms by specifying formal processes for information exchange the goal of which is to allow the parties to assess their counterparties expertise and ability to cooperate under conditions of high uncertainty. The exchanges of information required for benchmarking, simultaneous engineering, and error

detection and correction increases the mutual transparency of the actors to each other, revealing to each how rigorously and cooperatively the others scan for solutions in addressing joint problems of design or quality. By such monitoring, the parties learn their counterparty's capabilities to operate in this transactional structure and to perform the substantive tasks required for the particular product.[126] The contractually established collaboration serves to build trust in *both* character and capability, which then provides the platform for braiding between the explicit contract for collaboration and implicit contracting over the parties' relationship when the collaboration results in a product to be produced. Where a relational contract under moderate uncertainty depends on trust based on informal adjustments over time, under conditions of high uncertainty, the creation of trust is the central outcome of the formal contract's terms.

Networks: Thick Markets from Low to High Uncertainty

The need to achieve scale other than through vertical integration has given rise to a variety of efforts to collectivize the contracting process. In the low uncertainty space, we have long observed organized networks—cooperatives and trade associations –where, as with Lisa Bernstein's interesting work on the cotton industry, these associations collectivize the contracting process by providing members standard contract terms that are updated as conditions change and enforced through a private dispute settlement regime.[127] In the cotton industry, for example, dealers in cotton and cotton mills, in a structure dating back to the 1920s, adopted standard contracts governing transactions between association members, which are periodically updated by the trade association. Arbitration panels exist that resolve disputes among members, which have the benefit of deep knowledge of the form contract and of industry practices. Given the low uncertainty and continually updated industry standard contracts, the result is a collective equivalent of state contingent contracts – a contract that is continually updated in response to changed conditions that could not be anticipated ex ante – and a pattern of very low rates of arbitration. This efficient capture of scale economies, however, is critically dependent on the low level of uncertainty. In the post-2011 period, when the volatility of cotton

[126] See Gilson, Sabel & Scott, *Contracting for Innovation*, supra note ---.

[127] Lisa Bernstein, *Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions,* 99 Mich. L. Rev. 1724 (2001).

prices jumped significantly, contract breaches between farmers and merchants and merchants and mills increased substantially as did recourse to the formal arbitration procedure.[128]

As the speed of change has accelerated, however, we see the evolution of networks that seek to capture scale economies in thick markets where the level of uncertainty makes the development of standard-form contracts, as in the trade association pattern, unworkable. Recall from Chapter Two that uncertainty-driven disruption in the auto industry led to vertical disintegration and bilateral collaborative supply chain contracts. That shift, in turn, created a demand for information about potential partner/suppliers. The resulting braided contract specified an iterative process designed to produce information about a counterparty's skills before commitments were made to produce or purchase anything. The cost of this switch to braided contracts, however, was a loss of scale in information gathering: knowledge about the capacity of each potential supply partner is gathered through iterative exchange one partner at a time. The development of strategic alliance or "supply" networks, an informal non-contractual organizational form among multiple firms adapting to the new vertically disintegrated supply chain environment, provided a way to scale the production of information about potential suppliers. By facilitating information sharing gained in bilateral braided contracts governing links in the new supply chains among industry participants, important elements of information production shift in part from bilateral to multilateral. In effect, these strategic networks reduce the costs of the information that supports reputation markets in high uncertainty contexts, which in turn reduces the search costs associated with finding new partners.[129]

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[128] Michael Rothfeld & Carolyn Cui, Plague of Broken Contracts Frays Cotton Market, Wall St. J., Aug. 30, 2012, at A1.

