

Nasty, Brutish, and
Short: Embeddedness
Failure in the
Pharmaceutical Industry

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Since the early 1990s, U.S. pharmaceutical firms have partially outsourced the coordination of the clinical trials they sponsor to specialized firms called contract research organizations. Although these exchanges appeared ripe for the development of close, “embedded” ties, they were in fact “nasty, brutish, and short”—i.e., marked by ill-will and a bias toward replacing current exchange partners due to perceptions of underperformance. Drawing on in-depth field work, we use causal loop diagrams to capture this puzzle and to help explain it. Our analysis suggests that attempts to build embedded relations will fail if the parties do not recognize the limitations of the commitments they can credibly make. More generally, when managers misdiagnose as failure what is in fact a trade-off inherent in the design of their organizations, they risk engendering even worse outcomes than those they would otherwise attain. ●

CROs [contract research organizations] suck! They always promise more than what they can deliver. Every single one of them. By wide margins. In any function.

—Pharma clinical operations manager

... modern decision theory [presents] a vision that emphasizes calculating the relative importance of different values and making a choice that maximizes expected value. The values foregone are costs that are accepted in the name of the greater benefits achieved. ... [But in fact,] important values foregone are [experienced] not just [as] costs but also deep, enduring sorrows and personal failures.

—Augier and March (2008: 102, 104)

Why might the organizations in an industry converge on a practice that underperforms relative to what seems achievable? Three considerations may eliminate the puzzle posed by such a case of apparent “organizational practice failure.” First, the industry may constitute a relatively weak selection regime, such that organizations suffer little penalty for poor performance, and managers therefore have little motivation to fix failing practices. Second, the industry may be moving toward better practices, but at a relatively slow pace. Insofar as poor practices are weeded out over time, it is difficult to say that the case is one of failure, though we may wonder why improvement is so slow. Third, the very fact that no organizations in an industry employ better practices suggests that further improvement may be impossible and that the diagnosis of organizational practice failure is incorrect. But consider a scenario in which managers themselves regard industrywide practices to be inferior to what can be achieved, and yet they fail to improve despite the passage of time and the investment of considerable resources in solutions that seem to be prescribed by received theory. Such a scenario cannot be explained by any of the three aforementioned considerations. Managers are motivated. They regard better performance as achievable via theoretically informed solutions. But they make little or no progress toward that goal. Why?

One specific instance of organizational practice failure is “embeddedness failure,” when managers believe that interorganizational exchange would benefit from the mutual commitment and goodwill of a close, embedded relationship,

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but efforts to develop such relationships fail and performance suffers as a result. Research that documents such scenarios includes McKenna's (2006) report on the failure of partnerships between sponsors and contractors in large engineering contracts and MacDuffie and Helper's (2007) and Ro, Liker, and Fixson's analyses (2008) of similar breakdowns in the U.S. auto supply chain. These failed relationships are difficult to square both with prior organization theory and with scholarship on interorganizational relations. Each of these lines of work has tended to rely on the three considerations above, such that they have difficulty accounting for chronic cases of maladaptation and underperformance. To be sure, organization theorists differ on the extent to which adaptation occurs via learning or selection (Hannan and Freeman, 1977), is more sensitive to technical than institutional contingencies (Meyer and Rowan, 1977), and is driven more by survival pressures than by profit maximization (e.g., Pfeffer and Salancik, 1978). And some scholars have argued that powerful interests can keep maladapted organizations from suffering the consequences, rendering them "permanent failures" (Meyer and Zucker, 1989). None of the scholarship that traces its roots to contingency theory, however, expects managers to regard an organizational practice as broken yet chronically fail in their concerted efforts to fix it. Furthermore, though Granovetter (1985) cautioned against assuming that relationships are always functional, no theory has been developed to explain why a set of interorganizational relations might get stuck in an underperforming state, even in the face of managers' attempts to develop embedded relations.

This paper exploits such a case to develop inductively a theory that sheds light on organizational practice failure in general and embeddedness failure in particular. We begin by providing background on the case and describing our research methods and then documenting the puzzling empirical pattern we seek to understand. During the 1990s and early 2000s, pharmaceutical companies ("pharma") regarded their relationships with contract research organizations (CROs)—to whom they outsourced an increasing proportion of their clinical trials—as chronically underperforming and punctuated by interactions that were acrimonious, conflictual, and rarely repeated. This state of affairs, which is reflected in the quotation from the clinical operations manager in the epigraph, occurred despite—or possibly, because of—pharma firms' attempts to build embedded relations with the CROs (Granovetter, 1985), as deemed appropriate by theory that predicts embedded relations when exchanges are marked by significant vulnerability to defection (e.g., Baker, 1984; Kollock, 1994; DiMaggio and Louch, 1998) and the opportunity to create value from specific investments and coordination (e.g., Powell, 1990; Uzzi, 1997).

The remainder of the article is devoted to resolving this puzzle and deriving general lessons from it. Ironically and poignantly, the same factor that marks this setting as a case of failure—i.e., managers' diagnosis of the CROs as underperforming—was itself responsible for the failure to improve performance. While managers believed that better

performance was achievable via embedded relations, the very logic of the pharma organizational design implied that they could not make the level of commitment to CROs necessary to support embedded relations. And this failure to lower their expectations made matters even worse. In short, the attempt to build embeddedness where it could not be built led to its opposite—"nasty, brutish, and short" relationships. The specific implication of our analysis for theories of interorganizational relations is that an actor may fail to build the desired relationship if (because of its organization design) it does not recognize the limitations of what it can credibly commit to its partners.

The general implication of our analysis, as suggested by Augier and March (2008), is that pathological practices may result from a failure to accept the trade-offs inherent in an organizational design. The model that emerges from our analysis resembles models of self-confirming "capability traps" suffered by organizations when they fail to stay the course during the initial degradation in performance associated with a process redesign (Repenning and Sterman, 2002). But our case is not a failure to anticipate "worse before better" but of failing to expect "worse as a general rule." Insofar as organizational design involves trade-offs, it will often be the case that certain organizational practices that are "first-best"—the best that is achievable in general—will not be achievable in a given organization or even an entire industry. Human nature and organizational practice often conspire to prevent managers from accepting the trade-offs associated with a particular organizational design, however, leading them to take corrective actions that produce an even worse outcome than settling for a second-best, yet achievable outcome.

METHODS

To introduce a new drug into the U.S. market, the Food and Drug Administration (FDA) requires that a pharmaceutical company provide substantial evidence of a drug's effectiveness through adequate and well-controlled clinical investigations. Although the details of these requirements have evolved over the years, proof of effectiveness must be demonstrated via randomized control trials. Running these trials effectively and documenting them to the satisfaction of the FDA is a complex and costly enterprise (Spilker, 1991; Mathieu, 1997).

Until the mid-1980s, pharma firms relied on an in-house labor force of clinical monitors to recruit, coordinate, and supervise the large number of investigators needed to conduct experimental human studies. Proper monitoring of clinical investigations is an integral part of a set of rules known as "Good Clinical Practices" that are mandated and enforced by regulatory authorities. From the mid-1980s through the early 2000s, a growing proportion of these activities was outsourced to a new breed of specialized subcontractors called contract research organizations (CROs). Over time, CROs have extended the range of services they provide to include protocol design, biostatistical analysis, and report writing. At the time of the study, the contract research industry was growing at the brisk pace of 20 percent per year, with

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independent CROs capturing up to one-fifth of overall pharmaceutical development budgets, \$7B out of \$35 billion in 2001 (Mathieu, 2003).

In 2000, we conducted field work at six pharmaceutical and biotechnology firms in the United States, focusing on a single activity performed in the course of drug development: the coordination of clinical trials. Data collection followed grounded-theory-building techniques (Glaser and Strauss, 1967). The field study was complemented by telephone interviews with personnel of seven suppliers so as to avoid providing a one-sided account. We believe that we achieved theoretical saturation (Eisenhardt, 1989), as we have confirming evidence from two additional firms that we chose not to include in the paper because they yielded no additional insight with respect to the theory we develop here. As is often the case in field research, we were constrained by the need to gain access, a time-consuming process requiring the negotiation of confidentiality agreements with each research site. Nonetheless, as is displayed in table 1, the set of firms studied is quite diverse in terms of firm size and age, geographic dispersion, and breadth of product portfolio.

While in the field, we interviewed staff at various levels of responsibilities and interaction with CROs. We interviewed the vice president for clinical research at all but one firm, as well as all the employees in charge of negotiating outsourcing contracts, and we talked at length with project managers, clinical data managers, and clinical monitors involved in projects contracted out to CROs. In the course of telephone interviews with suppliers, the point of contact was the business development manager, but for the three largest suppliers, we also interviewed a project manager, the human resource manager, and one or two rank-and-file employees. Throughout the paper, we use the terms clinical study, clinical trial, and project synonymously.

We made initial contact with procurement officers using a variety of channels: an industry conference, an independent consultant, and two colleagues' industry contacts. In-depth interviews were open-ended, lasting from a half-hour to three hours. In five of the six firms, we spent three days on site interviewing personnel, and in one firm, we were privy to a project-team meeting. These trips enabled us to gather

Table 1

Characteristics of the Pharma Firms in the Sample

Firm size*	Number of drugs on the market (2000)	Location	Year outsourcing began	Number of CROs (2000)	Number of interviews	Number of interview hours
Large	6	Midwest	1993	13	14	16
Large	16	East Coast	1994	29	7	6.5
Large	3	Southern California	1985	10	25	34
Medium	8	Northern California	1990	20	6	10
Medium	6	Northern California	1992	12	10	11
Small	0	Pacific Northwest	1995	4	20	18

* Firm size in sales: small \$0–100 million; medium \$100–3,000 million; large \$3–50 billion.

firsthand field data on human-resource practices and the nature of buyer-supplier relationships. After asking permission from subjects, we recorded each interview using a pocket-size tape recorder. The recordings were transcribed within a few days after each site visit so as to maximize accuracy. We recorded field observations and anecdotes separately in a notebook.

The study proceeded in five stages. Stage one involved open-ended, semi-structured interviews. We conducted interviews carefully so that we could examine natural alternative interpretations of the facts, for example, investigating the existence of social ties between buyers' and suppliers' employees. We used nondirective items to probe sensitive issues, for example, "Do you have further examples of this?" or "Can you give me a more detailed description of what happened?" When respondents expressed strong negative feelings about their suppliers (a fairly common occurrence), we usually pressed them by asking why they thought these suppliers were used at all. The interview items are available in an on-line appendix.¹

In the second stage, we began to organize the data according to a crude and preliminary working framework. A cross-site display, shown in table 2, indicates the frequency and weighting of data across cases (Miles and Huberman, 1994). Armed with this understanding of the buyers' perspective, we then proceeded to interview suppliers in stage three. Because one of our objectives was to compare and contrast buyers' and suppliers' perceptions of the nature of their relationships, we were careful not to lead the interview with the insights we had gained in stage two.