[129] Strategic alliance networks act as a conduit for the flow of private information about resources and capabilities. The knowledge that is created by the information exchange within the individual alliances diffuses throughout the network. Thus, the network becomes a reservoir of all the informational value that accumulates within that particular sphere of economic activity. Balaji R. Koka & John E. Prescott, *Designing Alliance Networks: The Influence of Network Position, Environmental Change and Strategy on Firm Performance*, 29 STRATEGIC MGMT. J. 639, 640 (2008). *See* David T. Robinson, & Toby E. Stuart, *Network Effects in the Governance of Strategic Alliances*, 23 J. L. & ECON. ORG. 242, 245 (2006) (over 5500 alliances between dedicated biotechnology firms, pharmaceutical firms and universities have been formed since the mid-1970s); M. Hergert & D. Morris, *Trends in International Collaborative Agreements, in* COOPERATIVE STRATEGIES IN INTERNATIONAL BUSINESS 99 (F.K. Contractor & S. Leinhardt eds. 1988) (analyzing the increasing use of collaborative agreements between international partners).

Some information networks form around or are formed by a central agent who exercises some control over the distribution of benefits and costs in the network. Here we turn back to our previous example -- the modern supply chain that relies on collaborative contracting between the suppliers and the buyer (GM, in our example) to coordinate vertical or transactional interdependencies between and among the firms.[130] Facing conditions of moderate to high uncertainty, modern supply chains have devised master agreements that braid with the bilateral collaborative agreements: the evolving non-formal network supports the contractual dyads by further nurturing norms of coordination and cooperation.[131] In turn, the legal mechanisms that support the collaborative contract facilitate the parties' search for reliable partners and the productive use of information generated through the network. As a consequence of the braiding of formal processes and a combination of low-level formal enforcement covering only egregious behavior and more generally applicable informal enforcement, the cost of the endogenous development of trust within bilateral collaborations is reduced by information sharing among participants in the network.

Finally, when the level of uncertainty is very high, network formation often requires the introduction of an external coordinating agent. Here we see the active participation of the state to coordinate parties around a "regulatory network." Under conditions of high uncertainty, contracting parties in a given market are unsure about the correct approach to a problem common to all. The aim of the regulatory regime is the organization of joint exploration of possibilities for joint problem solving. In this sense, the problem is the thick market analogue to bilateral contracting for innovation discussed above, but with scale now making possible public facilitation of collaboration. This pattern is especially suited to efforts to mitigate exogenous risks that can only be addressed through exacting, common efforts by all market participants.

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[130] Lisa Bernstein, *Beyond Relational Contracts: Social Capital and Network Governance in Procurement Contracts*,7 J. Legal Analysis 561 (2016); Claude Menard, *The Economics of Hybrid Organizations*, 160 J. Inst. & Theoretical Econ. 345, 348 (2004); J. Tienekens & P Zuurbier, *Chain Management in Agribusiness and the Food Industry* (2000); JOSH WHITFORD, THE NEW OLD ECONOMY: NETWORKS, INSTITUTIONS, AND THE ORGANIZATIONAL TRANSFORMATION OF AMERICAN MANUFACTURING (2005).

[131] An example of such a buyer- centered network is the use by John Deere of both master agreements covering the entire network of suppliers together with bilateral collaborative contracts between Deere and each of its tier one suppliers. See Bernstein, supra note --; Gilson, Sabel & Scott, *Contracting for Innovation*, supra note – at ---.

As noted in Chapter One, food safety illustrates the class of risk that induces formation of this type of regulatory network. As the supply chains for foodstuffs lengthen, pathogens can enter in innumerable and rapidly changing ways. All actors in the food supply chain—growers, processors, distributors and retailers—have an interest in protecting their market by developing a regime of practices that reduce the chances for contamination and limit its effect. Since the failure of any actor to adhere scrupulously to the good practices can undo the efforts of all the others, adhesion to the requirements of the regime will be a precondition to contracting in the market – the externality imposed by a single party will be internalized through collective action. The state, as the protector of public health, has complementary interests and can serve a coordinating function. Here, the goal is to use the network to reduce risk common to all industry participants where failure by one party to take precautions creates negative externalities that affect everyone in the industry. [132]

Figure 3 illustrates how the levels of risk, uncertainty and scale intersect for the examples discussed in this chapter. Here, our goal only has been to introduce the intersection of risk, uncertainty and scale as driving contract design and illustrate the remarkable adaptive qualities of contract. We focus intensively on the many faces of contract in further chapters and there we develop the centrality of risk, uncertainty and scale to the way that contract has and will continue to adapt to facilitate innovation in business practices that are, in turn, propelled by the rapid acceleration of changes in the underlying environment.