In the fourth stage, we generated a dynamic explanation of the acrimonious and short-lived relationships between CROs and pharmaceutical firms, using the causal loop diagramming method commonly used in system dynamics (e.g., Sterman, 2000). Causal loop diagrams have a rich history in organization studies (e.g., Weick, 1979; Masuch, 1985; Sastry, 1997) and provide a convenient and precise technology for distinguishing between the influences of endogenous and exogenous variables, on the one hand, and self-reinforcing feedback

¹ Available at http://pazoulay.scripts.mit.edu/docs/nbs_appendix.pdf.

Table 2

Summary of Cross-Site Ethnographic Evidence

	N*
CRO employees are "data mules" [poorly trained and overworked]	10
There are benefits to "partnerships"	8
Outsourcing is purely tactical (i.e., we only have arm's-length ties)	22
There are learning curves (i.e., specific human capital is important)	5
Outsourcing is an insurance policy for our own employees	11
We need to constantly monitor the suppliers and their employees	13
We may lose the soft data	15
We outsource selectively	11
CRO teams have a lot of turnover	13
You are as good as your last project (i.e., no generalized reputations)	6
We got burned with "Preferred Provider Agreements"	8
If resources were not an issue, we would not outsource	4

* Frequency of responses by interviewees aggregated across person-cases.

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loops and unidirectional relationships, on the other hand. We began with the initial categories that emerged from the data in stages two and three and further used our field notes to suggest causal linkages between these categories. These in turn forced us to reassess the extent to which our informants' explanations lay outside our provisional theoretical framework. The resulting causal loop model is both tightly grounded in our data and provides a logical and internally consistent explanation for how the micro-level interactions involved in decision making combined to create the macro-level dynamics we observed.

The fifth and final stage focused on gaining construct and external validity, in two ways. First, at the leading industry conference, we conferred with five managers whose companies did not participate in the study. These managers told us that we had presented in a more systematic form inchoate ideas they held about the structure of supply relationships in their industry. We take this as evidence that what follows is not a mere artifact of the selection of firms. Second, we triangulated the qualitative evidence on the nature of exchange relationships with CROs using data from FastTrack, Inc., a company that gathers information from pharma firms to help them benchmark the costs of their development activities. For brevity's sake, this evidence is available in the on-line appendix.

THE PUZZLE OF EMBEDDEDNESS FAILURE

We found that pharma-CRO relations were chronically underperforming, adversarial, and short-lived and that this state of affairs obtained despite efforts to follow the apparent prescriptions of received theory by building embedded partnerships. The following quote from a pharma financial officer, who had overall responsibilities for contract negotiation, provides a useful introduction into the nasty, brutish, and short relations we observed between pharma and CROs:

Our purchasing department uses a matrix where relationships can be described anywhere from a continuum that goes from "used-car salesman" to "We're married" kind of thing. For the used-car salesmen, we try to squeeze whatever we can out of the price, and we don't care if they go out of business, we do not care if they lose money, we are just trying to get the best deal we can, and of course the other side of that is "we are going to grow together, we are going to give you business, you are going to give us better quality, faster, whatever." And we are more on the used-car salesman end of the spectrum. I think that's the case for most sponsors. I think that Merck and Pfizer are even tougher with the CROs than we are. Gosh! We're pretty tough on those guys, you know.

At first glance, this manager seems merely to characterize the conventional continuum of interorganizational relations in recent scholarship, whereby relations range from embedded ties, characterized by high degrees of mutual commitment and goodwill, to arm's-length ties characteristic of the neo-classical spot market (see e.g., Uzzi, 1997). And this manager seems to report that the pharma-CRO relations were conducted at arm's-length. Accordingly, competitive bidding was standard practice, with buyers usually organizing a "dog and pony show" whereby three or four CROs competed for a

single project. All of the firms we visited dealt with a large number of CROs (29 in one case) and acknowledged that they were constantly changing suppliers, even for projects pertaining to the same molecule. Even in this small sample of firms, however, much of the variation in the number of suppliers could not be explained by client size. Firm 4, for instance, though one-tenth the size of Firm 2 in terms of sales, still used 20 suppliers, only 30 percent less than Firm 2. The proportion of studies outsourced was broadly comparable across these two firms. The same patterns can be observed in the larger sample of FastTrack firms used to triangulate our findings.

But although the lack of mutual commitment between pharma and CROs was consistent with arm's-length exchange, two key features make this a puzzling case of embeddedness failure. First, the incessant churning of supplier ties did not reflect a lack of commitment but a situation of negative commitment, or a bias toward replacing the current exchange partner. This bias in turn reflected the feelings of ill-will and mistrust (as opposed to either the indifference that characterizes arm's-length exchange or the goodwill and trust that characterizes embedded relations), which derived from pharma firms' assessment of the CROs as chronically underperforming. This assessment of underperformance, however, is characteristic neither of embedded nor arm's-length exchange, which are generally depicted as being adapted to the conditions in which they arise. Second, pharma managers did not believe it possible to conduct CRO contracts at arm's-length. Rather, they recognized in these exchanges the two key features that theory suggests are associated with embedded relations—a vulnerability to defection and an opportunity for creating value through specific investments—and therefore tried but failed to build moderately embedded relations with the CROs even as they succeeded at fostering “internal embeddedness” within the pharma organization.

Ill-will and Mistrust Due to Perceived Underperformance

The atmosphere of mistrust and ill-will found its clearest expression in the oversight practices of pharmaceutical sponsors. On this point, a clinical project manager claimed: “. . . you don't just outsource, you devote 25% of the headcount to overseeing the outsourcing.” The vice president (VP) for clinical research at another company agreed: “You still need internal FTEs [full-time equivalents] to ‘mind’ the CRO because they tend to go off track.” Our informants appeared resigned to the conflictual nature of their relationships with CROs, and their firms had developed routines to deal with the gravest dysfunctions. A particularly vivid example was recounted by a contract officer:

Here is a nightmare story. We just canceled a contract. It was a CRO that we had used in the PPA [preferred provider agreement]. Our project team was a bit wet behind the ears, and they were intimidated with the CRO. So whatever the CRO wanted to do they allowed. The CRO would even charge them for the coffee that they were serving them when they organized meetings. It is how petty it got.

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They promised us that they were going to have 5 monitors working on your project, when in reality there was only one doing it all. We did not monitor them enough. They were taking pages, Xeroxing them and taking them to their hotel room. That is forbidden. We tried to train them, gave them some time. But at some point, we had to say that enough was enough. They were charging us phenomenal amounts of money for things they never did, and then arguing about it. The project was going slow, so they pull some people out of our study. . . . By the time we [the procurement group] got involved, the project had been going on for a year and a half. We had to stop the financial insanity.

The need for ongoing monitoring of CRO teams was expressed by the vast majority of our respondents. In most cases, pharma clients had adopted the practice of co-monitoring, whereby a pharma and a CRO employee would each check the accuracy of the same clinical data. The practice of “monitoring the monitors” explains why cost-benchmarking studies performed by two of the firms in our sample revealed outsourcing to be more expensive, on a per-project basis, than internal monitoring.²

Had CRO teams performed in line with their pharma clients’ expectations, there would be no basis for ill-will toward them, nor would there be such a strong bias toward switching suppliers, especially if the current CRO had developed some amount of client-specific expertise. As one of the procurement officers we interviewed remarked, “If you work with a CRO, and they do a nice job for you, and they hit the milestones you wanted, why on earth would you look somewhere else?” Yet as colorfully punctuated in the first epigraph to this article, pharma firms tended to view each engagement as a failure attributable to their suppliers’ lack of diligence. In the words of a clinical program manager, “It depends on how badly they screwed up on the last project versus the costs involved in bringing a new CRO on board.” As another clinical program manager decried, “We keep burning our bridges, going through learning curves because we are never satisfied.”

At the same time, these pharma managers’ assessments were not based on an unachievable standard. Rather, the clinical trials monitored and coordinated by in-house employees provided a salient benchmark against which outsourced projects were evaluated, and pharma managers almost universally perceived internal teams as outperforming CRO teams. From questioning our informants in pharma firms, it also became clear that the perception of underperformance reflected the contrasting human resource practices of pharmaceutical firms and CROs. Four elements of internal organization are particularly notable: job design, communication channels, performance measures, and employee turnover, as summarized in table 3.

First, internal and external clinical trial services allocated personnel and responsibilities in strikingly different ways. One project manager at a CRO confided that “in order to get the optimal utilization, the pool of monitors needs to be common across therapeutic areas. Otherwise there are silos of staff, and people are being underutilized.” CROs maximized

2

Because assigning the costs of internal resources to individual projects is arduous, we must take these claims with a grain of salt. They are nonetheless informative, as they would seem to rule out sheer cost reduction as a primary rationale for outsourcing. Though relevant in many vertical supply settings, cost considerations played a role at the firm level, rather than the project level, prompting the use of CROs for clinical development.

Table 3

Organizational Design of Pharmaceutical Firms vs. CROs

Internal monitors	CRO employees
More knowledge-intensive projects	More data-intensive projects
Low turnover	High turnover
Therapeutic expertise	General expertise
Single-project job design	Multi-project job design
High-involvement work practices	Hierarchical communication flows
Implicit incentives	Explicit incentives

short-run profits by keeping their employees fully billable, which often meant assigning them to multiple projects at a time and shifting them laterally across projects as needed. By contrast, in-house monitors at pharma firms were generally assigned to a single project at a time and specialized therapeutically—except in the early stages of development, as it was felt that safety trials required expertise that cut across therapeutic areas. Furthermore, the assignment decisions of in-house monitors took idiosyncratic expertise into account. Thus if a monitor had worked on previous studies for a drug, he or she was very likely to be assigned to the follow-on study as well. Finally, the organization of the in-house staff was designed to facilitate knowledge sharing. The training manager at a large biotechnology company probably best described the environment typical of in-house clinical monitoring units, one that echoes accounts of the posthierarchical (Zuboff, 1988) or “functionally flexible” (Kalleberg, 2001) workplace:

A team is worth many times more than any function. As long as that team is vibrant, alive, and functioning, everything is fine. If that team goes away, then team members feel very lost. . . . The role of the leader is to harmonize the inputs of different people. A lot of decisions are reached by consensus, e-mail, or corridors. The decision making is not as crisp or formalized in ways that you may find at other companies. That often means that taking decisions is a long process. But our approach is that decisions should be taken at the lowest competent level.

This difference in organization led to a sharp contrast in what practitioners called the “sense of project ownership.” For example, an in-house clinical monitor in the early-stage unit found emotionally painful the need to “disinvest” molecules that had progressed past the initial safety hurdle for which she was responsible:

I am always wondering what has happened to compounds I have worked on and have gone over to later development. It becomes part of you. . . . It is a little bit unfortunate that you have to hand it over. Some of the people in our group are actually transferring to the therapeutic areas to follow the compound. . . .

By contrast, a pharma project manager described the state of mind of CRO teams as follows: “. . . once the trial is under way, your crisis is not theirs. You are probably more attached to that product than they are.” And a clinical research associate at another pharma firm put it more bluntly: “CROs just don’t care as much. They go home at five o’clock.”

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A second key point of contrast pertained to information flow. Inside CROs, such flows relied heavily on formal reporting mechanisms. By contrast, information flowed more freely, and often laterally, in pharma firms. As a result, fine-grained local information, even if acquired by CROs' staff, was less likely to find its way to the pharma employees who could use it most effectively. In the words of a project manager:

The bigger the CRO, the more information gets filtered before it reaches the sponsor. . . . The CRO is a business. They don't have the time to develop a rapport with the staff, the study coordinator or the investigator, to elicit some of this [soft] information. They are there, they are looking at the source documents, they are checking the case report forms, the regulatory binders, but that's all they do . . . depending on how you set up the project, they may call their supervisor who calls their supervisor, who eventually calls the project manager. By then, the information is likely to be lost because they do not have a sense of ownership for the project.

The third point of contrast concerns the distortionary performance measures used by the CROs. CROs earned a reputation as data-production "sweatshops" by using narrow metrics of job performance to reward (and punish) individual employees. Project-level measures of performance had two distinct effects on the productivity of CRO teams. First, they skewed clinical monitors' attention and effort away from knowledge production toward data-processing tasks. A procurement officer described the unbalanced incentives of CRO employees in these terms:

There is a line-by-line definition of the CRO's responsibilities. That means that the CRO is less likely to notice stuff that might be going on at the sites. There are no incentives for the individuals at CROs for capturing "soft data," unlike here, where you get rewarded at every level. At a CRO, you might work for two or three (pharma) sponsors at the same time. So it's all about hard deliverables. Anything beyond the contract you do not get.

A second and related source of misaligned incentives stemmed from the fact that what could be measured easily within the CRO was often several steps removed from what pharma sponsors ultimately valued. In particular, CROs put great emphasis on speed of execution for every task, partly because they were paid according to a task-specific schedule (i.e., a clinical site monitoring visit, number of case report forms audited, etc.), and partly because suppliers often suffered financial penalties when they did not complete projects on time. But this emphasis could have unintended consequences. A pharma project manager provided the following example pertaining to the investigator selection process:

. . . [Inside the CRO] it does not pay to be honest. The people doing the recruiting for CROs do not have a clue. They do not understand medicine, so if a private doc tells them they are going to recruit 24 patients, they will believe him, even though this is clearly ridiculous. For the CROs, this is simply a numbers game. . . . It is all about meeting deadlines, even though the sponsor may end up with the worst set of investigators.

This last quote highlights the overall goal conflict between the CROs and pharma. Inside pharma firms, managers strive to produce all the information required to reach the correct “go/no-go” decision for a particular drug, subject to a budget constraint that includes “time costs” (i.e., foregone sales opportunities because the drug, whose patent clock is ticking, lingers in development). Due to the severe penalties for late performance contained in many outsourcing contracts, CRO managers focus instead on time-to-project completion (subject to the constraint that data quality had to exceed some minimum standard). This lack of congruence between managers’ objectives on either side of firms’ boundaries reinforced work behaviors among CRO employees that reduced the overall attractiveness of relational governance while increasing opportunities for conflict between exchange partners. Most saliently, employees engaged in “chunking,” whereby each task was partitioned in ways that improved measurable performance within tasks at the expense of a smooth transition between tasks. In the words of a frustrated clinical operations manager at a major biotech firm:

Think of the various steps that are needed from protocol development, site initiation, enrollment, data collection, database lock, analysis, and final study report. The way CROs do this is: you finish one, then you start the next one, then you start the next one, etc. This mentality, while it is great to make sure that you are charging people the right amount of money. . . . it’s a killer in drug development.

A final set of complaints can be summarized by the characterization of the CRO employees as “data mules” and of their employers as “high attrition workmills.” The latter complaint pertained to the limited training that CRO employees had received. The former term, which was frequently used by the many in-house clinical monitors who had previously worked for a CRO, reflected the fact that the CRO monitors receive very little training, as well as the fact that they were strenuously overworked (including travel four or five days a week). This approach naturally led to burnout and turnover. One asserted, “When I was working for a CRO, I was there strictly to pay my dues so that I could be hired by a pharmaceutical company.” A business development director at a mid-size CRO concurred, conceding that

Being a clinical monitor is not a lifetime career, it is a stepping stone to other jobs in the pharmaceutical industry. In a pharma firm, employees get attached to a specific product, or at least a specific therapeutic area; they develop a sense of ownership because it is possible to see the development of a product from start to finish. If you work for a CRO, you see a little piece of everybody’s pie, it is much less exciting.

Complaints about monitor turnover invariably came up as an issue in interviews. As one clinical operations manager said, “So I think the CROs are pathetic. They concentrate too much on this charge charge charge charge. They are not concentrating on building an infrastructure of quality people. This turnover thing is going to kill them.” By contrast, whereas CROs’ organizations were aptly described by the often-uttered complaint that they were little more than data-production sweatshops, pharma’s internal monitoring function reflected the adoption of high-performance work

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practices designed to elicit greater employee involvement and commitment in the workplace (Osterman, 1994; Pil and MacDuffie, 1996). The following anecdote, culled from the first author's field notes, captures the sense of loyalty and commitment typical at pharma:

On my way to lunch during a site visit at a large pharmaceutical firm, I stumbled across a large crowd assembled in the atrium for a ceremony recognizing employees of the "Class of 1980." I asked my host what the number 1980 referred to, and he replied in all seriousness that those employees had first joined the firm 20 years earlier. I found revealing the fact that a large corporation would cultivate such an institution; even more telling was that a large fraction of the employees who had joined the firm that year were still employed there 20 years later.

Embedded Relations with Employees, Embeddedness Failure with CROs

The acrimonious relations between pharma and CROs fall nowhere on the established continuum between arm's-length and embedded relations. But the characteristics associated with embedded relations—mutual commitment and goodwill with the expectation of enhanced transfer of fine-grained information and joint problem solving (Uzzi, 1997)—do correspond to the pattern of experience in the internal clinical monitoring function of the pharma organization described above. Moreover, the adversarial nature of pharma-CRO relations obtained despite pharma managers' concerted attempts during the 1990s to develop "preferred provider agreements" (PPAs), i.e., long-term contracts negotiated with particular CROs to whom pharmaceutical firms would outsource a large number of projects, thus ending the regime of one-shot exchanges that prevailed in the industry. Although parties to PPAs felt the need to couch their shared understandings in a formal contract, their dispositions appeared to have been consistent with embedded relations, or at least a moderate version of them, as in MacDuffie and Helper's (2007) account of the Japanese auto supply chain. As the chief executive officer of a small CRO put it, the idea behind PPAs was to select CROs "based first on cultural compatibility, second on therapeutic capabilities, and only third on price." Yet though PPAs were attempted throughout the industry, they were abandoned after a few years. This failure is particularly puzzling both because received theory would seem to indicate that this is a context in which developing embedded relations was appropriate, and embedded relations were already established within the pharma firms. It is thus particularly surprising that at least moderately embedded relations could not be achieved with the CROs rather than the adversarial relations we observed.

Perhaps the absence of embedded ties should not surprise us. Azoulay (2004) distinguished between data-intensive and knowledge-intensive projects and provided evidence that pharma firms display a greater propensity to outsource data-intensive projects to CROs, which might make them inappropriate for anything but arm's-length ties. We did not observe arm's-length exchange, however, but, rather underperforming, adversarial relations. We found that despite

pharma's attempt at sorting projects such that data-intensive projects would be assigned to CRO teams and knowledge-intensive projects would be run internally, such attempts often failed due to two practical difficulties. First, projects often revealed their true nature only once they were already under way, for instance, when unexpected toxicities surfaced. Second, the lumpiness in workload inevitably resulted in misallocation, as firm-level human resource constraints sometimes took precedence over idiosyncratic project considerations. A procurement specialist lamented:

In the past, we just tried to fill the resource gaps. There was no portfolio approach [i.e., an attempt to consider the decision to outsource a particular project in the wider context of the firm's entire set of clinical studies currently under way or expected to start in the near future]. I asked in a training session, "How many people in this room would outsource this study? It's a safety study, 3 years, 100 centers, not a critical path study." Everybody raised their hands. Then I asked, "How many people in this room would outsource this study? It is a study of 25 patients, 3 centers, on the critical path (you have to have the answer before you go on to the next phase), dose determination, multiple cohorts of doses." Nobody wanted to outsource that. But we had done exactly the reverse. This is not proper resource planning! This is just such a striking example. Somebody who is just processing data will miss out what we are trying to learn early on. In Phase III [the final phase], it's great, since you are more in an operational mode.

Had outsourced projects consisted only of highly data-intensive projects, pharma would not have attempted to build embedded relations via preferred provider agreements, and we would not have found ample evidence that the outsourced projects displayed high levels of the factors suggested by prior theory for when embeddedness should be expected. In particular, while few theorists have developed detailed prescriptions for when embeddedness should be pursued, there is nonetheless significant agreement regarding two key factors. First, embeddedness is expected when there is more value in specificity—i.e., when more value can be created in the exchange if each party adapts its assets to or coordinates its activities with the other (e.g., Powell, 1990; Uzzi, 1997). Second, when a transaction is marked by vulnerability to defection—i.e., when at least one of the exchange parties faces a significant risk that the other will exploit it, it is more likely that the transaction will become embedded (e.g., Baker, 1984; Kollock 1994; DiMaggio and Louch, 1998). And outsourced projects displayed significant levels of each of these features.

With respect to the first factor, human capital in clinical development featured both firm- and drug-specific characteristics. Cooperation among team members was deeply grounded in the particular routines used by the firm to integrate knowledge into collective action. Most pharma firms developed and refined processes that ensured compliance with regulatory guidelines, but this client-specific body of knowledge was seldom codified. Instead, it diffused among clinical monitors as stories and anecdotes. As a result, clients incurred non-trivial switching costs when selecting new suppliers. As a clinical operations manager in one of the larger firms explained,

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If I go and work with a new CRO, I need them to understand the way I work and what I expect; moreover, I need to understand how they work. It's never easy. The first 6–8 months working with a new CRO are awful, because you are constantly stepping on each other's toes and miscommunicating.