[132] See Charles F. Sabel & William H. Simon, *Contextualizing Regimes: Institutionalization As A Response to the Limits of Interpretation and Policy Engineering*, 110 Mich. L. Rev. ---(2012).

Figure 3

Simple Schematic of the Interaction of Risk/Uncertainty and Scale in Defining the Design Space

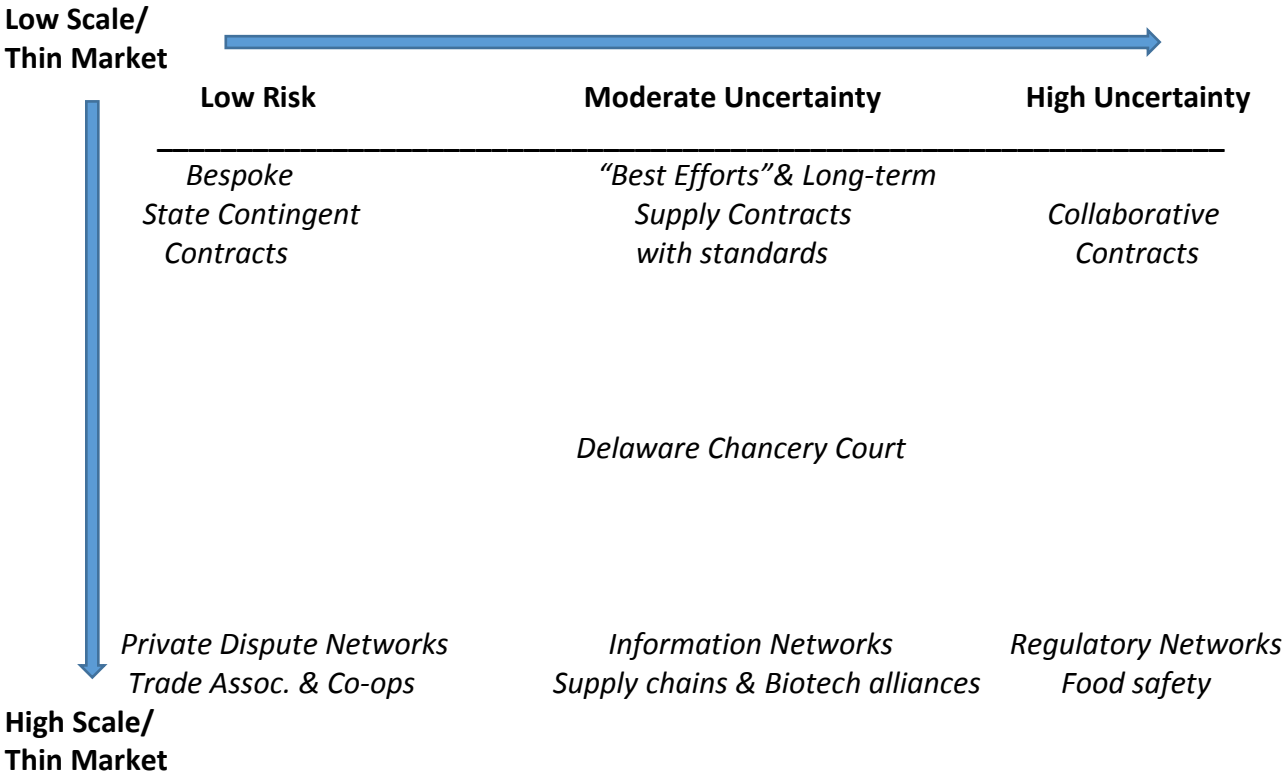

Figure 3 provides a simple schematic of the interaction of risk/uncertainty and scale in defining the design space and the transactional techniques associated with different combinations of those central characteristics. Understanding what defines the different design spaces and shapes the contracting practices in that space should help academics and practitioners match tools to problems and design new tools as changes in the business environment requires adaptive contracting to address the increasing pace of innovation.