Performance was also heavily influenced by employees' ability to learn from the previous studies and apply this knowledge creatively during subsequent studies. Very often, this knowledge was contextual and hence not easily codified or rationalized: "There are all the things that you have done but not fully documented, and you just wish you could pull a cassette out of the head of [our] project manager and implant it in the head of [the CRO's] project manager."

In addition, various features of the drug development process increased pharma firms' awareness of opportunities for enhancing value through coordinated adaptation and joint problem solving (Uzzi, 1997). Because the patent clock on experimental compounds starts ticking shortly before they enter the clinical phase, the challenge faced by pharmaceutical companies is to collect the information necessary to take the crucial go/no-go decisions about project cancellation in the shortest amount of time. This requires close coordination of scientific and operational decision making, which is generally best achieved by putting "heavyweight" product development teams in charge of specific projects (Clark and Wheelwright, 1992; Itoh, 1994). The team structure is designed to encourage ongoing cooperation and information pooling among team members, who represent different functional areas. Therefore one would expect teams to span organizational boundaries, and our informants shared this expectation. One clinical team manager claimed that he would "work best with CROs that felt like they were part of the team, that brought up issues, that came up with suggestions." Another added, "If I have an enrollment problem, the CRO should be the first to bring it to my attention. . . . I would expect a CRO to have expertise and creativity, to be proactive, and to take ownership of most organizational issues."

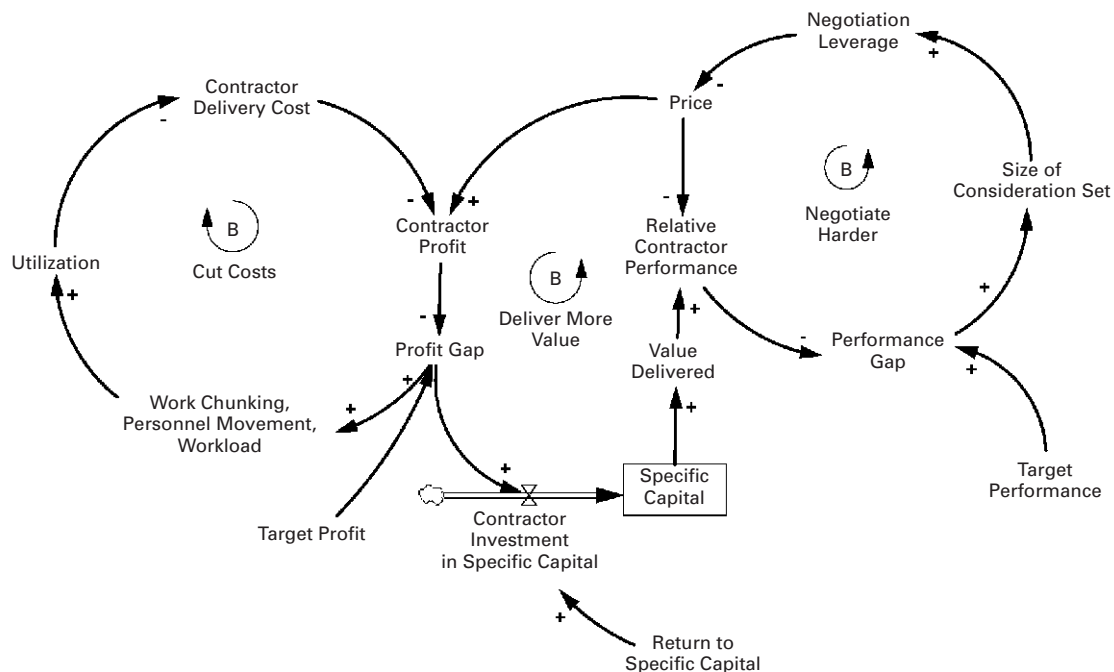
The high value in specificity in turn raised the salience of the second factor expected to give rise to embeddedness, vulnerability to defection. A major bone of contention was the assignment of employees to projects. Outsourcing clinical trial services involves relinquishing a key decision right to CROs: the ability to match particular employees to specific projects. The identity, skill-level, and job design of CRO employees could not be easily contracted upon. In the words of a procurement officer, "CROs keep giving us bad people to choose from, and there is nothing I can do about it." Others highlighted instances in which a CRO had promised a team of seasoned veterans, but "rookies" had been substituted for the "A-team" at the last minute. This "bait and switch" tactic appeared to be common. Formal contracts did not resolve the issue because buyers (or a court of law) could not distinguish voluntary turnover from opportunistic reassignment to another client.

A Causal Loop Representation of Embeddedness Failure

We are thus left with the puzzle of why CRO-pharma relations were so acrimonious and perceived as underperforming and why this was observed when embedded relations would

seem appropriate. To begin to address this puzzle, we capture the dynamics underlying embeddedness failure in a preliminary causal loop diagram. Figure 1 represents the decision processes that determine the nature of the relationship between the pharma client and a contractor. The term “contractor” refers in the first instance to a CRO, but the model will be broadened so that it encompasses internal monitors as well. The dynamics in the relationship between client and contractor are captured in the form of three balancing feedback loops. Balancing loops are a basic building block of dynamic systems and are used to depict decision processes that seek stability or equilibrium. On the left, we start with the contractor’s effort to organize its operations profitably. The contractor seeks a *Target Profit* from its portfolio of projects, which it compares with its current profitability to determine its current *Profit Gap*. As discussed above, when profitability fell short of the goal, the contractors took a variety of remedial actions, including making the chunks of work more granular and identifiable, moving personnel more rapidly, and simply taking on more work. Each of these actions had the effect of increasing the contractor’s fixed and human capital *Utilization*, thus reducing the contractor’s *Delivery Cost* and contributing to closing the profit gap. Taken together, these links create the balancing *Cut Costs* loop, which represents the contractor’s efforts to organize its work in ways that meet the required profitability targets. A plus or minus at the arrowhead indicates the polarity of the causal relationship. A plus sign denotes that an increase in the independent variable causes the dependent variable to increase, ceteris paribus (and a decrease causes a decrease); that is, $X \rightarrow Y^+ \leftrightarrow \partial Y / \partial X > 0$. Similarly, a minus sign indicates that an increase in the independent variable causes the

Figure 1. Three processes that determine the level of embeddedness.



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dependent variable to decrease; that is, $X \rightarrow Y^- \leftrightarrow \partial Y / \partial X < 0$ (see Sterman, 2000).

Moving to the far right, we capture pharma firms' behavior in a similar fashion. Pharma managers seek a level of *Target Performance* from their relationships with CROs. When the contractor's relative performance falls short, a *Performance Gap* results. As highlighted above, when a contractor fails to meet pharma's targets, the pharma managers respond by searching for another provider, represented above by the variable *Consideration Set*. And as these managers seek more competition in their bidding process, they effectively increase their negotiation leverage and are able to extract price concessions to compensate for the contractor's shortcomings, thereby creating the *Negotiate Harder* balancing loop. The two processes are interconnected, as any attempt by the pharma managers to reduce the price of the work pushes the contractor to reorganize its work in an attempt to maintain profitability.

Finally, the contractor can respond to price pressure differently, choosing to organize itself in a way that delivers more value rather than cutting costs. Our data and the literature on embeddedness suggest that the contractor could respond to a profit gap by investing in relationship-specific capital, the existence of which would allow the contractor to deliver more value to the buyer for a given price. We capture this option in figure 1 by introducing a link from the contractor's profit gap to investments in relationship-specific capital. These investments then accumulate in the stock of *Specific Capital*, which, in turn, allows the contractor to deliver more value to its pharma customer.³ These additions create a third balancing feedback process, the *Deliver More Value* loop, that works to close the contractor's profitability gap.

Thus when facing price pressure from pharma, the contractor faces two basic options, to cut costs or to invest in specific capital. If it chooses the former, it increases its short-term profits but increases the likelihood that the pharma firm will prefer someone else in the future, especially if the pharma firm interprets the CRO's focus on utilization as tantamount to reneging. If it chooses to invest in specific capital, it will lower profits in the short term but close the client's performance gap, thus increasing the likelihood of being retained in the next engagement. We can now rephrase the puzzle as follows: why did CROs overwhelmingly seem to choose the former option, to the point that the performance gap never seemed to close? Why did we not observe instead a version of the virtuous dynamic evident within pharma firms, whereby employees made specific investments and delivered more value to their organizations, reinforcing employers' commitment to them?

UNDERSTANDING EMBEDDEDNESS FAILURE

There are four steps to our explanation. First, we contend that the level of commitment from pharma sponsors to their suppliers was a critical factor that was often missed by pharma managers. The presence of conflicting commitments, detailed below, made highly embedded relationships infeasible. Second, moderately embedded relationships, while

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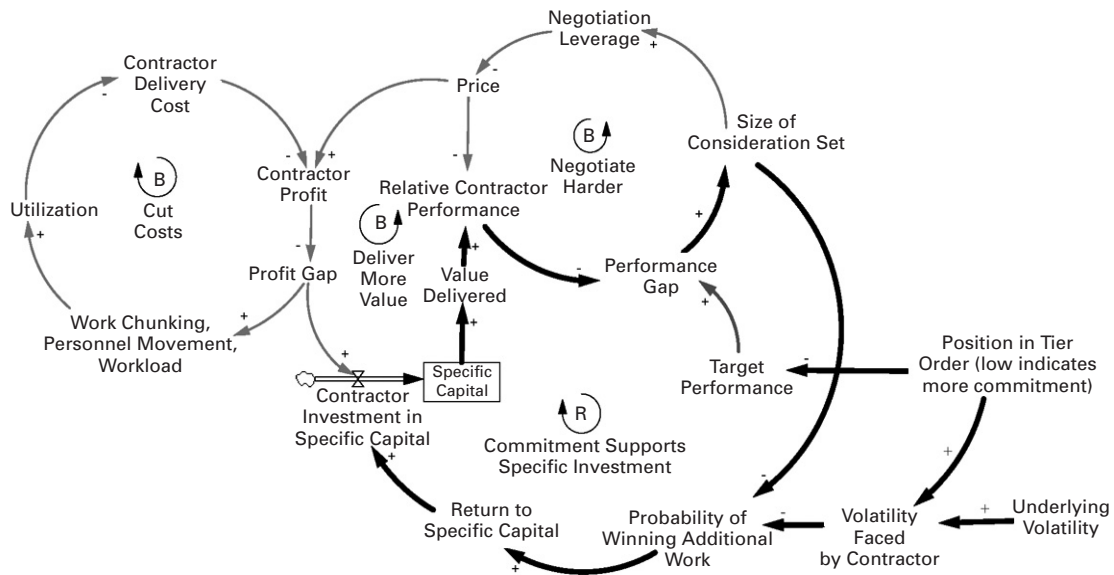
Boxes represent stocks; arrows with valves represent flows. A stock is the accumulation of the difference between its inflows and outflow (see Sterman, 2000).

feasible in principle, tended to be very fragile due to the sharp substitutability between activities that support the development of relationship-specific capital and activities that support asset utilization. Third, embeddedness requires reasonable performance expectations. If the client clings to unreasonably high expectations (similar to those that would be appropriate for highly embedded relations), then, paradoxically, moderately embedded relationships tend to unravel, leading to acrimonious relationships. Finally, we detail a set of institutional and organizational dynamics that prevented pharmaceutical firms from reducing their expectations of CROs' performance. Most poignant and relevant for general theory was the tendency for the first organizational response to institutionalize the problem rather than to solve it.

Embedding Buffers Is a Contradiction in Terms

Levin's (2002) analysis of multilateral contracting explains why highly embedded partnerships between pharma and CROs were infeasible. The key insight of Levin's model derives from recognizing how different relational contracts interact with one another, such that stronger commitments to one set of contractors may undermine the commitments made to other contractors, particularly under conditions of uncertainty. This insight is particularly relevant in the context of volatile drug development pipelines. Pharma clients were unable to make a credible long-term commitment to their external suppliers because they had already made much deeper commitments to their internal staff in the form of an implicit promise of continued employment. This promise directly undercut the credibility of a promise of repeat business with external suppliers, thereby making highly embedded relations infeasible. Although it is not emphasized in research on interorganizational relations, a critical component in building a partnership is the ability to make a credible, long-term commitment to a partner who is being asked to make a specific investment. Accordingly, figure 2 elaborates on the model in figure 1 by focusing on the tension inherent in seeking to create embedded ties within and between firms simultaneously. In considering the willingness of a contractor (whether internal or external) to specialize its human capital to serve better a particular client, the perceived *Return to Specific Capital* depends on the *Probability of Winning Additional Work* from that particular client. In turn, the probability of repeat business is driven by the client's *Size of Consideration Set*. Unlike the loops discussed previously, these links create a reinforcing feedback that, rather than moving the system toward an intermediate equilibrium, will tend to drive the system toward a more extreme outcome. When operating in the upward direction, this loop creates a virtuous cycle whereby specific investments will be rewarded with repeat work, which in turn supports those investments. But how can the contractor be reasonably certain that the promise of repeat work is credible? This question is particularly salient in a context such as drug development, where the demand for clinical trials is highly variable, which we reflect in the negative link between the *Underlying Volatility of the Environment* (i.e., whether the client can be expected to have the same demand from period to period) and a contractor's *Probability of Winning Additional Work*.

Figure 2. Performance implications of supplier tiering as in Levin (2002).



Levin (2002) addressed this question by relying on the standard game-theoretic intuition that the credible threat of future retaliation (or "shadow of the future") can overcome opportunistic behavior and support cooperation, thereby solving the tension between private incentives and the common good (Axelrod, 1984; Bull, 1987; Dal Bo, 2005). Levin (2002) extended this logic by focusing on an aspect of supply relationships that is both highly relevant to our setting and neglected in the organizational literature: whether commitments to suppliers are bilateral or multilateral. With multilateral commitment, the promise of repeat business is made to all suppliers as a class; reneging on one is tantamount to reneging on all of them. When volatility is low, a multilateral contract is a more powerful commitment device than a series of bilateral contracts because it raises the severity of the punishment that can be meted out to a client that would renege on its promise. Conversely, as volatility increases (i.e., there are often sharp, unexpected drops in demand for contractors' services, as is common in the pharmaceutical industry when results from clinical testing cause a drug to be pulled from development), expanding the class of agents to which the commitment is made can undermine its credibility. Motivated by examples from both the employment (Greenhouse, 1998; Grimsley, 2000) and supply-chain (Ansanuma and Kikutani, 1992; Bensaou, 1999) settings, Levin observed that multilateral commitment is still feasible in situations of high underlying volatility, provided that the client creates tiers of suppliers. Core (lower-tier) suppliers are provided with strong assurances of repeat business, thereby dampening the effect of underlying volatility for these suppliers. In turn, peripheral (upper-tier) suppliers are provided with much weaker assurances, thereby helping to "buffer" the core against demand shocks. Of course, this means that upper-tier suppliers will make lower levels of client-specific investments, since all concerned know that they bear the brunt of adjustment to shocks to the development pipeline, and their specific investments are thus less likely to pay off.

Our field evidence suggests that Levin's model captures well the reason why pharma firms turned to CROs—i.e., to bolster the promise of job security made to in-house staff. "If resources were not an issue, we would never out-source" captures the spirit of comments often heard at the highest echelons of pharmaceutical firms' clinical development operations. But resources were an issue. Hiring and firing insiders according to the vagaries of the highly volatile drug development pipeline was not viewed as a viable option, and project leaders faced hard caps on the number of internal clinical monitors their teams could lay claim to. Though the strategy of using CROs to reinforce the pharma firms' commitment to their own employees was not articulated publicly, at least one manager in every firm we visited could grasp its underlying logic. The argument also resonated with in-house monitors who were the beneficiaries of this insurance mechanism. Below are two representative quotes:

... if you hire somebody here, you hire him for 40 years, and you have to give him work for 40 years. Otherwise you may lose the team esprit-de-corps. People here are incredibly committed. You see them doing heroic acts to support the team. Even if we did not think about it that way initially, outsourcing helps maintain continuity for our own people. (Training manager)

I would hate working for a CRO. They really have to be worried and keep everyone on their staff busy. But that's precisely why you hire a CRO—because you do not want to lay off half your staff if an indication is canceled. (Junior clinical monitor)

This last statement clarifies why highly embedded partnerships with CROs proved elusive in clinical development. Outsourcing to CROs could serve its function of enhancing the credibility of commitment to insiders only if CROs were residual claimants for clinical trial services—i.e., CROs rather than internal monitors would suffer the consequences of adverse shocks to the clinical pipeline. As one procurement officer at a large biotech firm put it, "the essence of a CRO contract is that in 30 days, you can be out of here." Another spelled out the logic quite explicitly:

The hire and fire model for CROs really gets in the way of forming stable relationships and growing the pie over time. At the end of the day, we want to be able to fire them when we don't need them. That's the primary thing we want. Although we have a scale-down process as part of our contracts, it is very limited.

Figure 2 reflects our understanding of pharma firms' outsourcing strategy in an arrow drawn between contractors' *Position in Tier Order* and the *Volatility Faced by Contractor*. Core suppliers (the internal teams in our setting) face very low volatility in the demand for their services and therefore accurately assess their probability of winning additional work as high (i.e., downsizing is less likely). By contrast, peripheral suppliers (the CRO teams in our setting) are fully exposed to the capriciousness of the drug development process and cannot count on securing additional work in the future. Given the logic of Levin's model, it is clear why pharma-CRO

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exchanges were not highly embedded despite exhibiting high levels of the factors that make vertical supply relationships ripe for embeddedness: embedded relationships with buffers are a contradiction in terms.

The Fragility of Moderate Embeddedness

Levin's model predicts that relationships with upper-tier contractors should entail lower degrees of specific investment and be less stable than relationships with core suppliers, thereby leading to somewhat lower levels of performance. There is nothing in his model, however, that predicts the acrimonious relationships we documented. In fact, nowhere in the past literature do we find a steady-state situation in which clients are disappointed with and bear ill-will toward the contractors that the clients themselves consigned to a peripheral upper tier. Rather, clients should presumably accept heterogeneous performance across tiers as the necessary correlate of high commitment for core suppliers. And this expectation of a continuum of expectations and performance is also consistent with a growing body of evidence suggesting that embeddedness is not a binary choice: economic exchanges can be moderately, rather than fully embedded. For example, MacDuffie and Helper (2007) used the term "hybrid collaborative" to describe relationships between Japanese automakers and their U.S. suppliers and noted that each relationship is subject to a performance assessment on a regular basis. Moreover, the set of potential suppliers is not closed, as in the traditional Keiretsu model, but rather is open to new suppliers after a vetting period. Similarly, we discovered that pharma firms' relationships with at least one other class of suppliers, central laboratories, could be characterized as moderately embedded. As recounted by the procurement officer of a large biotechnology firm:

Partnerships have worked with Central Labs. We get dedicated program managers that are ahead of the curve. The service level has gone up, costs have gone down, and they are getting more business. . . . When we started that initiative, there were 7 or 8 labs in use. Each team had a preference, and moreover, they were quite likely to terminate the relationship with a lab after one project, switch to another lab, work with them for one or two projects, then terminate that lab because things were not working. From my standpoint, there was an absence of shared understanding and expectations. The teams did not realize what the labs needed to be successful. The hardest part was to build the trust in the initial projects. Once those had been successful, it was like a positive reinforcement loop. We are now doing 80% of our lab business with a single lab.

In another firm, the procurement officer in charge of laboratory services as well as CROs explained his approach in the following terms:

One of the things we did going into it was to tell the lab that we were not going to guarantee a certain amount of business because we couldn't do it, the teams needed to have a certain amount of choice. But what we guaranteed is that we would only work with two labs. Their senior management believed us. That's a limited free market. They would be competing within a smaller pool.

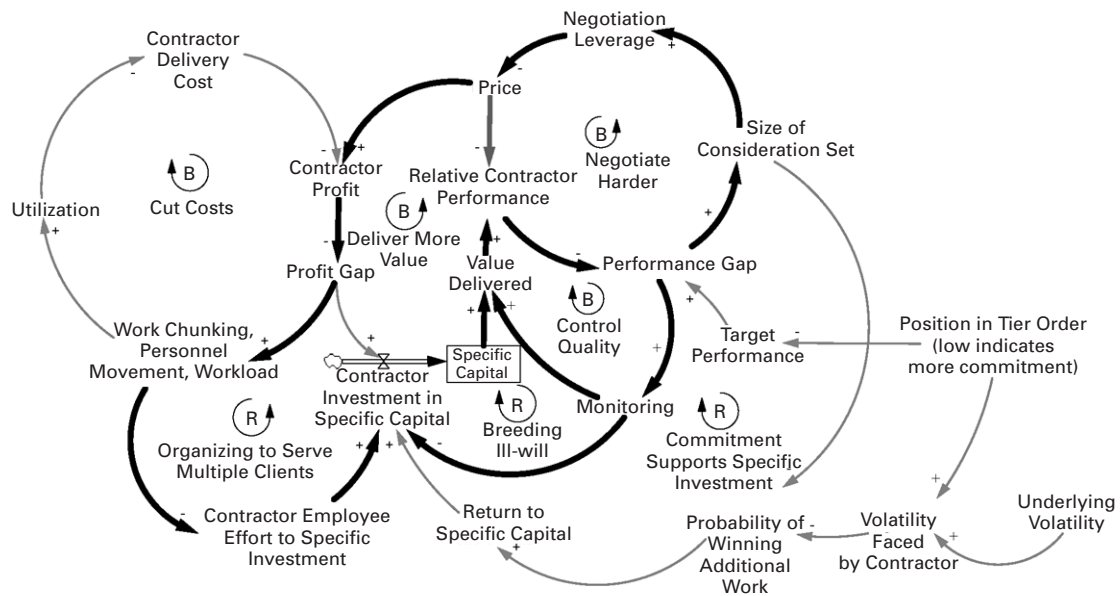
The evidence from the central laboratory setting, as well as the experience of Japanese automakers does not allow us to

infer that intermediate levels of embeddedness presented a feasible governance mechanism for pharma-CRO exchanges, because these activities differ in fundamental technological and organizational respects. Nonetheless, these other contexts help establish the theoretical plausibility of moderate embeddedness as a coherent alternative to nasty, brutish, and seldom-repeated exchanges. One could well have imagined relationships between CROs and pharmaceutical firms based on a somewhat lower level of commitment in return for a moderate degree of specialization. This could have taken the form of a request by pharma firms for CROs to go beyond the letter of the contract and invest in client-specific capital (e.g., codifying procedures so that they can be reused in the future, while not dedicating staff), in exchange for a promise of awarding more contracts in the future. That is, the alternative to highly embedded relations could have been relations of low-to-moderate embeddedness, rather than the antagonistic ties observed in practice. The question then becomes why pharma-CRO relations did not stabilize in a state of moderate embeddedness commensurate with their position in the tier order.

The answer lies in the fragility of moderately embedded ties. This fragility stemmed from the fact that the practices supporting arm's-length exchange were fundamentally incompatible with the investments necessary to support even moderate amounts of embeddedness. This could be understood from either party's perspective. From the CROs' standpoint, pharma clients' inability to make long-term commitments lowered their willingness to cater to client-specific needs. In the words of the sales director of a large CRO: "Contracts have a 60/90 days cancellation clause. So we assume a lot of risk. We are mindful of it, and that has an impact on contract negotiations. Relationships can actually hurt you in this business."

Although demand for clinical trial services from any particular pharma client was highly variable and unpredictable, adverse pipeline shocks were, to a first order of approximation, uncorrelated across clients. As a result, much less variation in demand existed at the industry level, relative to the volatility faced by an individual pharmaceutical firm. Facing these conditions, CROs' only viable strategy was to aggregate the demands of multiple clients to create a diversified and stable portfolio of projects. But insofar as this strategy involved satisfying industry-level rather than client-level demand, it required these suppliers to adopt highly standardized processes. In figure 3, we model the consequences of CROs' attempts to maximize the short-run utilization of their staff. As the contractor seeks to improve profitability via such activities as *Chunking* and *Personnel Movement*, it necessarily reduces its employees' attention to specific clients' needs, thereby depressing the stock of specific human capital. These linkages form the basis of the *Organizing to Serve Multiple Clients* reinforcing loop and ultimately lower the value delivered to clients. We can now cast CROs' highly hierarchical, sweatshop-like internal organization in the proper light, as these Tayloristic human resource practices flow logically from their buffering position.

Figure 3. Processes contributing to the fragility of moderately embedded relationships.



Conversely, from the clients' standpoint, we can now better appreciate the effects of "monitoring the monitors," depicted in the *Controlling Quality* balancing loop in figure 3, on the degree of embeddedness in pharma-CRO exchanges. In our interviews with CROs employees, it became clear that they greatly resented what they called "micro-management" by "control freaks" and the arrogance of buyers who wanted them to adopt their own processes. We illustrate this dynamic with the *Breeding Ill-will* reinforcing loop: monitoring contractors undermines their employees' investment in specific capital, thereby counteracting the direct, beneficial effects of monitoring on value delivered to the client.

Taken together, these additions suggest that pharma-CRO relationships are characterized by the existence of several self-reinforcing processes with the potential to unravel any moderately embedded tie and drive the transaction to the point at which each project is put out for open bid to a large number of providers; recent experience with that pharma firm might even hurt a CRO's chance of winning the bid; CROs organize themselves around highly standardized, granular processes that deliver exactly what is directly billable and no more; and pharma firms invest heavily in monitoring CROs but, in doing so, breed ill-will in the supplier pool. In short, the processes we have identified have the strong potential to create relationships that are antagonistic, and apparently did so in the firms we studied. It was an inherently fragile situation that was complicated by pharma's stubbornly high expectations for performance.

The Tyranny of High Expectations

Though we have so far depicted the three reinforcing loops as guiding the behavior of the system we studied, it is equally plausible that the balancing feedbacks could have quickly moved the system to an intermediate equilibrium instead.

Formally, the behavior of the system turns on the relative dominance of its constituent balancing and reinforcing processes (Sterman, 2000). If the balancing processes are dominant, then we would expect the system to equilibrate at an intermediate level of moderate embeddedness. By contrast, if the three reinforcing processes dominate, then we would expect two outcomes, full embeddedness at one extreme, and nasty, brutish, and short exchanges at the other. While questions of loop dominance often require formal analysis, the field evidence provides a strong basis to infer which processes were more influential and also suggests the reason why.

Among the six pharma firms in the sample, we found only one isolated instance of a relationship with a particular CRO that could be characterized as moderately embedded. A manager in charge of the company's training facilities confided, "CRO X got its first contract with us in 1995. Ever since, they've done 32 projects. They dedicate a team to the compound. The only way that the team gets broken up is if a person leaves the company. That makes us more committed to the relationship."

Even in this seemingly successful case, however, the client firm's procurement officer challenged the assertion that the relationship of his company with CRO X was substantially different from the relationships it entertained with other CROs:

CRO X is not that phenomenal, they are really nothing special. We get along with them, they are a nice CRO, but it's a crapshoot. On the next study they could be terrible. You just don't know, there is no long-term trust in this business. If you hit something that looks like a good match, you are going to continue—until they underperform. Then you reset the counter to 0.

What is striking about this statement is that it betrays no recognition of the fact that he was holding CRO teams to a performance standard that they could not be expected to meet—the one achieved by internal monitoring teams. This is critical. In Levin's model, there is no place for conflict in equilibrium because performance expectations for each supplier incorporate their position in the tier order. Just as it is unreasonable to ask temporary workers to be as loyal to their current employer as is the permanent staff, it should have been perceived as unreasonable to expect the same level of performance from internal and external teams. Yet pharma clients' expectations appeared rigidly set at an unrealistically high level, which we represent in figure 3 by deactivating the link between *Position in the Tier Order* and *Target Performance*, using a lighter shade of gray for the corresponding arrow.

The puzzle of acrimonious relationships therefore hinges on whether clients can appropriately match performance expectations with the tier to which the supplier belongs. Figure 4 introduces these expectations into our model for the first time and explicates their essential role in closing the perceived performance gaps. Even if pharma managers are endowed with less rationality than Levin's idealized principals, we might expect they would quickly adjust their (initially off-the-mark)

expectations as they learned from their experiences with CROs. We depict this process as the *Expectation Adjustment* balancing loop in figure 4, whereby a persistent performance gap leads to *Reduced Expectations for Target Performance* and stabilizes the system.

Procurement specialists. In all the firms in the sample, the first organizational response to contracting difficulties with

CROs was the creation of a procurement group dedicated to clinical outsourcing. In smaller firms, this group was limited to a single individual, whereas in the large ones, this group could comprise up to 10 employees. Whereas the choice of a supplier had previously been left to the project team, bringing these supply decisions under the aegis of a centralized group was intended to rationalize the bidding process. Procurement officers prequalified CROs, standardized contracts across projects with "master agreements," and orchestrated the bidding process. Their involvement stopped when a project began, and there was wide agreement that the creation of these groups had resulted in less wasteful duplication of effort. It did little, however, to reduce the acrimony between sponsors and CROs.

Changing contract terms. In a second phase, pharma firms and procurement officers searched for a contractual solution to fix the most dysfunctional feature of their outsourced relationships: runaway spending caused by change orders. Up until the mid-1990s, outsourcing deals had been structured as "time and materials" (T&M) contracts. Such contracts had the virtue that they did not create incentives for suppliers to skimp on quality, but they also created opportunities for CROs to "lowball" their bids and overcharge clients later for "scope changes." In response, all the firms in our study progressively adopted so-called fixed-unit contracts. The tasks to be performed by the supplier were broken down to a very detailed level (some contracts included more than 200 items), and each unit was then priced independently. According to a contracting officer, the results were dramatic:

When we realized T&M was nuts, [Consulting Firm X] came up with what they call fixed-unit pricing that says: "show me deliverables." What I want to pay for is a monitoring visit, a case report form entered, a statistical analysis. And you assign a price for each of these units. Now the CRO says, "This month I did the following things for you," and now our clinical people can say, "Yeah, they entered a thousand pages, yeah, they cleaned 500 pages." I know what I got for my money. The CROs are completely held accountable. It's a great system for them to bid properly, and now they must run an efficient shop.

This contractual innovation effectively rid buyer-supplier relationships of the problem of insincere bidding strategies and artificial scope changes, but it reinforced the CRO employees' predilection for "chunking" discussed earlier. Because the costs induced by chunking were less transparent and more diffuse than those caused by scope changes, fixed-unit contracts had been broadly adopted in the industry. Yet front-line personnel were under no illusion that tinkering with the structure of formal contractual arrangements brought CROs' performance up to the level of internal monitors.

Preferred provider agreements. The striking element in firms' unsuccessful attempts to embed their relationships with CROs is that clients anchored their performance expectations on the level achieved with internal teams, rather than the lower level that an understanding of Levin's (2002) model would imply. Therefore these attempts and how they were framed betrayed a lack of recognition of the

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interdependencies among the different types of relationships these firms maintained in clinical development. Furthermore, these failed efforts to engineer embeddedness created a backlash against the very idea of relational contracting, raising the hurdles faced by front-line managers engaged in grassroots efforts to improve the quality of their supplier relationships. Reminiscing about the surprisingly enduring relationship between his firm and CRO X, the training manager cited above mentioned, "We would need to strengthen [the relationship with CRO X], but we've been burned by the PPAs and we told them that we are not making commitments anymore. This is like a PPA without the legalese, and it was not negotiated at the VP level, which actually kills the partnership."

An obdurate performance gap thus drove pharma firms in a constant search for the contractor that could meet their expectations. But the intensity of that search—changing suppliers each time a project was completed—insured that no CRO could ever meet the performance achieved by internal teams. Thus, if, unlike the principals in Levin's model, the pharma firms were unwilling to accept lower performance from the class of agents they had consigned to a buffering role, the ensuing dynamics were likely to generate relationships that were nasty and brutish; these relationships were also likely to be short, as pharma firms continually cycled through the pool of available CROs.

Failure to Adjust Performance Expectations

The final ingredient necessary to explain the prevalence of acrimonious exchanges in clinical development is the explication of the set of organizational factors that prevented the adjustment of performance expectations to a more appropriate level. At first blush, it seems that front-line managers should have been able to grasp the rationale for buffering and act on this understanding in their dealings with external suppliers. Yet the heterogeneity of projects and outcomes tended to weaken the inferences these managers could draw from their experiences with CROs. Though CROs fell short of their clients' expectations on average, performance was highly variable across projects, even for the same supplier. This idea was encapsulated in a piece of industry wisdom often heard during the field work: "A CRO is only as good as its last contract." To justify this dictum, a project manager explained, "We have not had examples of enduring good matches—mostly because CRO people turn over so quickly. Sometimes, with a single vendor who handles two projects simultaneously, the first one is a huge success, the second one is a horror story." This implied that even if the average internal project outperformed the average CRO project, there were occasional instances of projects handled by CROs whose performance met or exceeded clients' expectations. In the words of another project manager, "One of the battles that I am fighting continually internally is the battle against CRO bashing. My best project ever was with a CRO!" Although these isolated examples did little to change the CROs' overall poor reputation, they did make it difficult to recognize that expectations should be lowered: if at least some CRO projects could

perform at the level of internal projects, why couldn't all of them? And such superstitious learning was especially likely for project leaders who, unlike procurement specialists, were exposed to a relatively small sample of projects involving CROs. But why did the performance of internal teams provide such a salient benchmark to anchor clients' expectations of CRO performance? After all, employers tend to form very different expectations for their permanent and temporary staffs, even when those employees are commingled and perform similar tasks (Greenhouse, 1998). It should have been clear to all parties that, given the use of CROs as buffers, internal projects were an inappropriate benchmark for outsourced projects. Our data suggest two factors that prevented managers from lowering their performance targets for the CROs as befits the logic of their use of CROs as buffers. The first, that buffering is an unofficial practice, is somewhat specific to the context. The second, the creation of the procurement officer function, carries far more general implications.

Unofficial buffering. The practice of using CROs as buffers was not articulated publicly; it was, at best, something of an emergent strategy (Mintzberg, 1987). Most of our informants rationalized outsourcing as a natural corollary to the hard employment caps faced by project leaders. These limits on the number of full-time-equivalent employees were not justified in general strategic terms but were simply presented as taken-for-granted facts of corporate life. As discussed above, some employees came to discern the buffering logic involved, but this recognition was neither widely shared nor incorporated into formal policy statements.

Publicly recognizing the buffering role played by CROs, with the corresponding implication that they should be expected to perform at a lower level, would have made these firms vulnerable to both external and internal pressures. Internally, the fiction of homogeneity was useful insofar as it prevented project leaders from using CROs as a convenient scapegoat to explain away failure or delay. Externally, pharmaceutical firms' clinical development activities faced intense regulatory scrutiny. The drug approval process is predicated on the idea that randomized controlled trials are impervious to the influence of non-medical factors and thus provide a valid and impersonal evaluation. From a legal standpoint, it would be highly problematic for a pharmaceutical firm to admit that it did not always choose the most reliable approach to data production. Nor could regulators be expected to acknowledge the influence of heterogeneous organizational arrangements on the outcomes of clinical studies, which would have undermined the legitimacy of the entire enterprise. It thus made sense for senior management not to recognize the buffering strategy as official policy, even though this lack of public recognition proved to be an impediment in engaging with CROs more productively.

The role of procurement officers. Our field data also suggest that the creation of the procurement officer function inadvertently contributed to keeping aspirations stubbornly high. The creation of these positions was intended as an organizational fix for the problem of dysfunctional

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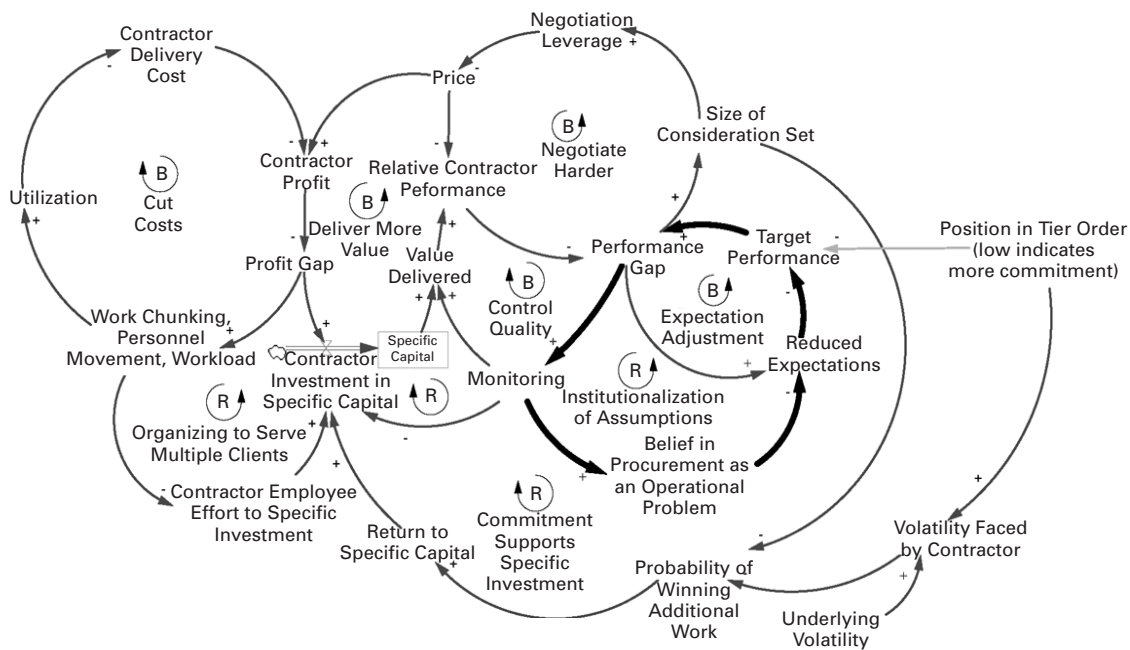
relationships with CROs. Procurement officers' boundary-spanning position afforded the opportunity to observe the full distribution of performance outcomes, for both internal and external teams. They were also partially aware of the contrasting levels of specific human capital deployed by clinical monitors on either side of the firm's boundaries.

Yet far from facilitating the process of expectation adjustment, procurement officers tended to reify pharma clients' stubbornly high aspirations for CROs' performance. The very existence of a separate procurement function was predicated on the notion that this additional organizational layer could narrow, if not eliminate the perceived performance gap between internal and external teams. As "staff" rather than "line" positions, procurement officers would have greatly endangered the legitimacy of their function within the organization if they had publicly espoused the view that less should be expected of CROs, relative to internal staff. As a result, there was little chance that these individuals would set in motion the necessary reconceptualization of the type of partnership achievable between pharmaceutical firms and CROs.

Furthermore, procurement officers had often internalized the belief that procurement was an operational, rather than a strategic problem for their firms. For instance, one of these managers forcefully claimed that "clinical monitoring is not one of our core competencies," seemingly oblivious to the fact that many of the drugs his department shepherded through the clinical trials process had been in-licensed from smaller biotechnology firms eager to tap into his employer's vaunted development expertise.

We capture this phenomenon in figure 5 by adding a link between *Monitoring*, *Belief in Procurement as an Operational Problem*, and *Reduced Expectations*. These new links create the final feedback in our diagram, the reinforcing *Institutionalization of Assumptions* loop. This loop captures the processes through which pharma's belief in the collective inadequacy of the contractor community became increasingly institutionalized. As the pharma firms increased their investment in supervision, whether in the guise of co-monitoring or through the watchful gaze of procurement officers, it became increasingly difficult for them to revisit their assumption that CROs' performance targets should be anchored on that achieved by internal teams. But because the performance target remained unrealistically high, the pharmaceutical sponsors remained perpetually disappointed with their suppliers, thereby justifying further investment in monitoring. Operating in this mode, the *Institutionalizing Assumptions* loop continually reinforced an unproductive but self-sealing view of the system they were attempting to manage and, therefore, trapped them in a relationship with their suppliers that was not only nasty, brutish, and short, but also surprisingly persistent. In this way, regulatory pressures to maintain the fiction of exchange homogeneity, combined with the institutionalization of this fiction in the organization via the procurement function, contributed heavily to a situation in which the perceived performance gap between internal and external teams was unbridgeable; this, in turn, undermined the fragile basis for a

Figure 5. Processes preventing the adjustment of expectations.



moderately embedded relationship and increased the likelihood of embeddedness failure.

DISCUSSION

Our study documents why pharma-CRO relations were so adversarial and chronically underperforming. We showed that arm's-length exchanges were not a viable option due to the need for close coordination, which explains why pharma firms attempted to develop moderately embedded relations. A four-part argument explains why these attempts failed. First, pharma's inability to commit to giving repeat business to the CROs meant that it was impossible to attain more than a moderate degree of embeddedness. Second, while moderately embedded relations were conceivable, they were also very fragile because they entailed mixing incompatible activities and routines. Third, stubbornly high aspirations triggered the devolution into a state of conflict and incessant churn. And finally, two factors explain why pharma managers failed to adjust their aspirations downward: a regulatory environment that prevented public recognition of performance heterogeneity and the adoption of a common but flawed structural remedy—the hiring of procurement officers—that institutionalized these stubbornly high aspirations.

The foregoing analysis is necessarily provisional and suggestive. Comparing our case with existing theory revealed the phenomenon of nasty, brutish, and short relationships, the analysis of which yielded both several theoretical refinements and implications for the two lines of research that intersect our case: the study of interorganizational relations, on the one hand, and organizational process improvement, on the other hand. These lessons provide the basis for a set of theoretical propositions that would be valuable to test systematically in future research.

The Sometimes Futile Search for Embeddedness

The literature on interorganizational relations has converged on the rough consensus that insofar as a vertical supply exchange features high levels of value in specificity and vulnerability to defection, it will be more likely to be embedded, i.e., marked by a high level of commitment and goodwill relative to an arm's-length exchange. That such conditions make embeddedness attractive is not mere speculation on the part of academics; this is a literature that has long been informed by practice (e.g., Macaulay, 1963). And we see in such contemporary cases as the auto industry (e.g., Dyer, 1996; Stallkamp, 2005) and large engineering projects (McKenna, 2006) that managers understand that embedded relations are appealing when either or both factors are present. And yet, despite the obvious appeal of embeddedness, attempts to create it often fail dramatically. One contribution of our paper is simply to sensitize us to the fact that such failed cases need to be considered in the range of outcomes to be explained. Moreover, as we see from our setting as well as the U.S. auto supply chain, acrimonious relations seem to involve "permanent failures" (Meyer and Zucker, 1989), such that they cannot simply be ignored as degenerate cases that will soon be weeded out via competition or learning.

To clarify the contribution made by our analysis, it is useful to first recast the received literature more conservatively such that it is also consistent with our findings:

Proposition 1: Insofar as a vertical supply exchange features high levels of value in specificity and vulnerability to defection (singly and especially jointly), this exchange will be less likely to be conducted at arm's length.

In short, given the high degree of collaboration or mutual adjustment (Sabel, 1994) that such transactions require, we can be quite confident that they will not be conducted via the spot market, at least in equilibrium. Highly embedded relations are thus attractive and explain the significant and concerted efforts to build such relations.

These features alone cannot, however, distinguish which non-arm's-length outcome will be observed on a continuum that ranges from highly embedded to nasty, brutish, and short relationships, which are marked by an adversarial orientation and a high degree of turnover due to perceived underperformance. As we have seen, intermediate cases of moderate embeddedness are also possible and are characterized by lower levels of commitment and specific investment, relative to highly embedded exchanges (MacDuffie and Helper, 2007). Our analysis points to three additional factors, leading to more refined predictions of what type of outcome will obtain in a given case.

The first factor is straightforward even if underemphasized in the prior literature—i.e., a client's ability to credibly commit to giving repeat business to the contractor. In the absence of a credible commitment, the contractor will be loath to make investments that are specific to the client. In such situations, highly embedded relations, however appealing, will be

unachievable. A more moderate degree of embeddedness is thus the best that can be achieved, even if it is not the best that is imaginable when one conducts a narrow examination of the transaction:

Proposition 2: Insofar as a client cannot commit to giving repeat business to a contractor, interorganizational transactions between the client and contractor will not be highly embedded even if they feature high levels of value in specificity and vulnerability to defection.

The element of commitment seems so obviously important that one might be tempted to regard it as a mere boundary condition. Put differently, the logic seems so powerful that we would expect selection and learning processes to create a world in which contractors do not even try to embed transactions when their clients cannot commit to giving the contractor repeat business. In the case we studied, however, this logic was obscured. Our analysis identified a general condition that weakens the commitment a client may make to a given contractor: the fact that it has made stronger commitments to parties that can substitute for the contractor (e.g., in-house clinical monitors). And without such commitments, the contractor cannot be expected to make investments that are specific to the client. Moreover, appreciating this condition alerts us to the possibility that other organizational or environmental factors often render highly embedded ties elusive. For example, the key barrier to embeddedness in the U.S. auto supply chain seems to be the historical legacy of adversarial relations, an example of the shadow cast by past experiences, rather than the likelihood of expected future interactions (Buskens and Weesie, 2000). This history and its associated stock of ill-will hinder efforts at fostering the trust necessary for clients to make specific investments.

Although an incapacity to strongly commit to a contractor explains why highly embedded relations may not be feasible, outcomes ranging from moderate embeddedness to acrimonious relationships are still possible. Moreover, it is not clear why only the end-points of this continuum should be observed. Why do we not witness a full range of cases between moderately embedded relationships and antagonistic ties? Our analysis suggests that the answer lies in a second factor: the actions taken to produce moderate embeddedness can also undermine it. These self-defeating efforts can be observed on both sides of the transaction.

From the contractor's standpoint, the infeasibility of highly embedded ties implies that it should organize itself to serve a wide variety of clients, which, in turn, entails a set of organizational routines that run counter to those necessary to support even moderate levels of embeddedness. Conversely, from the client's standpoint, the supplier's provision of perfunctory, rather than consummate effort (Williamson, 1975), means that it will need to devote internal resources to monitor the contractor's performance, but this set of activities runs counter to the goodwill needed to motivate relationship-specific investments. Finally, the infeasibility of highly embedded ties implies that the client will want to adopt a tough bargaining stance with contractors before selecting any

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particular one, but, as we have seen, this tends to lower the level of specific investments contractors can pledge to the exchange.

Thus though it is feasible to achieve moderate embeddedness, it is quite an achievement, given the fragility created by the clear substitutability between the actions necessary to produce embeddedness and those that support arm's-length exchange. And once this fragile state of affairs is disturbed, the downward spiral into nasty, brutish, and short relations is hard to reverse. In short:

Proposition 3: Because the activities and routines that support embedded and arm's-length exchange are substitutes, moderately embedded ties are fragile and subject to rapid degeneration into nasty, brutish, and short relations.

As long as each party understands the implications of the client's limited commitment capacity, they will not be tempted to fix what cannot be fixed, and moderate embeddedness will be a stable equilibrium. But as we see in the case of clinical development, managers often fail to recognize the implications of their organizational design for their ability to make credible commitments. A key element shaping the governance of interorganizational exchange therefore lies in clients' ability to form performance expectations that are well matched to their level of commitment and acknowledge the constraints imposed by internal organizational arrangements. When there is a mismatch, ill-will and underperformance seem foreordained. In short:

Proposition 4: Insofar as a client's organization design prevents recognition of the limits of its commitments to a contractor, it cannot achieve embedded relations with that contractor. Instead, relations are likely to become adversarial, chronically underperforming, and seldom repeated.

Finally, the above propositions and supporting discussion recast how we think about firms, markets, and networks. The existing literature contains two positions on how these forms of organization relate to one another. One view, associated with Williamson (1975, 1985, 1991), is that markets and firms are the key points of contrast due to their sharply opposed logics (the invisible hand of the price system vs. the visible hand of managerial authority) and that networks represent an intermediate or mixed form. A second view, associated with Powell (1990; cf. Podolny and Page, 1998), is that networks represent an entirely different logic from either markets or firms. Our analysis suggests that neither of these positions is satisfactory. At a minimum, we have seen that networks can be found both inside firms and between them (cf. Baker, Gibbons, and Murphy, 2002). In particular, though they couch their analysis in various ways—e.g., high-performance work systems (Osterman, 1994), post-hierarchical workplace (Zuboff, 1988), or knowledge-based view of the firm (Kogut and Zander, 1996)—various scholars effectively document how firms foster internal embeddedness. Just as in the case of external embeddedness (Uzzi, 1997), employees strongly identify with the organization and are highly motivated to solve problems, share information, and generally improve its performance.

Moreover, by highlighting the tension inherent in seeking to create embedded ties within and between firms simultaneously, our analysis indicates that the logics of the market and the firm are not as different as has been assumed. In particular, a key feature of both environments is that the threat of replacement hangs over every potential long-term exchange. Within the firm, employees must worry about being fired, while employers are concerned with retaining talent; in the market, sellers must worry about repeat business, while buyers are concerned about supplier switching costs. In both settings, the exchange partners may all be better off if they shift to a relational mode of governance. But this cannot happen unless the party who can replace the other makes a credible commitment to refrain from using that power. In that respect, embedded social networks represent neither a different logic from firms or markets nor an intermediate form between them. Rather, they reflect a mode of exchange that is possible in either institutional context, but only if the formal rights that define these institutions are effectively suppressed.

Accepting Worse as a General Rule

We turn finally to the general implications for organizational-practice failure, of which our case is one example. The key question suggested by proposition 4 is why the limits that inhere in an organizational design are not appreciated. In our case, the reason is partly idiosyncratic: the regulatory environment exerts pressures on clients to cling to the fiction that all projects are homogeneous, and performance is impervious to the influence of organizational design. In addition, managers' failure to come to terms with the ramifications of conflicting commitments is a pervasive problem, often leading to self-defeating attempts to increase performance. This may in part reflect the fact that organizations generally find it difficult to announce publicly when they have reduced aspirations relative to the highest performance levels. In addition, and as captured in figure 5, our analysis suggests a general, self-reinforcing process capable of producing systematic failure in many organizations: efforts to achieve unrealistic expectations result in those expectations becoming institutionalized. This lesson may be better appreciated when it is considered in light of the "expect worse before better" lesson found in the literature on process improvement. According to this line of work, the success of process improvement efforts depends crucially on managers' recognition that the returns from such efforts are uncertain and realized in the long term and that they should therefore expect a short-term degradation in performance as the price of long-term improvement (Klein and Sorra, 1996; Pfeffer and Sutton, 2000; Repenning and Sterman, 2002). But if managers do not expect this short-term degradation, they will tend to draw the wrong inferences from a short-term decline in performance and take actions that both undercut the possibility of improvement and, due to superstitious learning (Levitt and March, 1988), further reduce the likelihood that expectations will be adjusted.

Our analysis suggests that a similar self-fulfilling prophecy is responsible for the systematic failure by pharma firms and CROs to build highly embedded partnerships. In this case, the failure of expectations is not that managers do not anticipate

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"worse before better," but that they fail to expect "worse as a general rule." The general challenge is the one suggested by Augier and March (2008): insofar as organizational design involves trade-offs, certain organizational practices that are first best—the best that is achievable in general—will not be achievable in the particular organization in question. But aspects of organizational practice often conspire to prevent managers from accepting the trade-offs associated with a particular design, and this may poignantly lead them to take corrective actions that produce an even worse outcome than settling for a second-best outcome, which is in fact the best that is achievable. The decision by pharma firms to create a procurement function and charge it with bringing CRO teams' performance up to the level achieved by internal teams contributed to reify managers' stubbornly high aspirations. Not only did procurement officers lack the authority to revisit this assumption, they also acted in ways that institutionalized it. Failing to accept "worse as a general rule" and intervening in ways that reinforce the initial error is likely quite common and may be responsible for suboptimal performance or, worse, the failure of entire organizations.

Finally, it is worth underlining what is distinctive about the self-fulfilling dynamic that is at the heart of our analysis. The canonical case of a self-fulfilling prophecy is Merton's (1968) parable of a Depression-era bank run. In that example, a prediction becomes reality because actions taken to adjust to the world that is predicted bring about that very world. In our case, the self-fulfilling dynamic is somewhat different—what we might call instead a self-fulfilling diagnosis. By diagnosis, we mean the identification of a problem of a certain type, which then guides the inference processes that circumscribe the treatment that is indicated (see Abbott, 1988). But diagnoses are often wrong. And at least in certain contexts, it seems that certain misdiagnoses can induce pathologies that are more serious than the problem that was erroneously identified. Such cases are particularly poignant because, unlike the case of a bank run, they result from prosocial behavior. Participants in a bank run pursue a course of action that is at the same time individually rational and socially harmful. In contrast, managers who misconstrue a performance problem and then harm their organization in the act of problem solving show that the road to organizational hell is paved with managers' most sincere process-improvement efforts. This reminds us that one of goals of social science is to try to save ourselves from our better instincts.

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